



Council of Australian Governments

National Inquiry on Bushfire Mitigation and Management

31 March 2004

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**Council of Australian Governments
National Inquiry on Bushfire Mitigation and Management**

The Hon. John Howard MP
Prime Minister
Parliament House
CANBERRA ACT 2600

Dear Prime Minister

**Council of Australian Governments
National Inquiry on Bushfire Mitigation and Management**

It is our privilege to submit to you the report of the Council of Australian Governments National Inquiry on Bushfire Mitigation and Management.

This Inquiry was prompted by the 2002–03 fire season. Our efforts have included reviewing other reports emanating from that time, as well as analysing research and previous major reports on bushfires in Australia spanning over 60 years. The report is not only the culmination of an intensive six months of research, consultation and inquiry by the panel and secretariat, but also reflects the efforts of many others who have made submissions, authored previous reports, or contributed in some other way.

Every State and Territory, together with relevant Australian Government departments, have contributed to the Inquiry in a positive and constructive manner. We progressed the Inquiry through meetings with jurisdictional representatives, departments and agencies, all of who provided assistance, advice and encouragement. Our approach within government has been open and consultative.

The Inquiry also sought advice from specialists, researchers and recognised experts. We did not hold public hearings. This was partly because the Select Committee of the House of Representatives tabled its report in October 2003 – when this Inquiry commenced – having received over 500 submissions and having completed a series of public hearings and meetings. This Inquiry was able to draw both on the Committee report and its submissions. Other recently completed reports in Victoria and the Australian Capital Territory included extensive consultations and we benefited from their deliberations.

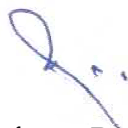
The Inquiry recommendations are largely of a policy and strategic nature and the proposals for additional expenditure are modest. We commend them to the Council of Australian Governments. We encourage the early consideration of this report so that implementation of endorsed recommendations can commence as soon as possible, and before the next fire season.

Finally we thank the Inquiry Secretariat. Without their tireless commitment and contribution, our task would have been impossible. We personally thank Nicole Matthews, the initial Secretariat Director, and Robert Tonkin, who held that position for the substantive period of the Inquiry, both from the Department of Prime Minister and Cabinet. They provided outstanding support at the highest level. Secretariat members included Paul Adcock from the Queensland Fire and Rescue Service, Michael Blyth from CSIRO, David Forsyth from the Department of the Environment and Heritage and Jane Hollier from the New South Wales Rural Fire Service. Their individual efforts contributed directly to the success of the report and we are grateful to their agencies for releasing them for the duration of the Inquiry. Fiona Whyte, Beth Reid and Janette Irwin provided administrative support.

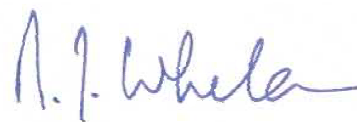
There is no way we can 'fire proof' Australia, nor should this be our objective. We can reduce the risk, and both understand and better prepare for the impact of bushfires. The Inquiry trusts that the report will provide an immediate focus for the national progress of bushfire mitigation and management, as well as the necessary reference and guidance for coming years.



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Bushfire in Australia: a vision for 2020

All Australians understand, accept and respect bushfires and know that they will continue to occur. We have drawn on Indigenous, local and scientific knowledge in learning to live with bushfires. Communities understand that the risk, and the responsibility for bushfire mitigation and management, is shared by individuals, landholders, communities, fire and land management agencies, researchers, and governments.

Australians recognise that bushfire can be damaging but that planned fire can also be beneficial, by sustaining ecological processes or by reducing fuels – thus reducing the risk of uncontrollable bushfires. Decisions about bushfire mitigation and management are made within a risk-management framework, known as the 5Rs – Research, information and analysis; Risk modification; Readiness; Response; and Recovery.

Research, information and analysis. All schoolchildren learn about bushfire survival and the role of fire in our environment. Governments, agencies and community groups guide good practice in preparing for bushfire. Coordinated bushfire research redresses gaps in our understanding of bushfires and their effects, is at the international forefront of knowledge, and informs management and policy. A ‘Centre for Lessons Learnt’ distils and disseminates lessons from major fire events.

Risk modification. There is a cooperative approach to risk reduction. Arson is a rare source of ignition. Fuel reduction and ecological burning are based on fuel management zones that link landscape management to the protection of community, environmental and economic assets. There is greater knowledge, awareness and trust between rural landholders, public land managers, communities and fire agencies. Systematic planning, development constraints and building codes in bushfire-prone areas reduce risk to life and property.

Readiness. As individuals and as a community, Australians know how to defend themselves and their property effectively against fire. The previous culture of complacency, blame and risk avoidance has been replaced by shared understanding and valuing of all assets, cooperative assessment of the most suitable risk-reduction measures, and shared responsibility for action.

Response. Bushfire response is planned, coordinated and managed by the states and territories, and cooperative arrangements facilitate cross-border assistance. Aerial firefighting resources are coordinated nationally. State and territory bushfire services operate within integrated emergency services, structured for a range of hazards. Volunteers are integral to rural firefighting. The states and territories deliver training to national standards, and there are many examples of interagency and interstate deployments of personnel affording greater experience. Volunteers are valued, encouraged and recognised.

Recovery. Recovery occurs concurrently with the response effort and focuses on individual support, community and economic renewal, and environmental restoration. Part of recovery is learning from the experiences of each fire event, and from other emergencies, to maintain our awareness and improve our knowledge, planning and responses.

Summary: living with fire

Bushfires are an inherent part of the Australian environment. We cannot prevent them, but we can minimise the risks they pose to life, property and infrastructure, production systems, and the environment.

Australia has a large and very capable force of volunteer and career firefighters, advanced firefighting technologies, and significant firefighting resources. But the geographical scale of our country, the large and expanding rural-urban interface, and the potential for rapid bushfire development and spread under adverse weather conditions mean that individual Australians cannot rely solely on fire agencies to protect their lives and property from bushfires.

Bushfires have a fundamental and irreplaceable role in sustaining many of Australia's natural ecosystems and ecological processes and are a valuable tool for achieving land management objectives. However, if they are too frequent or too infrequent, too severe or too mild, or mistimed, they can erode ecosystem health and biodiversity and compromise other land management goals.

We have been learning to live with fire since the first Australians arrived on our continent. We need to continue, and enrich, that learning process in contemporary circumstances and be able to adapt our planning and responses to change. This report seeks to help all Australians meet these challenges.

The Inquiry

The Inquiry responded to its terms of reference by focusing on the following themes: risk factors contributing to bushfires; bushfire mitigation strategies and their impacts; the impacts of bushfires on the environment, life, property and the economy; resources and infrastructure for fire mitigation and firefighting; efficiency of resource use and the best use of technologies; cooperation between agencies and jurisdictions; and examples of good practice.

Building on the extensive body of knowledge about bushfire in Australia and on the reports of previous bushfire inquiries, we adopted an evidentiary approach and a strategic national outlook. Some of our recommendations can be implemented quickly, but we consider that many important outcomes are achievable only in the longer term. Achieving them will require strategic and sustained investments, cultural and institutional change, and leadership from all Australian governments.

The recent report to the Council of Australian Governments, *Natural Disasters in Australia*, proposed reform of mitigation, relief and recovery arrangements for all natural disasters. Our philosophy, approach and recommendations complement those advanced in that report.

The 2002–03 fire season

The Inquiry's establishment was prompted in part by the severity of the 2002–03 fire season, between May 2002 and April 2003, and its impacts. Severe drought conditions and above-average temperatures prevailed across much of Australia, creating high-risk conditions. Ten people lost their lives; city suburbs, rural towns, farms, plantation forests and infrastructure were damaged; property losses exceeded \$400 million; and there were significant environmental impacts. In southern Australia the fire season was characterised by both campaign fires – bushfires extending over a prolonged period – and extreme events on particular days during the campaign fires.

Nationally, over 54 million hectares were affected by bushfires. In this fire season, as in others, the greatest area burnt was in Australia's rangelands and northern savannas, where extensive bushfires affected particularly Indigenous communities, pastoralists and environmental assets. The area burnt in the northern Australian savannas in 2002–03 was less than that burnt in the two preceding seasons, but Central Australia experienced the greatest area burnt in 25 years as a consequence of high fuel loads following good rains in previous years.

Aspects of the 2002–03 fire season in south-eastern Australia were reminiscent of other seasons that have generated inquiries, among them 1939 in Victoria, 1961 in south-west Western Australia, 1967 in Tasmania, 1983 in Victoria and South Australia, and 1994 and 2001 in New South Wales. This pattern is a reminder that, while the 2002–03 season was severe, it was not unprecedented or even unusual in the longer sweep of history in such a fire-prone continent.

We can expect other severe fire seasons in the future; they may even become more frequent and more severe under changed climatic conditions.

Learning how to live with bushfire

Given the inevitability of bushfires, all Australians must learn how to live with them. This has been recognised at least since the Streeton Royal Commission of 1939, which identified both school and adult education as 'the best means of fire prevention and protection'. Despite achievements in other areas of education about living safely in the Australian environment, and progress on particular aspects of education and awareness of bushfires in individual states and territories, a nationally consistent bushfire education strategy that reaches and informs all Australians is yet to be implemented.

Australia needs a nationwide program of school and community education about bushfires – the fire history of the continent, the role of bushfire in the Australian environment, and how to prepare for bushfires and survive them. As a result of this learning, Australians will be better able to protect their own life and property and those of others. There is strong evidence that well-informed and well-prepared communities, with realistic expectations both of the likely impacts of bushfire and of the suppression capabilities of fire services, can minimise the impacts of bushfires.

A well-informed community will also appreciate that there are 'good' as well as 'bad' bushfires. Good bushfires help to meet land management and fire mitigation

objectives without adverse impacts on people, property or the environment. Bad bushfires threaten lives, property or the environment and can do so in ways that are difficult to control.

We should grasp opportunities to integrate learning about bushfires with learning about other hazards, to learn from and with Indigenous Australians, and to draw on scientific research and educational innovation.

A risk-management framework

A structured risk management process, consistent with the Australian Risk Management Standard, offers the best framework for making strategic and operational decisions about bushfire mitigation and management. Emergency management in Australia has adopted one form of this framework; its elements are Prevention, Preparedness, Response and Recovery, or PPRR.

The Inquiry further developed and adapted the PPRR framework to a 5Rs framework – **R**esearch, information and analysis; **R**isk modification; **R**eadiness; **R**esponse; and **R**ecovery – which is a better basis for understanding the integrated elements of bushfire mitigation and management.

Application of the 5Rs framework should be informed by a thorough understanding of the full range of assets that are threatened by bushfire – life and property, infrastructure and production systems, and environmental values.

Research, information and analysis

Information and data, and their analysis and synthesis, are the basis for knowledge and learning from which we can continuously improve the effectiveness and efficiency of bushfire mitigation and management. Consistent data gathering and collation about bushfires across Australia have been limited, handicapping informed decision making.

Spatial data and its use in mapping products have become increasingly important for bushfire mitigation and management. The capture and provision of data and information relevant to bushfire mitigation and management are being greatly facilitated by the adoption of all-hazards and whole-of-government approaches by the Australian Government and the state and territory governments.

Advances in technology, analytical tools and communication (such as the increasing availability and quality of satellite remotely sensed data and its interpretation and communication to diverse audiences) are very important to bushfire mitigation and management. There has been good progress towards nationally consistent, widely available data and information in some arenas, but anomalies and gaps remain. These include a national program of fire regime mapping, establishment and maintenance of a suite of nationally consistent databases, establishment of a network of long-term ecological research sites, and integration of information gathering in an adaptive management process.

Research investment relevant to bushfire mitigation and management has been boosted by the establishment of the Natural Heritage Trust and relevant

cooperative research centres. Although these investments by the Australian Government and state and territory governments and their agencies are significant, there remain gaps and urgent priorities. For example, more research is needed on building design and materials, climate and climate change, fire behaviour and ecological responses, individual and community psychology and social processes, and Indigenous Australians' knowledge and use of fire.

Strategic research planning, and sustaining research capacity beyond the lives of the cooperative research centres are critical concerns and need to be addressed now if current research is to continue to inform bushfire mitigation and management.

Risk modification

Risk modification has three main elements:

- planning processes that ensure that built assets are not placed in areas of high fire risk and that structures meet standards of construction that reduce their vulnerability
- reducing the frequency of ignitions that result from arson and carelessness
- managing the landscape so as to minimise the risk of damage to life and assets.

Identification of assets and agreement about the most suitable and effective forms of risk modification for them underpin decisions about risk modification.

Land use planning, development controls and building standards have a central role in reducing the risk to people and property from bushfire. The Inquiry endorses the recommendation of the *Natural Disasters in Australia* report to the Council of Australian Governments in relation to land use planning, development controls and building standards.

Arson is a significant cause of bushfires. Reducing the frequency of ignitions that result from arson depends on effective education and policing and on community vigilance. There are a number of examples of successful arson-reduction programs. School and community education are the principal means of reducing the number of fires that arise from carelessness.

Modification of elements of the landscape is an important means of reducing risks to assets. Among the objectives of landscape modification are reducing the probability of a bushfire starting, slowing its spread, limiting its intensity so that it might be controlled, and maintaining ecological processes and biodiversity. Strategically planned and effectively implemented fuel reduction, usually but not only by burning, is the primary means of risk reduction.

There is no point in conducting fuel-reduction burning unless it is effective in reducing the risk to assets. There are many constraints on achieving fuel reduction on a large scale across the landscape. Some of these are operational; others are associated with environmental damage caused by too-frequent burning. Consequently, fuel-reduction burning should not be seen as a panacea: it needs to be used to address strategic priorities that respect the range of assets and values in

a landscape and minimise the risk to each of them. Effective risk reduction requires shared understanding of assets and shared responsibility for protecting them.

Creating a mosaic of fire regimes across a landscape – with fire intervals, seasons and intensities in the mosaic appropriate for particular ecosystems – appears to be the best means of sustaining biodiversity and should be a goal of both ecological and fuel-reduction burning. There will still be trade-offs, because fuel-reduction regimes that threaten biodiversity might have to be applied in particular circumstances to achieve adequate risk reduction.

We still have much to learn from Indigenous Australians about their knowledge and use of fire. Evidence from several parts of Australia shows that their understanding of fire can be integrated with current scientific knowledge and adaptive management to improve bushfire mitigation and management across the continent.

Readiness

Readiness describes everything that can be done before a bushfire event. It is just as important for individuals and communities as it is for fire and land management agencies. Relevant and effective community education and public information programs are therefore central to readiness. The 2002–03 fire season revealed some of the difficulties of achieving this, especially in ensuring that programs retain their relevance and impact during extended periods without major bushfires. Encouraging membership of volunteer rural fire brigades and the development of community-based fire groups are two important elements of maintaining bushfire readiness in the community.

An incident management team needs to be ready to provide comprehensive ‘operational’ information on the status of a bushfire, the response measures being taken, the areas potentially at risk, and preparations that members of the public can make. The media have a particularly important role to play in conveying accurate and timely information. All agencies involved in fire and recovery need to be fully prepared and able to call on additional resources as required.

Agencies need to be able to communicate readily with each other. There are still significant impediments to good communication, and the Inquiry supports the efforts of the National Coordinating Committee for Government Radio Communications to develop a national plan to ensure interoperability of emergency services radio communication across Australia.

Response

State and territory fire authorities are responsible for most aspects of operational response. The Inquiry supports the all-hazards approach to control and coordination of bushfire responses based on the AIIMS Incident Control System. Important elements of such a system are unity of command in large, complex, multi-agency bushfire responses and mechanisms for identifying and using local knowledge.

Rural fire agencies place strong emphasis on safety and training. The media and residents may also need training in fire-ground safety. Less experienced firefighters also need more structured programs so that they can gain operational experience.

There is currently no standard system across the states and territories for fire ban advice or for bushfire threat warnings. Given the mobility of the Australian population, especially in summer, the Inquiry supports the development of standardised national warning and alert systems.

Fire access trails and water access are important components of bushfire response that often receive too little attention. Although land management objectives can place constraints on the specific location of fire trails and stored water, these response components need to be strategically planned, mapped, marked and maintained.

The Defence organisation has the capacity and willingness to support bushfire fighting in emergency situations, but the limits to its potential contribution are generally not understood by the public. The operating arrangements for Defence assistance to the civil community are generally effective and well coordinated.

Aerial fire suppression is valuable technology when used as part of a coordinated strategy with firefighters on the ground. The Australian Government has displayed leadership in supporting the establishment of the National Aerial Firefighting Centre, and the Inquiry considers that the Government's support should continue, pending the outcomes of current research into the overall effectiveness of aerial fire suppression.

Residents need to be sufficiently well informed and prepared to be able to decide whether to evacuate when threatened by a major bushfire or to stay and defend their property. There should be a consistent national policy that is understood by residents as well as fire, police and emergency services personnel. Such a policy must be fully integrated with community education, so that residents can make informed decisions and avoid risky evacuation at the height of a fire event.

Recovery

Processes for recovery from major bushfires parallel those relevant to other natural disasters and should therefore be considered from an all-hazards perspective. There is a comprehensive, nationally agreed framework for recovery, the *Australian Emergency Manual – disaster recovery*, which should now be updated to incorporate lessons learnt from the recovery programs following the recent major bushfires and the outcomes of the review of community support and recovery arrangements by the Health and Community Services Ministerial Council.

This update should highlight the importance of adopting a whole-of-government approach; quickly implementing special arrangements for a particular bushfire event but ensuring an effective transition back to normal arrangements; helping affected people to navigate the maze of support structures; and encouraging the insurance industry to provide consistent and clear advice to policy holders.

Governance and coordination

Major bushfires do not recognise local government boundaries, interstate borders or the distinction between private and public lands. As the size and impact of bushfires increase, each level of government is progressively engaged. The effectiveness of bushfire mitigation and management is determined by the degree of interaction within and between the three levels of government.

The development of policy on bushfire mitigation and management across Australian Government departments and agencies would be best coordinated by a senior-level committee. That committee could also coordinate advice on these matters to the Australian Emergency Management Committee and the augmented Australasian Police Ministers Council. The Inquiry also considers that a mechanism should be established for the Australasian Fire Authorities Council to provide advice to the Australian Emergency Management Committee.

Urban and rural fire agencies are drawing closer together in each jurisdiction, and operational coordination within land management organisations is improving. This trend is desirable, and the culture of cooperation must be extended throughout the organisations. Regardless of the structures in place, there must be a single, unified command system for bushfire events and integrated operational planning and response.

Knowledge, learning and training

Learning and training are fundamental to bushfire mitigation and management and are relevant for volunteer and career firefighters as well as land managers. Learning and training take various forms – general schooling and education, competency-based qualifications under the Australian Quality Training Framework, tertiary education courses, interaction with Indigenous Australians, and through the culture of a ‘learning organisation’.

In terms of competency-based training, retaining a public safety focus is preferable to integration into a wider public sector context. The Public Safety Training Package is being used widely for volunteer and career firefighters. The Inquiry suggests that a National Safety and Security Skills Council be formed, under the Australian National Training Authority, to administer this Package and to continue its development.

Most university education about bushfires focuses on particular aspects such as fire ecology or land management. There are few programs that deal with bushfire mitigation and management as an integrated whole. Several cooperative research centres are helping to redress this situation. There is a need for a nationally coordinated program of professional development relevant to the various aspects of bushfire mitigation and management. Such a program would best be developed and run by the Australasian Fire Authorities Council and Emergency Management Australia, in partnership with relevant state and territory agencies and education and research institutions.

A ‘learning organisation’ has processes for capturing and sharing the lessons from recent events. To add most value, learning also needs to be shared among organisations. The Inquiry considers that Australia would be very well served by

the establishment of a Centre for Bushfire Lessons Learnt, to build on existing institutions and arrangements and to draw on the knowledge and experience of Indigenous Australians.

Rural fire service volunteering

Over 30 per cent of Australians over the age of 18 years do volunteer work of some kind. Emergency services volunteers make a major contribution to the safety and wellbeing of Australians. About a quarter of a million such volunteers, mostly in the rural fire services, contribute about 21.5 million hours annually. This effort forms the foundation of Australia's emergency service response. The Inquiry found that a wide range of methods are used to acknowledge the contributions of volunteers; the report catalogues and comments on these.

It is important for the states and territories to ensure that the demands made of volunteers are reasonable, especially during bushfire campaigns of long duration. This includes ensuring that there is a matching of volunteer availability with the assessment of the probable extent of deployment, having processes in place for volunteer support, and recognising the generosity and cooperation of volunteers' employers.

Recent increases in levels of training required to meet national competencies are making membership of rural fire brigades too onerous for some volunteers. It would be valuable to develop a brigade classification structure and training regime that provides greater flexibility for these volunteers.

Reviewing performance

The Inquiry proposes that a common set of bushfire good practice indicators be developed within a risk-management framework, to provide consistency of reporting and review.

Major bushfire events are typically followed by a cycle of government and community responses – bushfire event → accusations and blame → inquiry and review → increases in funding → initial change and compliance → coronial inquiry → complacency → the next event. Some elements of this cycle are positive and constructive; others are not.

Investigations of bushfires should be completed soon after the event. The public must be satisfied that deaths and other matters of concern are properly explored, and individuals need to be held accountable for their decisions. Reviews and investigations should focus on learning, rather than on blame. Adoption of a common set of national indicators of good practice – with subsequent state and territory review against them – will provide transparent measures of government, agency and community performance, potentially reducing or even eliminating negative aspects of the bushfire cycle and improving overall bushfire mitigation and management.

The Inquiry notes that the coronial inquest process can be adversarial, drawn-out and expensive and therefore less helpful in a review-and-learning process.

National bushfire principles

There is no consistently expressed common understanding of our approach to bushfire mitigation and management in Australia. This is a poor foundation for the future. A clear statement of principles is needed if we are to achieve the following objectives: establish shared goals; communicate the goals widely; develop a common framework for mitigation and management; ensure cooperative responses across borders and tenures; and improve assessment and reporting of performance and compliance with standards.

The Inquiry recommends that the Council of Australian Governments adopt a statement of national principles for bushfire mitigation and management; this report suggests the following indicative national bushfire principles.

Indicative national bushfire principles

Bushfires are understood, accepted and respected

Like other natural hazards, bushfires cannot be prevented. In many instances, bushfires are an important tool to assist in achieving land management objectives. The impact of unplanned fires needs to be minimised through effective action based on learning and understanding. This also requires strong self-reliance.

Shared responsibility

A philosophy of responsibility shared between communities and fire agencies underlies our approach to bushfire mitigation and management. Well-informed individuals and communities, with suitable levels of preparedness, complement the roles of fire agencies and offer the best way of minimising bushfire risks to lives, property and environmental assets.

Decisions within a risk management framework

No single action will lead to the elimination of bushfire risk. The best approach to minimising risk is to make decisions about bushfire mitigation and management within an integrated risk management framework.

Integration of learning and knowledge

Analysis of fire events is based on operational and scientific evidence and research. This should be informed by extensive and consistent national data, including fire regime mapping. The best results will be achieved by integrating all forms of knowledge, and good information about fire history, with analysis at the local and regional levels.

Manage fire according to the landscape objectives

Australia has a great diversity of climates, environments, land uses and built assets. Fire management objectives and outcomes will vary across landscapes and over time. Clear agreed objectives and an adaptive management approach are required for implementation.

Consistency of purpose and unity of command

There needs to be consistency of purpose during bushfire mitigation and unity of command for all fire response, irrespective of organisational structures.

Protection of lives as the highest consideration

Firefighter and community safety must be at the forefront of bushfire mitigation and management deliberations. Although there should always be a balance between safety, effective response and environmental considerations, it is personal safety that must be the greatest concern.

Monitoring performance

The states, territories and local governments need to regularly review their performance against these principles and other appropriate indicators. Performance review should not be allowed to wait until after a major bushfire event. If the principles are to improve performance and bring about change, they must be monitored on a regular basis.

Findings and recommendations

1 Bushfire in Australia

There are no findings or recommendations in this chapter.

2 The 2002–03 fire season

2.3 Distinctive aspects of the 2002–03 fire season

Finding 2.1

The 2002–03 fire season, extending from May 2002 in northern Australia to April 2003 in southern and western Australia, was characterised by:

- a historically significant fire season
- the potential to be the most severe fire season in all states and territories for between 20 and 40 years
- major fires in all jurisdictions, affecting in excess of 54 million hectares, with vast areas being affected in central and northern Australia
- major campaign fires in New South Wales, the Australian Capital Territory and Victoria and a major disaster in Canberra on 18 January 2003.

In total, these fires claimed 10 lives, destroyed over 1200 structures, killed over 21 000 head of livestock, and resulted in great environmental damage and estimated insurance losses in excess of \$400 million.

The principal reasons for the severity of the 2002–03 fire season were the prolonged drought over much of Australia, which dried out available grassland and forest fuels, combined with above-average temperatures and a much higher incidence of lightning strikes.

3 Learning how to live with fire

3.2 School-based bushfire education

Recommendation 3.1

The Inquiry recommends that state and territory governments and the Australian Government jointly develop and implement national and regionally relevant education programs about bushfire, to be delivered to all Australian children as a basic life skill. These programs should emphasise individual and household preparedness and survival as well as the role of fire in the Australian landscape. Program effectiveness should be audited by each state and territory after five years, with a national report to be provided to the Council of Australian Governments.

3.3 Community-based education

Finding 3.1

Well-informed and well-prepared individuals and communities complement the roles of land managers and fire agencies. This shared responsibility offers the best way of minimising risks to people, property and the environment. Effective community education, awareness and engagement programs targeted to the needs of local communities are required to achieve this objective.

4 The risk-management process

4.3 The 5Rs: a risk-management framework for bushfire

Recommendation 4.1

The Inquiry recommends that a structured risk-management process based on the Australian Standard for Risk Management be further developed and applied in all aspects of bushfire mitigation and management, informed by a thorough understanding of the full range of assets.

5 Research, information and analysis

5.2 Data and information relevant to bushfire mitigation and management

Finding 5.1

The quality and currency of digital mapping databases are critical for the provision of up-to-date mapping products. The Inquiry supports and encourages state and territory and Australian Government initiatives to digitise existing spatially explicit data and develop digital mapping databases according to nationally agreed procedures and standards and to make these products available in operationally useful form. The Inquiry strongly supports the role of national bodies and representative groups in facilitating nationally consistent and accessible spatial data and data products.

Finding 5.2

The Inquiry supports the use of remotely sensed data to provide more extensive, objective and timely data for informing strategic and operational decisions about fire mitigation and management. It also supports the development and delivery, in user-friendly forms, of data products that facilitate access by the community, as well as the staff of fire, land management and emergency services agencies.

Finding 5.3

The Inquiry notes the following:

- the fundamental importance of high-quality, locally specific weather information and forecasting services to bushfire mitigation and management
- the high quality of services provided by the Bureau of Meteorology

- the potential cost and the consistency implications of some weather services being provided by commercial suppliers.

The Inquiry supports the following:

- the continuation and further enhancement of Bureau of Meteorology fire weather forecasting
- the resourcing of the Bureau at a level sufficient for it to maintain and develop these services, particularly at the regional level
- further exploration of the potential benefits of a more strongly coordinated national fire weather forecasting system.

Recommendation 5.1

The Inquiry recommends the provision of additional resources jointly by the Australian Government and the state and territory governments for the following purposes:

- to accelerate the research necessary for the characterisation of fuel loads and dynamics for Australian ecosystems (both natural and exotic), the characterisation of fire behaviour and ecological responses, the development of 'burning guides' from this information, and the compilation of this information and knowledge in nationally accessible databases
- the establishment of a national network of long-term ecological research sites to provide a basis for long-term monitoring of the impacts of fire regimes and fire events.

Recommendation 5.2

The Inquiry recommends that the Australian Government and the state and territory governments jointly provide additional resources and work in partnership to establish and refine a national program of fire regime mapping.

Finding 5.4

The Inquiry supports the development of whole-of-government initiatives to improve aspects of information and data collection, storage, exchange and reporting. These initiatives should recognise the agencies involved in bushfire mitigation and management and take into account the particular characteristics of bushfires in the design and implementation of reporting systems.

Finding 5.5

The Inquiry strongly supports further capacity building relevant to bushfire data and information among communities and the public and private sectors.

Recommendation 5.3

The Inquiry recommends that the Australian Government and the state and territory governments continue to develop national consistency in data sets relevant to bushfire mitigation and management under the Australian Spatial Data Infrastructure framework, and within this context, identify and resource national bushfire data set coordinators.

5.3 Research relevant to bushfire mitigation and management

Finding 5.6

A national coordinating mechanism representing the principal interests and organisations in bushfire research is necessary to maximise the national benefit from investments in bushfire research.

Recommendation 5.4

The Inquiry recommends 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.

6 Risk modification

6.1 Planning and building in bushfire-prone areas

Finding 6.1

The Inquiry supports the view, expressed in *Natural Disasters in Australia*, that land use planning that takes into account natural hazard risks is the single most important mitigation measure for preventing future disaster losses (including from bushfires) in areas of new development. Planning and development controls must be effective, to ensure that inappropriate developments do not occur.

Recommendation 6.1

The Inquiry endorses the recommendations in the *Natural Disasters in Australia* report relating to disaster mitigation through land use planning and development controls and recommends that the states and territories continue to make their advisory and statutory measures more effective.

Finding 6.2

Adequate resourcing of local government is essential for robust and competent bushfire planning and decision making and for ensuring continuing maintenance of protection zones and adherence to development controls.

Recommendation 6.2

The Inquiry recommends that the review of the Building Code of Australia, with particular reference to the Construction of Buildings in Bushfire Prone Areas Standard – to deal with resistance to natural hazards, including bushfires – be completed by the Australian Building Codes Board as a matter of priority.

6.2 Arson

Finding 6.3

Arson remains a significant risk for bushfire ignitions, and the states and territories must continue to direct resources towards deterring people from engaging in this illegal activity. National information sharing will assist, although a national program is not justified.

6.3 Landscape management for bushfire risk: an overview

Finding 6.4

There needs to be a shared understanding and valuing of assets in relation to bushfire mitigation and management. There also needs to be better recognition of the fact that prescribed burning is a complex matter – ecologically and operationally – and that a variety of prescribed fire regimes might be necessary to meet a range of objectives.

6.4 Risk modification for community assets

Finding 6.5

There is a need to develop ways of assessing the effectiveness of fuel-reduction programs in terms of the resultant degree of reduction in risk.

Finding 6.6

Comparing the gross area treated annually in fuel-reduction burning – that is, for a whole agency, region or state – with a published target is not a good basis for assessing performance and is likely to be counterproductive.

6.5 Risk modification for environmental assets

Finding 6.7

The Inquiry supports the adoption of an adaptive management approach to setting fire regimes that are appropriate for biodiversity conservation. Such an approach should:

- make explicit the biodiversity objectives
- recognise lack of knowledge and clarify questions that need to be answered
- design burning prescriptions that can answer these questions
- devise and fund monitoring and other data-collection activities

- review and communicate results
- use the new knowledge to modify the management prescription.

Finding 6.8

More research and monitoring are required in order to understand the effects of fuel-reduction burning and large-scale bushfire events on water quality and quantity in catchment areas.

Finding 6.9

The potential for a reduction in air quality is one of several impediments to achieving necessary levels of fuel-reduction burning. There is a trade-off between tolerating reduced air quality and achieving risk reduction by fuel-reduction burning. Resolution of the question requires both more research and effective dialogue with the community.

Finding 6.10

Long-term strategic research, planning and investment are necessary if the Australian Government and state and territory governments are to prepare for the changes to bushfire regimes and events that will be caused by climate change.

Finding 6.11

There is a potential trade-off between maximising native pasture production by using fire and avoiding biodiversity loss. Too-frequent use of fire, and too much uniformity in fires, can result in loss of biodiversity in a region.

6.6 Land managers' responsibilities

Recommendation 6.3

All states and territories should have a zoning approach to the classification of fuel management areas, with clear objectives for each zone. The process should be applied at the landscape scale, and all land managers and the community should be involved.

Finding 6.12

Natural resource management regional plans developed under the National Heritage Trust should take bushfire management into account and be consistent with the bushfire risk-management process.

6.7 Indigenous Australians' use of fire

Recommendation 6.4

The Inquiry recommends that fire agencies, land managers and researchers continue to work in partnership with Indigenous Australians to explore how traditional burning practices and regimes can be integrated with modern practices and technologies and so enhance bushfire mitigation and management in current Australian landscapes.

7 Readiness

7.1 Community education, information and action

Finding 7.1

The community information and engagement programs conducted by the states and territories are generally comprehensive. Their effectiveness depends on community uptake and commitment. Community surveying needs to be done regularly to ensure that programs retain their relevance and are being delivered in ways that maximise community participation and understanding.

Recommendation 7.1

The Inquiry recommends that each state and territory formalise non-exclusive agreements with the Australian Broadcasting Commission as the official emergency broadcaster, providing an assured standing arrangement. Similar protocols with commercial networks and local media should also be established.

7.2 Operational communications

Finding 7.2

The Inquiry supports the efforts of the National Coordination Committee for Government Radio Communications in seeking to develop a national strategic plan to enable interoperability of emergency service radio communication across Australia.

7.3 Surge capacity

Finding 7.3

Emergency services' readiness for and response to bushfires is reliant not only on the movement and concentration of firefighting resources but also on the assured availability of recovery services and infrastructure support such as telecommunications. Community service obligations of suppliers should include this requirement.

8 Response

8.1 Operational response

Finding 8.1

The current all-hazards control and coordination arrangements at the national and state and territory levels are adequate for the operational management of bushfires in Australia.

Finding 8.2

Effective management of large rural fire incidents remains one of the greatest challenges for fire authorities. If bushfire management performance and outcomes are to improve, the necessary focus and resources must be directed to this end. The AIIMS Incident Control System offers the means to achieve that.

Recommendation 8.1

The Inquiry recommends that implementation of a single Incident Control System for the management of multi-agency emergency incidents be further examined by the Australian Emergency Management Committee, with a view to developing one nationally agreed system.

Recommendation 8.2

The Inquiry recommends that the AIIMS Incident Control System be adjusted so that it adequately allows for the identification and integration of local knowledge during firefighting operations.

Recommendation 8.3

The Inquiry recommends that a central function of the AIIMS Incident Control System be the flow of adequate and appropriate information to threatened communities, government, police and other emergency services authorities. The incident controller should have overall responsibility for this.

Recommendation 8.4

The Inquiry recommends that all Australian fire authorities adopt and continue to use the AIIMS Incident Control System in accordance with Australasian Fire Authorities Council guidance and policies.

Finding 8.3

Failure to acknowledge and use local knowledge erodes the credibility of fire agencies and the AIIMS Incident Control System, ultimately reducing the effectiveness of the national bushfire-response effort.

Finding 8.4

The Inquiry commends the 'safety first' approach adopted by fire agencies. This approach does, however, highlight the need for effective mentoring to complement formal training. It is not sufficient to rely on technical qualifications and competencies alone.

Recommendation 8.5

The Inquiry endorses the recommendations on warning systems in the report *Natural Disasters in Australia*. In addition, it recommends as follows:

- that all fire ban advice and subsequent 'bushfire threat warnings' related to specific fires be conveyed consistently in all states and territories, including the use of the Standard Emergency Warning Signal when lives or property are threatened
- that the final structure of the warnings be based on the findings of the Bushfire Cooperative Research Centre's project *Communicating Risk to Communities and Others*.

Finding 8.5

Fire access trails and water access are important, practical components of bushfire mitigation and management that are often inadequately considered. Consistent national markings adopted by all states and territories would benefit bushfire response, particularly for out-of-area fire crews.

Finding 8.6

- Defence has the capacity to provide valuable assistance in support of bushfire fighting, but it has a limited number of personnel with the necessary training to engage in direct firefighting operations. This is not always well understood by the public and should be better explained by Defence.
- The operating arrangements for Defence assistance to the civil community are effective, as is the coordination of that assistance at the local Defence command level and through Emergency Management Australia for larger scale or longer duration events.
- Defence support during the 2002-03 fire season was in all cases effective and well received.
- Matters relating to the possible presence of unexploded ordnance on former Defence land are emotive locally and require direct consultations between the Department of Defence and the fire agency concerned.

8.2 Aerial operations

Finding 8.7

The Inquiry encourages the Bushfire Cooperative Research Centre to place considerable emphasis on the aerial suppression elements of its firefighting technology project, being conscious of the three years planned to achieve a result. Early publication of results from the study will be an important contribution to the future work of the National Aerial Firefighting Centre. The appropriate extent of aerial support for bushfire fighting cannot properly be determined until the Bushfire Cooperative Research Centre has completed its research.

Finding 8.8

The Inquiry supports the approach taken in Victorian performance agreements, whereby aerial providers receive a proportion of the contract price dependent on satisfactory performance in such areas as safety, load performance, availability and communications. The Inquiry encourages the Bushfire Cooperative Research Centre to review this approach as part of its research.

Finding 8.9

The Inquiry considers that aerial fire suppression makes an important contribution to bushfire-suppression operations. We support the approach that the most effective use of aerial bombing is during the early stages of fire development, to establish and maintain control lines and to protect assets in the path of a fire. The effectiveness of aerial bombing on more intense fires is questionable. All aerial operations are reliant on a coordinated approach with the firefighters on the ground.

Recommendation 8.6

The Inquiry recommends that the Australian Government maintain leadership of and support for the National Aerial Firefighting Centre for a further three years, until the Bushfire Cooperative Research Centre has finalised its research into the effectiveness of aerial suppression operations.

8.3 The decision to go early or stay and defend

Finding 8.10

A decision on the application of the 'go early or stay and defend' policy in circumstances where particular properties are not defensible is one for individual states and territories.

Recommendation 8.7

The Inquiry recommends as follows:

- that the approach that gives residents the option of leaving when confronted by a major bushfire threat or making an informed decision to stay and defend their home or property be adopted as a common national policy
- that implementation of a 'go early or stay and defend' policy must be fully integrated, with effective community education programs to improve preparedness and support timely and informed decision making.

Provision of training for fire, police and emergency services personnel in the application of the go early or stay and defend policy is essential if this approach is to be applied safely – with particular emphasis on minimising evacuations at the height of fire events. This should be supported by formal agreements between the relevant authorities.

9 Recovery

9.5 Updating current recovery practice

Recommendation 9.1

The Inquiry recommends that the *Australian Emergency Manual – disaster recovery* be updated as a matter of priority by Emergency Management Australia, in consultation with the states and territories, the Australian Local Government Association, the Department of Transport and Regional Services and the Department of Family and Community Services, to incorporate:

- the lessons learnt from the recovery programs undertaken in relation to the recent major bushfires
- the outcomes of by the Community Services Ministers Advisory Council’s review of community support and recovery arrangements.

9.6 Insurance

Finding 9.1

The insurance industry should provide improved and more consistent advice to policy holders on how to ensure that their level of insurance cover for buildings and contents meets the full replacement cost.

Recommendation 9.2

The Inquiry recommends that the Insurance Council of Australia be asked to review the industry’s code of practice in response to the lessons learnt from the claims arising from the 2002–03 bushfires.

Finding 9.2

An opportunity exists for the insurance industry to engage in community bushfire awareness through offering a premium reduction for property owners who have taken bushfire preparedness measures. This may have only a limited impact, but any raising of community awareness is beneficial.

10 Governance and coordination

10.4 Policy development and coordination

Recommendation 10.1

The Inquiry recommends that the Australian Government formalise the coordination of the development of policy on bushfire mitigation and management across Australian Government departments and agencies and the provision of advice to the Australian Emergency Management Committee and the augmented Australasian Police Ministers’ Council.

Finding 10.1

A single ministerial council overseeing bushfire mitigation and management is not practical because of varying considerations that must be taken into account by the different jurisdictions and government departments and agencies.

Recommendation 10.2

The Inquiry recommends that the Australasian Fire Authorities Council be co-opted as an adviser to the Australian Emergency Management Committee whenever bushfire mitigation and management are to be discussed.

Finding 10.2

Urban and rural fire agencies are drawing closer together, and operational coordination within land management organisations is improving. Much has been achieved in the last 20 years. This trend should be encouraged: it reduces operational vulnerability during emergencies and provides the best possible service to communities. Regardless of the structure in place, though, a single, unified command and integrated operational planning and response must exist.

10.5 Common acquisition of equipment

Finding 10.3

The potential savings from collective purchases of major equipment items between states and territories is extensive and should be explored through the Australasian Fire Authorities Council.

11 Knowledge, learning and training

11.1 Learning and training under the Australian Quality Training Framework

Recommendation 11.1

The Inquiry recommends that the Australian National Training Authority establish a National Safety and Security Skills Council to continue the development and administration of the Public Safety Training Package, including competencies and qualifications relevant to bushfire mitigation and management.

Recommendation 11.2

The Inquiry recommends that the states and territories and the Australian National Training Authority provide additional funding, as necessary, to registered training organisations to support the development and delivery of learning and training resources to all firefighters.

11.4 Further professional development

Recommendation 11.3

The Inquiry recommends that the Australasian Fire Authorities Council and Emergency Management Australia – in partnership with state and territory agencies and other education and research institutions – coordinate a national program of professional development focused on bushfire mitigation and management. Under the program, partners would deliver nationally coordinated professional development services to all jurisdictions.

11.6 A Centre for Bushfire Lessons Learnt

Recommendation 11.4

The Inquiry recommends that the Council of Australian Governments support and fund the establishment of an Australian Centre for Bushfire Lessons Learnt, for an initial period of five years.

12 Rural fire service volunteering

12.4 Volunteer representation

Finding 12.1

Existing state and territory arrangements for the representation of rural fire service volunteers are sound and provide an appropriate vehicle for volunteer consultation at agency and government levels. Questions of national significance should be directed through Volunteering Australia.

12.5 Legal protection and compensation

Finding 12.2

The Inquiry is satisfied that existing state and territory legislation dealing with occupational health and safety is sound and that the effort required to achieve a nationally uniform approach is not warranted. In other areas where volunteer firefighters may be liable, the Inquiry is satisfied that volunteers do not face greater exposure than other citizens. We do, however, urge the states and territories to maintain a process of review, to ensure that judicial interpretations are reflected in policy and procedures and that volunteers are not disadvantaged, particularly when they deploy interstate.

12.7 Tax concessions for volunteers

Recommendation 12.1

The Inquiry recommends that an opportunity for reimbursement of out-of-pocket expenses should be available for each volunteer rural fire agency. In addition, the Council of Australian Governments should decide on the question of tax concessions as raised in the paper prepared by PKF Chartered Accountants on behalf of the Western Australian Government.

12.8 Support for employers of volunteers

Finding 12.3

The Inquiry commends employers of emergency services volunteers for their contribution in allowing volunteers to deploy during emergency events. Their contribution is critical to the viability of volunteer fire brigades and needs to be recognised at every opportunity.

12.9 Commonwealth legislation

Finding 12.4

Access to Centrelink payments for volunteers deployed on campaign fires and other people who are displaced or cut off by fires was a problem in some states. The Inquiry considers this matter should be amenable to resolution through liaison at the appropriate level between state and territory and Australian Government officials.

12.10 Training of volunteers

Finding 12.5

The Inquiry received no information to suggest that state and territory rural fire services would benefit from the recognition of their volunteers as trainees. There was concern that such a change might lead to fire agencies losing control of key training responsibilities. On the basis of the available information, the Inquiry does not support this proposal.

12.11 Recruitment and retention of volunteers

Finding 12.6

The Inquiry endorses the Bushfire Cooperative Research Centre's volunteerism research project. Consideration should be given to expanding the project to include an examination of the professional development needs of managers of volunteers.

12.12 Models of rural fire service volunteering

Finding 12.7

Use of a brigade classification structure based on risk assessments is a sound approach, providing greater flexibility for volunteer commitment, particularly for rural volunteers who are unlikely to fight bushfires outside their local area.

13 Reviewing performance

13.2 Indicators of good practice

Recommendation 13.1

The Inquiry recommends that the states and territories agree to a common set of national bushfire indicators of good practice, based on the five mitigation and management factors it has identified – the 5Rs. These indicators, together with an assessment against the proposed national bushfire principles, would provide a consistent framework for review and reporting in each state and territory.

13.4 Coronial Inquiries

Finding 13.1

All reviews and investigations into bushfire events, at any level – internal or independent – need to focus on learning not blame. The inquiry approach needs to focus on this outcome, in the interests of all involved. Coronial inquests into bushfire matters other than deaths may not be the most suitable form of inquiry.

14 National principles for bushfire mitigation and management

14.1 Why national principles are needed

Recommendation 14.1

The Inquiry recommends that the Council of Australian Governments adopt a statement of national principles as the framework for the future direction of bushfire mitigation and management in Australia.

Part One

Background

1 Bushfire in Australia



Crown fire with flames up to 30 metres burning through 15-year-old fuel of jarrah forest near Mt Cooke, Western Australia

(Photo: Kristian Pollock)

We have to get over the perpetual characterisation of wild fire in Australia as a terrifying aberration, an ineluctable, unpredictable Act of God, and start to see it and manage it as an inherently Australian phenomenon that goes with the territory. Fire is a crucial shaper of many of our landscapes and a valuable resource management tool. Rather than demonising fire with the language of warfare, disaster, destruction and terror, we should have explicit programs that are about learning to live with fire ...

—Andrew Campbell¹

1.1 Introduction

Bushfires have been part of Australia's environment for millions of years. Our natural ecosystems have evolved with fire, and our landscapes and their biological diversity have been shaped by both historical and recent patterns of fire. Because of the climatic variation across Australia, at any time of the year some part of the continent is prone to bushfires, as illustrated in Figure 1.1. Climate change is likely to increase the frequency, intensity and size of bushfires in much of Australia in the future.²

Just as we now appreciate that Australia cannot be 'drought-proofed'³, so it is that the land cannot and should not be 'fire-proofed'. Rather, we must continue to learn to live with bushfire, as we have been doing since the first Australians arrived on this fire-prone continent. Indigenous Australians developed a sophisticated understanding and purposeful use of fire for land management.⁴ Since 1788 the

¹ Campbell, A 2003, 'Learning to live with fire', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

² CSIRO submission, p. 3.

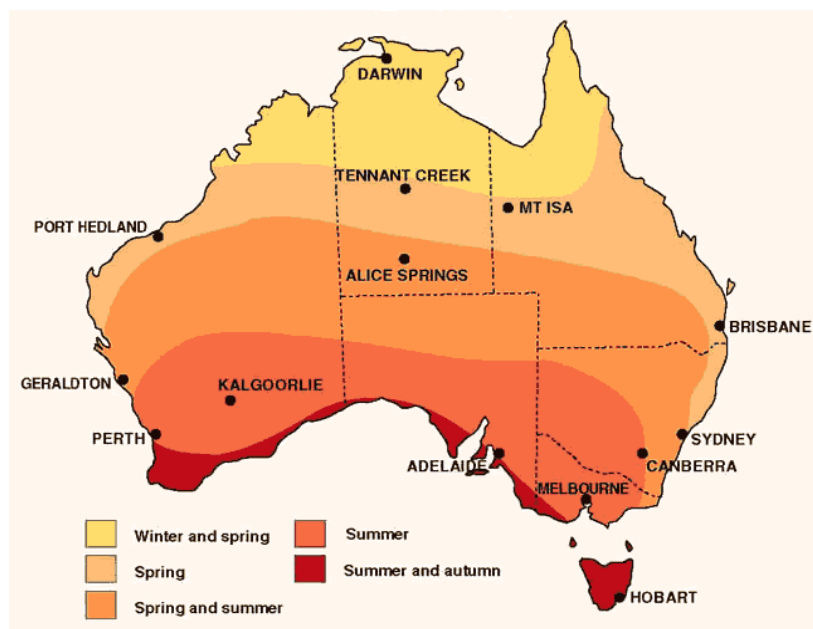
³ See, for example, Wentworth Group of Concerned Scientists 2003, *Blueprint for a National Water Plan*, viewed 27 February 2004, < www.wwf.org.au/freshwater.php>.

⁴ See, for example, Hill, R 2003, 'Frameworks to support Indigenous managers: the key to fire futures', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne; Whitehead, PJ, Bowman, DJMS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415-425.

understanding of bushfire by non-Indigenous Australians' and their capacity to respond to it have developed progressively, informed by experience, by modern science and by traditional knowledge. Australia's leadership in many elements of bushfire research, mitigation and management is now widely recognised internationally.⁵

Planned fire to achieve specific objectives (ecological⁶, fuel reduction and traditional burning) has been and remains a fundamentally important land management tool for Australia's landowners and managers and for firefighters. Australians who work with bushfire – Indigenous Australians, environmentalists, farmers and pastoralists, firefighters, public land managers and scientists – recognise that there are good, as well as bad, bushfires. Good bushfires help to meet land management and fire mitigation objectives without adverse impacts on people, property or the environment; bad bushfires threaten lives, property or environmental assets and do so in ways that are difficult to control.⁷

Figure 1.1 Fire seasons across Australia



Source: Bureau of Meteorology, <www.bom.gov.au>, cited by Lindsay, J 2003, 'Fire and climate in Australia', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

⁵ See, for example, Pyne, SJ 2003, 'Introduction – fire's lucky country', in Abbott I & Burrows N (eds), *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden, p. 4; Russell-Smith, J, Whitehead, PJ, Williams, RJ & Flannigan, M 2003, 'Fire and savanna landscapes in northern Australia – regional lessons and global challenges', *International Journal of Wildland Fire*, vol. 12, pp. 1-5.

⁶ In Chapter 6 we define 'ecological burning' to include burning for regeneration of pastures and forests.

⁷ For many examples and further discussion, see Cary G, Lindenmayer D & Dovers S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

1.2 The occurrence and extent of bushfires in Australia

Bushfires occur throughout Australia, although they may be very infrequent in some climatic zones, such as those dominated by rainforest or wet eucalypt forest ecosystems.⁸ In any given year the greatest extent of bushfires is in the savannas of northern Australia; in some seasons these extend into the semi-arid and arid interior. At the national level, fire-affected area data have been available only since 1997, with the advent of satellite fire mapping. Table 1.1 shows the area of Australia burnt in each of the past seven years; Figure 1.2 shows the extent of bushfires in Australia from the start of the 2002 dry season in northern Australia until the end of the 2002–03 summer in southern Australia.

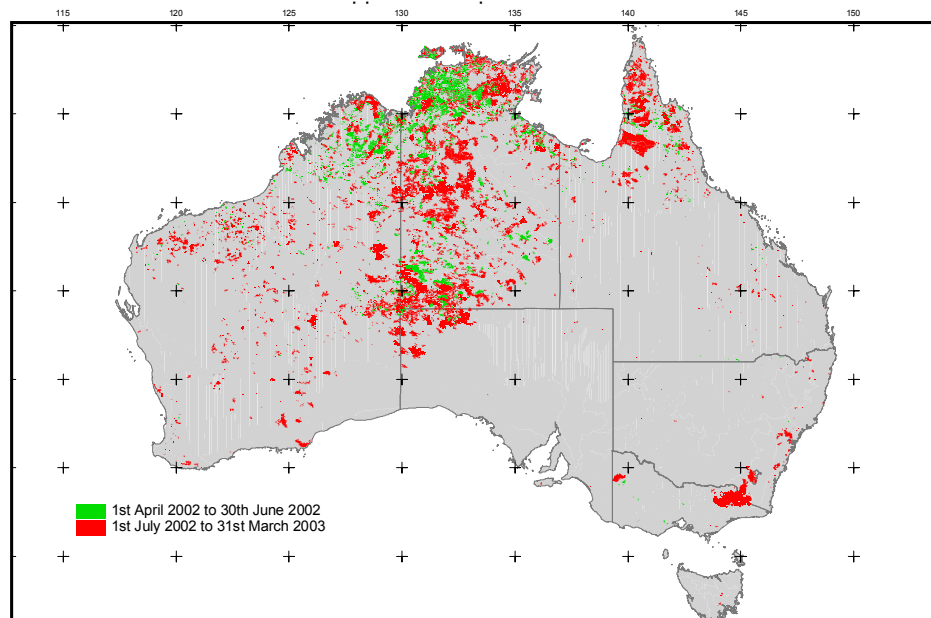
Table 1.1 Approximate fire-affected areas across Australia, 1997 to 2003

Calendar year	Area (million hectares)	Percentage of total land area fire affected	Percentage of fire-affected area that is tropical savanna ^a
1997	48.3	6.3	86
1998	26.3	3.4	92
1999	60.0	7.8	86
2000	71.5	9.3	65
2001	80.1	10.4	84
2002	63.8	8.3	63
2003	31.6	4.1	85

a. Defined by the Department of Land Information, for the purposes of monitoring fire-affected areas, as being the area north of 21°S and east of 120°E.

Source: Western Australian Department of Land Information.

Figure 1.2 Areas burnt from April 2002 to March 2003



Note: Areas burnt are mapped from 1-km NOAA-AVHRR satellite images. Fire scars less than 400 ha are not included in this dataset. Source: Western Australian Department of Land Information.

⁸ For example, fire frequencies in such forests may be less than once in 500 years; see Australia's *State of the Forests Report 2003*, Bureau of Rural Sciences, Canberra.

1.3 The impact of bushfires

Bushfire events can have significant impacts on individuals, communities, and public and private assets: they can threaten human life and property, agricultural and forest production, animals, biodiversity, air and water quality, cultural heritage and infrastructure.

Climate and ecosystems, and the geographic distribution of the Australian population and of built assets, vary across the nation and within states and territories. Consequently, the likelihood and the impact of bushfires also vary, both within a year and between years. For example, as discussed in Chapter 2, community and media interest during the 2002–03 fire season focused on fires that affected about 3 million hectares in south-eastern Australia. These fires had the most severe impacts on life and property and dramatic impacts on the natural environment. In the same fire season, however, around 38 million hectares was affected by fire in northern and central Australia. Although some of these extensive fires had considerable impacts on biodiversity, greenhouse gas emissions and soil erosion, they had much less impact on life and property.⁹

The relative economic cost of bushfires compared with those of other ‘natural disasters’ such as cyclones, storms, floods and earthquakes is illustrated in Figure 1.3, which shows the relative impacts of major natural disasters between 1967 (the year of the Hobart bushfires) and 1999 across the states and territories. The data predate the fires of 2001–02 and 2002–03, which would have increased the relative significance of bushfires, particularly in the Australian Capital Territory.

In the past 40 years major Australian bushfires have cost \$2.5 billion, corresponding to an average of about 10 per cent of the cost of all major natural disasters in Australia.¹⁰ In the same period major Australian bushfires have claimed some 250 lives¹¹ – the greatest loss of life associated with any category of natural disaster in Australia.¹²

The relative significance of bushfire also needs to be considered in terms of the extent to which we can mitigate the impacts of fire. Australians have a far greater opportunity to influence the impacts of bushfire than we do those of cyclones, earthquakes and storms. We can try to extinguish fires early, and their subsequent impacts can be greatly reduced if risk-reduction strategies are well developed and implemented – that is, if we learn to live with fire.

⁹ See, for example, Russell-Smith, J, Whitehead, PJ, Williams, RJ & Flannigan, M 2003, ‘Fire and savanna landscapes in northern Australia – regional lessons and global challenges’, *International Journal of Wildland Fire*, vol. 12, pp. 1-5.

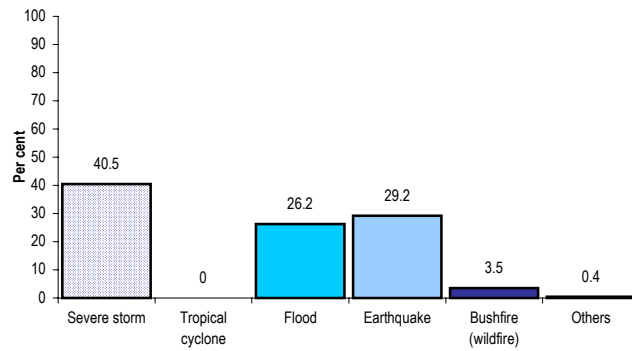
¹⁰ Between 1967 and 1999 – Bureau of Transport Economics 2001, *Economic Cost of Natural Disasters in Australia*, Report 103, BTE, Canberra.

¹¹ *ibid.*; Insurance Council of Australia submission, p. 6.

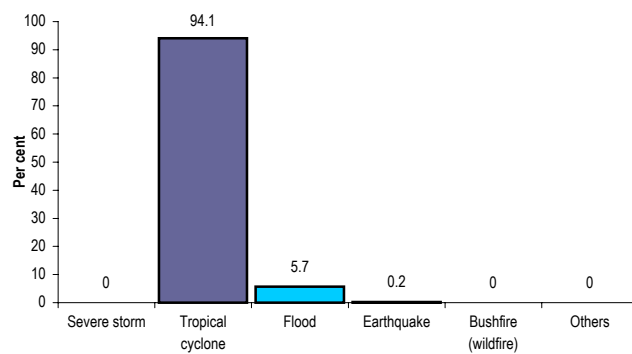
¹² Bureau of Transport Economics 2001, *Economic Cost of Natural Disasters in Australia*, Report 103, BTE, Canberra, p. 35.

Figure 1.3 Relative cost of natural disasters, by state and territory, 1967 to 1999

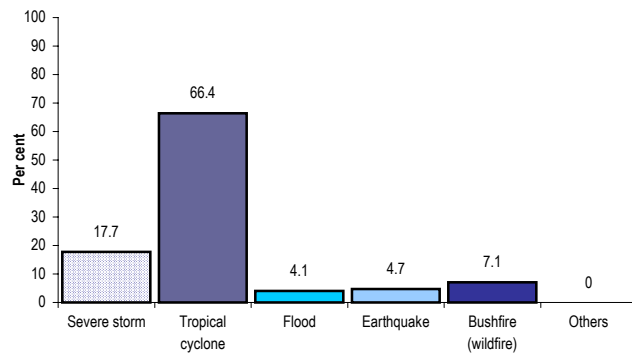
New South Wales



Northern Territory



Western Australia



Tasmania

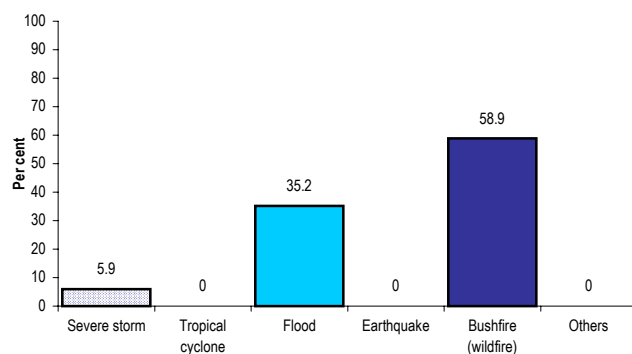
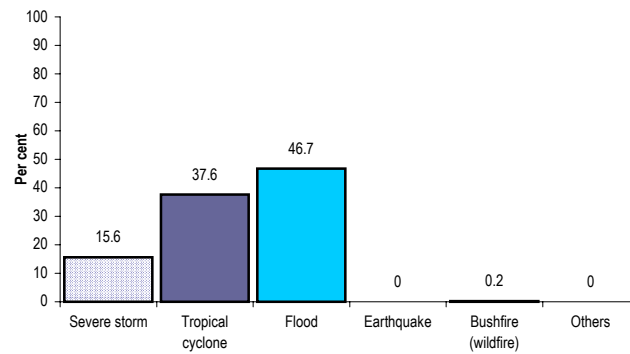
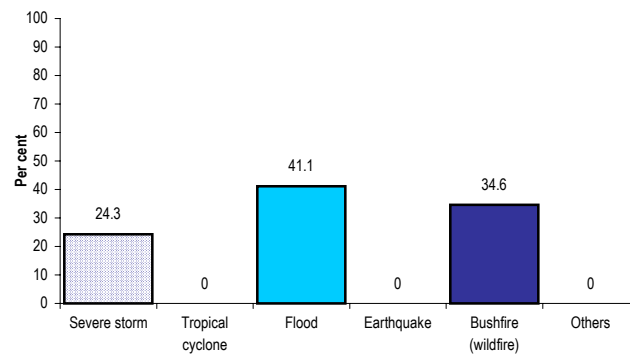


Figure 1.3 (cont'd) Relative cost of natural disasters, by state and territory, 1967 to 1999

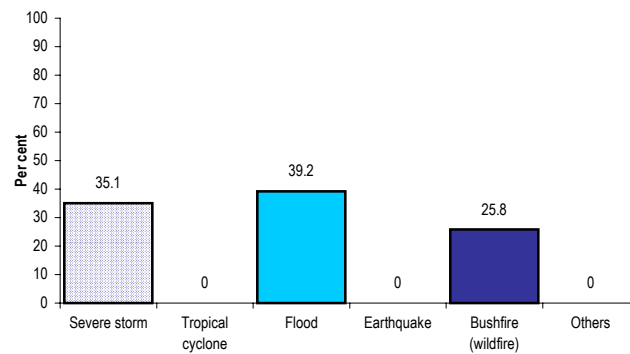
Queensland



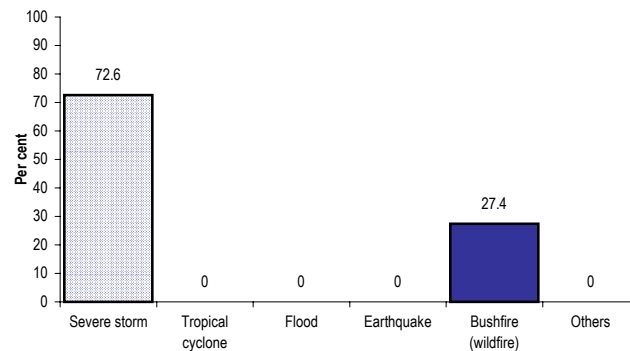
Victoria



South Australia



Australian Capital Territory



Source: Bureau of Transport Economics 2001, *Economic Cost of Natural Disasters in Australia*, Report 103, BTE, Canberra, p. 33.

1.4 Learning to live with fire

Periods of high and extreme fire danger will continue to be a feature of life in Australia; they might become even more common under probable climate change scenarios.¹³ As cities and other settlements continue to expand into bushland areas across Australia and as small-acreage estates continue to develop, the potential impact of bushfires grows. Bushfire mitigation and management and the threat of fire are likely to become more, rather than less, significant concerns for Australians in the future.

Bushfire also has a fundamental and irreplaceable role in sustaining many of Australia's natural ecosystems and is a valuable tool in the achievement of particular land management objectives. However, if fire is too frequent or too infrequent, too severe or too mild, or mistimed, it can erode ecosystem health and biodiversity and impede progress towards other land management goals. As a result, understanding and implementing fire management regimes to meet land management goals, and reconciling these regimes with the need to protect life and other assets, represent and will continue to represent a major challenge.

Australia has a large and very capable force of volunteer and career firefighters, advanced firefighting technologies, and significant firefighting resources. In spite of this, the geographical scale of the country, our large and expanding rural-urban interface, and the potential for rapid bushfire development and spread under adverse weather conditions mean that individual Australians cannot rely solely on others to protect their life and property from bushfire.

In addition to local communities, travellers and visitors can be at risk from bushfire. Consequently, all Australians need to understand how best to minimise the risk to themselves and others, and their property, from bushfire.

This report deals with how Australians can meet this challenge.

¹³ CSIRO submission, p. 3.

2 The 2002–03 fire season



Bushfires such as the one that threatened homes at Stanthorpe in Queensland were a familiar sight across south-eastern Australia during the 2002-03 fire season.

(Photo: Tony Hazell)

The terms of reference (see Appendix A) require the Inquiry to outline the facts of the major bushfires of the 2002–03 season, including where the fires started and what was affected. The timing and duration of fire seasons vary according to climate—from the winter and spring, or dry season, in northern Australia to summer and autumn in southern and western Australia. The Inquiry therefore defined the 2002–03 fire season as extending from the 2002 dry season in the north to the autumn of 2003 in the south and west. In each of these regions, the nature and extent of bushfires and their impacts during the season reflected the combined effects of climatic conditions, vegetation types, fuel ages and overall fuel loads.

This description of the 2002–03 season is based on a number of sources, among them submissions to the Inquiry, statistical information available in the annual reports of state and territory agencies, background information provided by the states and territories, and the reports of recently completed inquiries and investigations, such as the following:

- Auditor-General Victoria 2003, *Fire Prevention and Preparedness*, State Government of Victoria, Melbourne
- Department of Sustainability and Environment 2003, *The Victorian Alpine Fires, January–March 2003*, Department of Sustainability and Environment, Melbourne
- Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne
- Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra
- House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra

- McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra
- Milovanovich, C 2003, *Coronial Inquiry into the Circumstances of the Fire(s) in the Brindabella Range in January 2003*, NSW Coroner's Office, Sydney.

These reports provide detailed and comprehensive information on the major 2002–03 bushfire events, so the Inquiry did not conduct an independent investigation of where the fires started and what was affected.¹

What is presented in this chapter is a national overview of the 2002–03 fire season, followed by consideration of events in each jurisdiction and an outline of the ways in which this particular fire season might be viewed as distinctive. The information on the states and territories comes from their own sources.

2.1 A national overview

History will record 2002–03 as a 'bad fire season' in Australia. Many large bushfires occurred, resulting in loss of life, very significant damage to property, infrastructure and the environment, and a substantial investment of resources (both human and financial) in firefighting and recovery.

It is important to place the 2002–03 fire season in perspective, by comparing the situation in the different states and territories and by comparing the 2002–03 season with previous fire seasons in each jurisdiction.

Appendix D provides historical information about the major recorded fire events in each state and territory. It is difficult to make direct comparisons because many factors contribute to the perception of how bad a fire event was – the magnitude of losses (lives, property, infrastructure and environment), the type of vegetation burnt (for example, grassland, woodland or tall forest), the weather conditions, the number of fires and the areas burnt, the ease of control, the land tenure affected, and the scale and duration of the fire-suppression effort. Nevertheless, Appendix D shows that large and damaging bushfires are recurrent events in all jurisdictions, even to the extent that major fires decades apart have burnt similar parts of the landscape. It is also evident that there is substantial variation across Australia in the time of the year in which major fires have tended to occur and in the magnitude of the impacts of each fire.

Perceptions of what constitutes a bad fire season can differ. In one part of the country in a particular year there might be many fires and millions of hectares burnt, yet little damage to property and infrastructure. In another year or in another part of the country severe loss of life and property can be caused by a single fire affecting a relatively small area. For example, in the 2002–03 fire season fires burnt over 38 million hectares in the Northern Territory but there was relatively little loss of property or infrastructure, although the environmental impacts were significant. In the same season, in contrast, about 3 million hectares were burnt in the Australian Capital Territory, New South Wales and Victoria. In

¹ The Inquiry notes that the Australian Capital Territory coronial inquiry into the January 2003 fires is yet to be completed at the time of submitting this report to the Council of Australian Governments.

the Australian Capital Territory alone, four lives, over 500 houses and structures, and over 4000 sheep, cattle and horses were lost in fires that burnt 157 000 hectares.²

Three factors contribute to our impression of the seriousness of a fire season:

- the established pattern of bushfires in a particular climatic zone, especially the frequency of fire events and the typical intensity of the fires – which provides the context for assessing the fire season
- the climate (for example, the extent of drought) and the state of the vegetation and fuel loads – which (along with ignition probability) are primary determinants of bushfire hazard
- the impact on assets (environmental as well as human) resulting from fires in a particular fire season – which represents the severity of a bushfire event.

Eastern South Australia in 2002–03 illustrates the distinction between the last two of these factors: climatic conditions produced a high risk of a severe fire season (as in other parts of south-eastern Australia at the time) but the risk did not translate into significant fires.

As noted in Chapter 1, the time of year when the fire danger season occurs – that is, when unplanned fires have the potential to be large scale, high intensity, and fast moving and therefore likely to threaten human life and property, the environment, livestock and infrastructure – varies from one part of Australia to another. Appendix D demonstrates that serious fire events typically follow this pattern of fire danger seasons.

Clearly, the potential for a fire season to result in serious fire events is determined by climatic conditions, in the preceding seasons and months, during the fire season itself, and at or following ignition. The Bureau of Meteorology summarised the lead-up to the 2002–03 fire season in its submission to the Inquiry:

Over Australia as a whole, 2002 was one of the most severe drought years in the nation's recorded history, with large areas of the country experiencing serious or severe rainfall deficiencies for the period commencing in March 2002. Accompanying the low rainfall, daytime temperatures across Australia were at record high levels during autumn, winter, and spring, while atmospheric humidity and cloudiness were well below normal. This combination provided the climatological conditions for an early curing of fuels across most of eastern Australia, and difficult conditions for fire suppression once wildfire activity had commenced. These broad characteristics are shared by previous severe fire seasons in southeast Australia, including the seasons of 1938/39 and 1982/83, although the high temperatures in the lead up to the 2002/03 fire season appear to be unprecedented.³

In pastoral areas of eastern Australia, the drought conditions had led to a reduced surface fuel load and thus a reduced risk of serious fires. In Central Australia,

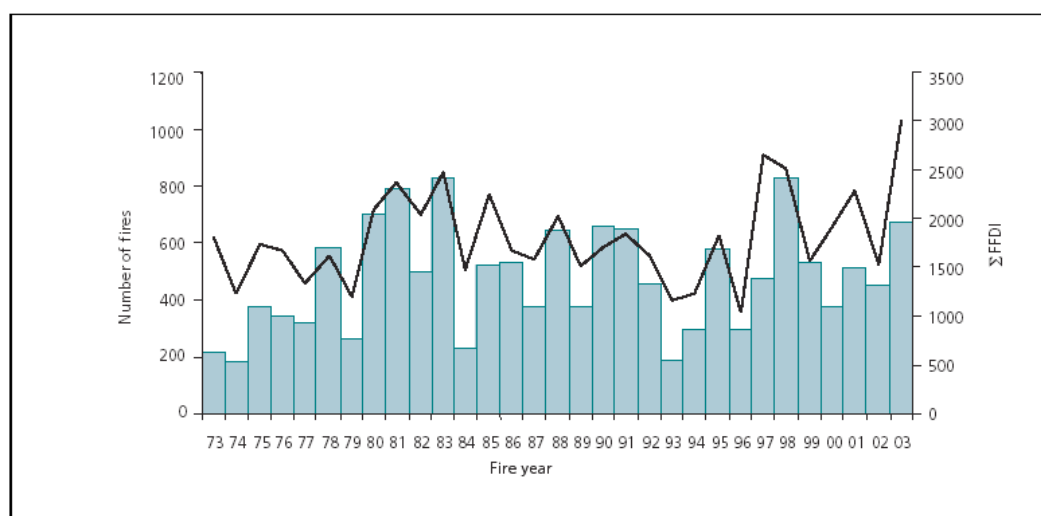
² Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra.

³ Bureau of Meteorology submission, p. 9. The terms 'serious' and 'severe' are defined as follows: serious rainfall deficiency – rainfall is among the lowest 10 per cent of recorded rainfall totals for the period in question but not among the lowest 5 per cent; severe rainfall deficiency – rainfall is among the lowest 5 per cent of recorded rainfall totals for the period in question.

however, above-average rainfall over the last three years had contributed to high grass fuel loads and widespread bushfires. In forested areas, surface fuels were already extremely dry early in 2002. These conditions limited the amount of hazard reduction that could be done by prescribed burning. For example, the Queensland Parks and Wildlife Service conducted prescribed burns on 830 000 hectares in 2001, 460 000 hectares in 2002 and 380 000 hectares in 2003; ForestrySA reported plans to burn some 800 hectares of native forest reserves, but the actual area burnt was only 155 hectares because of seasonal conditions. These figures also illustrate the contrast in areas that are burned in the various jurisdictions.

It would be useful to have a way of quantifying the seriousness of fire risk in a particular season, independent of the bushfires that actually occur. Two indicators that are often used are the Keetch–Byram Drought Index and the Soil Dryness Index, both of which describe the fuel’s moisture content. The *Report of the Inquiry into the 2002–2003 Victorian Bushfires*⁴ used the annual sum of the daily (3 pm) Forest Fire Danger Index, or FFDI, as an indicator. It was plotted for the period 1973 to 2003 for Victoria (see Figure 2.1). Since 1973 this indicator of bushfire risk has reached peaks in 1983, 1997 and 1998, and 2003, all years of major fire events.

Figure 2.1 Annual sum of daily (3 pm) Forest Fire Danger Index for Melbourne (line) and number of fires on public land in Victoria, 1973 to 2003



Source: Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne.

The weather leading up to a fire season is not the only aspect of climate that influences the severity of a fire event. The weather at the time of a fire has a major impact on fire behaviour and on the ease of suppression. In relation to the 2002–03 fire season, the Bureau of Meteorology stated:

The very dry conditions leading into the 2002/03 fire season do not in themselves fully explain the intensity and longevity of the fire episodes. A significant contributor to the long period for which the 2003 bushfires remained active was the absence of any significant rain for several weeks after

⁴ Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne.

the fires were first ignited. Most of the fire-affected region did not receive substantial rainfall (defined, for the purpose of this submission, as a daily total in excess of 5mm) after 2 January until 21 or 22 February, a period of approximately 50 days.

Such long dry periods in summer are not unprecedented. For example, Corryong and Yackandandah have both experienced a period of 50 consecutive days without any daily total exceeding 1mm in the past; at Corryong this has occurred 10 times in 112 years of records, and at Yackandandah 5 times in 116 years of records. Nevertheless, the combination of an exceptionally dry spell during mid-summer and the pre-existing severe rainfall deficits is highly unusual in an historical context, and led directly to the longevity of the fires.⁵

2.2 Events in the states and territories: a summary

Table 2.1 summarises some of the statistics for the 2002–03 fire season in the states and territories. The difficulties encountered in compiling this table highlighted to the Inquiry the limited and inconsistent nature of fire data held by jurisdictions and their agencies. The table demonstrates the marked differences between the states and territories in terms of the severity of the 2002–03 fire season and the seriousness of the impacts.

2.2.1 The Northern Territory

In the Northern Territory the landscape and climatic conditions vary considerably, from tropical and subtropical savannas⁶, woodlands and rainforests in the north to semi-arid and arid conditions in the south.

The tropical savanna fire season coincides with the dry season—from May to October. In the south of the Territory the summer monsoon's influence is less prominent, although the majority of rainfall still occurs at that time.

Every year, the rain and warmth of the summer wet season, from November to April, promotes lush grass growth. The long dry season from May to October dries the grasses out. Temperatures increase as the fuel dries, so that by the end of the dry season conditions across vast areas are primed for wildfires. These late season fires ... are widespread throughout northern Australia. People living in the savanna country have to live with this reality: that managing the country to a large part means managing fire. Wildfires can have devastating impacts on plants and animals as well as endangering lives and property. But, as part of the natural cycle of the savannas, fire also brings benefits. It promotes 'green pick' for stock and wildlife, regenerates food plants such as yams and creates habitat for various reptiles, mammals and birds.⁷

In the 2002 calendar year rainfall in both the tropical north and Central Australia was below average. In 2001 rainfall had been well above average, and abundant

⁵ Bureau of Meteorology submission, p. 10.

⁶ 'Savannas' are defined as 'grassy landscapes—woodlands with a grassy ground cover—that occur in the tropical areas where the climate is seasonally dry': Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams, D (eds) 2001, *Savanna Burning – understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin.

⁷ Tropical Savannas Cooperative Research Centre, viewed 23 March 2004, <www.savannas.ntu.edu.au/publications/brochures/savanna_prime_notes.html.firespm>.

grass in Central Australia in 2002 fuelled the most significant burning in the desert country for 25 years. Fires in the arid zone of the Northern Territory affected 17.2 million hectares in 2002, compared with a long-term average of 2 to 3 million hectares a year. In the savanna country, however, 2002 was an average year for fires.

The Northern Territory Fire and Rescue Service responded to 2661 grass and forest fires during the 2002 fire season, many of them on road verges and vacant blocks. Fire management in the majority of the Territory rests fundamentally with land managers.

In 2002 a total of 38.4 million hectares was burnt in planned and unplanned fires – 28.6 per cent of the total area of the Territory. The Northern Territory Minister for Land and Planning noted, ‘While some of these fires were due to land management activity, and some due to lightning strikes, most of these fires were either lit deliberately or as the result of careless actions of people travelling through the Territory’.⁸

Distinctive features

- In total, 28.6 per cent of the Northern Territory was fire-affected in the winter and spring of 2002. This was due principally to the exceptional scale of fires in the arid zone, which were responsible for 45 per cent of the total fire-affected area in the Territory in comparison with a long-term average of around 10 per cent. There was no loss of life and minimal loss of structures and infrastructure but there was considerable loss of fencing and pasture in some areas. The impacts on biodiversity, greenhouse gas emissions and soil erosion were significant, especially in large areas of the arid zone that had been burnt in the preceding two years.
- The vast area burnt – over 38 million hectares – highlights the distinction that can occur between the number of fires and the area burnt and the impact of the fires in terms of life and property and other assets.

2.2.2 Queensland

Three years of continuous drought affecting much of Queensland led to a difficult bushfire season in 2002–03. By September 2002 most of the state was exposed to very high or extreme fire danger, with the rural–urban interface being the area of greatest concern.⁹

In north-west Queensland, early rainfall in the previous summer resulted in increased fuel loads in several areas, and a rainfall deficit in the succeeding months produced rapid curing. In south and west Queensland, heavy winter frosts meant that most pasture regions were 80–100 per cent cured by September. Many areas had been declared drought-affected.

Satellite mapping (see Figure 1.2) shows that about 8 million hectares were burnt, including both planned and unplanned fires. A particular feature was over

⁸ Minister for Lands and Planning, Second Reading of *Bushfires Amendment Act (No. 2) 2003*, viewed 19 March 2004, < notes.nt.gov.au/dcm/legislat/Acts.nsf>.

⁹ Queensland Government submission, 4 December 2003.

1 million hectares burnt by the Queensland Fire and Rescue Service as part of hazard-reduction programs on private land.

Most of the 2780 bushfires that occurred in 2002–03 had limited impact and were generally brought under control relatively quickly. Between 16 and 29 October, however, three major fires occurred at different locations – the Stanthorpe district, the Toowoomba Range, and Tara (west of Dalby) – in a matter of days. Such a situation had not been experienced for a number of years, and together the fires burnt over 50 000 hectares and caused the death of one person and the destruction of a number of homes and buildings.¹⁰

The fire in the Stanthorpe district, at Ballandean, started on 17 October as a result of arcing of overhead power lines. Winds were over 85 kilometres an hour, with frequent changes in direction, leading to spotting up to 2 kilometres ahead of the fire front. This fire eventually covered 18 500 hectares and was responsible for the death; four houses were destroyed and \$6.5 million in damage was sustained.

The Toowoomba Range fire started on 22 October, emanating from a railway siding near Mt Kynoch. Two fire fronts developed – at Mt Kynoch and at Murphy’s Creek, near Toowoomba. The fire burnt about 18 000 hectares in rugged bush and escarpment country, on the urban fringe and in low-density urban areas. About 1000 people were evacuated; 10 structures were destroyed and a further 20 were damaged.

After burning since Wednesday 16 October, the Tara fire broke control lines on 23 October and rapidly moved towards residential areas. The firefighting effort was hampered by a dust storm that had blown across south-west Queensland that day, reducing visibility and increasing the discomfort of firefighters. The fire moved through grass and scrub into rural properties and low-density urban settlements. Several hundred homes were evacuated. At the same time, another outbreak, which appears to have been deliberately lit, was reported 10 or so kilometres east of Tara township. Overall, about 3350 hectares were burnt, several hundred people were evacuated, and six homes were destroyed.

Distinctive features

- The combination of fires in the south-east of the state in October 2002 constituted a severe season for Queensland, with considerably greater threat in the rural-urban interface zone than usual. The experience has led to improved understanding and closer cooperation between permanent, part-time and volunteer firefighters.
- The large prescribed burning program conducted by the Queensland Fire and Rescue Service is notable because most of the burning was done on private land.
- Using the Australian Inter-Service Incident Management System’s Incident Control System to ensure consistent management of fires marked an increased commitment on the part of the Queensland Fire and Rescue Service to a structured approach to fire management.

¹⁰ Queensland Government, supplementary information: ‘2002–03 bushfire season’, 18 December 2003.

- Interstate deployments were at higher levels than in previous years and provided invaluable learning opportunities.

2.2.3 New South Wales

The 2001–02 fires in New South Wales were identified as one of the longest running and most severe fire episodes the state had faced for many decades. That position was eclipsed by the events of 2002–03.¹¹

The 2002–03 fire season was characterised by adverse fire weather for almost five months. A group of serious fires occurred in the north-east of the state, towards the Queensland border, as early as July–September 2002.¹² The situation was exacerbated by the fact that the state was well into the most serious drought for a century. During the summer season, there were periods of extreme fire weather that caused rapid enlargement of fires and generated a very difficult suppression task before the onset of the next period of adverse weather.¹³

There were several large and extended firefighting campaigns:

- the alpine regions – the Childowla fire, the Brindabella Ranges Complex, the Kosciusko North Complex, the Kosciuszko South Complex, the Tuross Creek fire, and the Slaughterhouse fire – between December and February
- the Shoalhaven – the Touga fire – in November
- the Northern Tablelands and the North Coast in September and October
- the Hunter and the mid-north coast between October and February
- the Blue Mountains – including the Blackheath Glen fire, the Marked Tree fire and the Airly fire – between October and January
- the Bala Range Complex – incorporating the Hawkesbury, Cessnock, Singleton and Gosford local government areas – from October to December.

Conditions across the state were such that s. 44 of the *Rural Fires Act 1997* was invoked continuously for 151 days, from 27 September to 24 February.¹⁴ During the fire season – which the Rural Fire Service defined as extending from 1 July 2002 to 28 February 2003 – nearly 1.5 million hectares of land was burnt. The estimated losses included 86 houses (and another 28 houses damaged); 33 other major structures and 188 sheds, garages or outbuildings; 102 vehicles, boats or caravans; and about 3400 head of livestock. Three lives were lost as a direct consequence of the fires.¹⁵

¹¹ NSW Government submission, p. 6; NSW National Parks and Wildlife Service annual report for 2002–03, p. 6.

¹² NSW Rural Fire Service GIS Services Unit fire locations; NSW Government submission.

¹³ NSW Government submission, p. 8.

¹⁴ Section 44 of the *Rural Fires Act* empowers the Rural Fire Service Commissioner to take charge of firefighting operations where a particular fire situation has assumed or is likely to assume proportions greater than the capacity of the locally responsible firefighting authority.

¹⁵ NSW Rural Fire Service 2002–03 fire season statistics.

One factor contributing to the severity of some fires was the significant and widespread lightning activity that occurred early in the season in the northern half of the state and in mid-summer in the south. Because fuels were extremely dry, the lightning strikes caused more fires than is normally the case. Fires began in the Snowy Mountains – Monaro region on 17 December 2002 following a number of lightning strikes. They were contained within two days but another band of lightning strikes caused additional fires on 20 December. On 22 December section 44 declaration under the Rural Fires Act was made for the series of fires burning in the Byadbo area, within the Bombala and Snowy River local government areas. The boundaries of the declared area were expanded on 8 January to include the local government areas of Tumbarumba and Cooma Monaro. The Byadbo fire lasted several weeks before it was finally contained; it burnt about 30 000 hectares.

On the afternoon of 8 January, a series of dry thunderstorms moved across parts of the south-west slopes, alpine areas and the Southern Tablelands. There were lightning strikes from Albury in the south-west to Canberra in the north and across the Snowy Mountains to the east and south of Jindabyne. These storms were also experienced in Victoria, and many strikes were recorded in the east of that state.¹⁶ It is believed the storms ignited 164 fires across the alpine areas of New South Wales, the Australian Capital Territory and Victoria, with 80 of them occurring in Victoria.¹⁷ Of particular prominence were the alpine fires in the Victorian Alps, the Snowy Mountains and Monaro areas and the McIntyre Hut fire, north-west of the ACT.

The McIntyre Hut fire, in Brindabella National Park, was started by lightning on the afternoon of 8 January. It was not readily accessible, and a s. 44 was declared on 9 January for Yarrowlunla Shire. Significant resources were subsequently committed to the fire through an incident management team located at Queanbeyan. Efforts to contain the fire progressed until late 17 January, when it broke containment lines and rapidly spread south-east, burning into the ACT on 18 January. That fire was the subject of a specific coronial inquiry.¹⁸

A feature of the New South Wales fires in 2002–03 was the extensive use of aerial support in various capacities – fire detection; observation; visual and electronic reconnaissance; fire suppression; command, control and communications; and transportation for remote area fire teams. At the height of firefighting operations, 103 aircraft (80 per cent of them rotary) were deployed across the state in support of the suppression effort.

Distinctive features

- The second successive year of drought and prolonged adverse fire weather conditions led to a long and severe fire season – from July 2002 until February 2003.
- Comparatively little property was lost in New South Wales considering the number, extent and duration of the fires.

¹⁶ Incident Controller's Report, Tumut–Tumbarumba–Gundagai: s. 44 report.

¹⁷ NSW National Parks and Wildlife Service annual report for 2002–03, p. 57.

¹⁸ Milanovich, C 2003, *Coronial Inquiry into the Circumstances of the Fire(s) in the Brindabella Range in January 2003*, NSW Coroner's Office, Sydney.

- Unprecedented use was made of aircraft in suppression and support activities.
- There was a sustained, high-level commitment of volunteer firefighters during the season, with 459 major fires.
- Despite the level of fire activity in the state, firefighting resources were also deployed to the ACT and Victoria.

2.2.4 The Australian Capital Territory

The climatic conditions leading up to and during the fire season in the ACT were equivalent to those experienced in Victoria and New South Wales – that is, prolonged drought and periods of extreme weather. The Bureau of Meteorology identified the three months from October to December 2002 as ‘a very critical’ period: rainfall was less than one-third of the median (40.2 millimetres compared with 150.4 millimetres) and was the third-lowest total on record; the average maximum temperature for November 2002 was 5°C above average.¹⁹

During 2002–03, 94 grass and forest fires were reported and responded to in the ACT. Despite the climatic conditions, this was a below-average year in terms of the number of fires. What made the year notable, however, was the occurrence of many grass and forest fires before the beginning of summer and the major fires that began on 8 January and reached the suburbs of Canberra on 18 January, resulting in a catastrophic fire event.

The 18 January event was the result of a combination of a number of lightning-started fires in the ACT (at Bendora, Stockyard Spur and Gingera) and New South Wales (at McIntyre Hut, Broken Cart and Mt Morgan), which from 8 to 16 January burnt within national parks. This was a period of high but not extreme fire danger, with the fires growing progressively, despite ongoing suppression operations.

With extreme fire weather on 17 January all fires broke their containment lines. By the afternoon of the next day they had burnt through three rural villages and into several Canberra suburbs. The ferocity of the fires was compounded by a fire weather-generated tornado that, along with the associated ember attack, resulted in further extensive damage. A state of emergency was declared for the ACT on the afternoon of 18 January and was not lifted until 28 January.

The ACT fires burnt a total of 157 170 hectares. The majority of this area (109 400 hectares, or 70 per cent) was nature reserve, 16 770 hectares (11 per cent) was plantation forest (including 10 500 hectares of pine plantation) and the remaining 31 000 hectares (19 per cent) was rural land. Over 90 per cent of ACT land that is managed for nature conservation by Environment ACT was burnt, as was 65 per cent of the plantation estate managed by ACT Forests. The fires affected the Canberra urban edge along a 70-kilometre front.

There were four deaths and many injuries, including three serious burns cases. A total of 488 dwellings and nearly 100 other structures were destroyed and over

¹⁹ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra. p. 9.

4000 head of livestock were killed. The insured cost to the ACT has been estimated as exceeding \$350 million.²⁰

The speed of the advance of the fires on the afternoon of 18 January was remarkable. The fires' penetration deep into suburbs, largely through ember attack, surprised residents, fire agencies and fire experts.

A detailed account of the development of these fires and the suppression activities is contained in the report of the Inquiry into the Operational Response to the January 2003 Bushfires in the ACT²¹; the impacts of the fires and the recovery response are summarised in the report of the Bushfire Recovery Taskforce.²²

Distinctive features

- The 18 January fire event in the ACT was rapid and extreme – particularly in terms of fire behaviour, with multiple fires interacting with each other. It came in the midst of an extended fire campaign, from 8 to 28 January, in the ACT and in nearby parts of New South Wales.
- The community was ill prepared for such a severe event: loss of homes to bushfires in Canberra had last occurred in 1952. There had, however, been major fires in the ACT in 1978–79, 1982–83 and 2001–02.
- There was unexpected penetration of the fires well beyond the urban edge, with a sustained and intense ember attack.
- The recovery that began on 18 January was comprehensive, involving all areas of government, industry and the community.

2.2.5 Victoria

Victoria experienced a significantly higher incidence of fire in the 2002–03 season than in previous years. By 31 January 2003 the number of fires in the state was 50 per cent higher than the average annual number of forest fires.²³ Between December and March 2003 there were more than 3000 separate fires. 'On average, a little over 100 000 hectares are burnt each year compared with over 1 000 000 hectares for the fires that were ignited on 08 January 2003.'²⁴

Major ignitions earlier in the season, from September 2002, led to other significant fires, including the Big Desert fire (in the state's north-west), which burnt 181 400 hectares in December 2002. The *Report of the Inquiry into the 2002–2003 Victorian Bushfires*²⁵ and the Department of Sustainability and Environment report, *The Victorian Alpine Fires*, contain detailed descriptions and analysis of the major

²⁰ *ibid.*, p. 86.

²¹ *ibid.*

²² Hollway, S 2003, *The Report of the ACT Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra.

²³ Department of Sustainability and Environment 2003, *The Victorian Alpine Fires, January–March 2003*, DSE, Melbourne, p. 3.

²⁴ *ibid.*

²⁵ Esplin, B, Gill, AM & Enright N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne.

fires in the 2002–03 fire season. This Inquiry therefore only briefly summarises the key features of the season here.

By the start of the 2002–03 fire season, much of Victoria was in severe drought. At the beginning of the summer, the Bureau of Meteorology warned that conditions were similar to those preceding the 1983 Ash Wednesday fires. A weather system containing a large number of thunderstorms crossed eastern Victoria and parts of New South Wales and the ACT on the night of 7–8 January. Over 80 fires were ignited in Victoria.

The main fires that occurred during the season – in the Big Desert from 17 to 25 December and in the Gippsland and north-east area from 7 January to 7 March – together burnt more than 1.3 million hectares. The Gippsland and north-east fires burned over 1 million hectares of public land and over 100 000 hectares of private land. The scale and duration of the fires stretched the response capacity of land managers, fire services and the community.

Despite the large areas burnt, the severity of the drought and the climatic conditions at the time of the fires, there was remarkably little damage to structures and other human assets compared with earlier serious fires in Victoria (for example, Black Friday in 1939 and Ash Wednesday in 1983; see Appendix D). In all, 108 393 hectares of private land were burnt (including farms and 2500 hectares of forest plantation), 41 houses and 213 other structures were destroyed, 3000 kilometres of fencing were lost, and more than 9000 head of stock were killed. A thousand houses were saved within the perimeter of the fires.

The Department of Sustainability and Environment attributed the relatively low losses of built assets to the facts that the fires occurred largely in remote areas; there were relatively favourable weather conditions during much of February and March, when, historically, conditions can be extreme; and unprecedented attention was directed to firefighter safety and asset protection.²⁶ Although one firefighter was killed, it was not as a direct result of firefighting activity.

The *Report of the Inquiry into the 2002–2003 Victorian Bushfires* emphasised the effectiveness of the recovery process, which was conducted in parallel with response operations.

Distinctive features

- The incidence of forest fires during the 2002–03 fire season (until 31 January only) was 50 per cent above average.
- The alpine fires continued for 59 days and over 1 million hectares were burnt, but there were relatively few injuries.
- Public information dissemination during the course of the fires – through numerous rural meetings, newsletters, use of media and regional radio, and website visits – received high priority.
- There was minimal property loss considering the size, duration and extent of the fires.

²⁶ Department of Sustainability and Environment 2003, *The Victorian Alpine Fires, January–March 2003*, DSE, Melbourne, p. 213.

- Concurrent community recovery activities were emphasised during the fire campaign.
- In accordance with Victorian legislation, property owners who chose to remain and defend their properties were not forcibly evacuated.

2.2.6 Tasmania

During the summer of 2002–03 Tasmania experienced its most severe and challenging fire season since 1967, in terms of the potential for damage, the degree of difficulty and the effort required. Despite the potential, though, there were no deaths or major injuries, and there was relatively little damage to property and assets. Much of eastern Tasmania had well below average winter and spring rainfall; the west coast had above-average rainfall. By early November, significant drying had occurred in the east and the state began to experience weather phenomena directly related to the drought in mainland Australia. Lower than usual humidity was often experienced during north-westerly wind regimes. On 7 November Hobart Airport recorded a short burst of extreme weather, with an Extreme McArthur Forest Fire Danger Rating of 134.

The first of 23 major fires started in mid-November, the last in late February. Some 2800 grass and forest fires burnt about 58 000 hectares between 1 November and 31 March.

Lightning from the storm that affected Victoria, New South Wales and the Australian Capital Territory in early January was also responsible for starting a fire on Flinders Island. This fire burned 17 000 hectares and was active for more than six weeks. For the first time, firefighting personnel and resources from the Tasmanian mainland were deployed to assist the Islanders.

As the summer progressed, the drought worsened in the east and extended west, making fire control increasingly difficult and extinguishment almost impossible. Even when fires were under control, firefighters and equipment had to remain deployed in patrol mode, at times for weeks. As a result, each fire had the effect of progressively diminishing the ready availability of firefighting resources.

A fire at Broadmarsh, which started on 20 January, became one of the biggest operations for a decade. Remarkably little damage occurred, despite a major run through grassland into and through suburban Brighton, to the north of Hobart. Over the Australia Day weekend, the potential threat to Hobart was assessed as the worst since the 1967 disaster, but the forecast weather conditions did not eventuate and the fire was held within its control lines on Hobart's outskirts.

Tasmania's three fire agencies – Forestry Tasmania, the Parks and Wildlife Service, and the Tasmania Fire Service – cooperated closely on most of the major fires through joint incident management teams and using firefighting personnel from all three agencies.

With a number of fires adjacent to populated areas, the Tasmania Fire Service took the opportunity to emphasise that people at risk from bushfire are responsible for their own safety. Generally, residents in or near bushland accepted their responsibilities for property preparation and supporting firefighting efforts when

needed. The Fire Service website was used very effectively to provide up-to-date information about the fires.

Forestry Tasmania, the Parks and Wildlife Service and the Tasmania Fire Service sent five incident management staff to the United States in August 2002. Some 250 personnel were deployed as incident managers, firefighters and support staff in Victoria and New South Wales in November. In mid-February, during a lull in Tasmania, a further 18 Tasmania Fire Service incident management personnel went to help with the Gippsland and north-east Victoria fires.

The fire season came to an end in most parts of the state in late March with the arrival of heavy rainfall, particularly in the south-east.

Distinctive features

- Severe fire weather through the summer months maintained high potential for extreme fire behaviour.
- A strategy of deploying greater than normal resources to the initial response, proportional to the fire danger, was adopted.
- Fire agencies, the police, the State Emergency Services and the media adopted a cooperative approach throughout the fire emergencies.
- Local communities were engaged in protecting their own property during major fire threats.

2.2.7 South Australia

South Australia is the driest state, with about four-fifths of its area typically receiving less than 250 millimetres of rain annually. As elsewhere in southern Australia, 2002–03 was a hot, dry year, under the influence of an El Niño cycle.²⁷ Below-average winter and spring rainfall, coupled with warmer than average temperatures in spring, contributed to an early start to the fire season.

The 2002–03 season had the potential to be the worst since the devastating fires of 1983.²⁸ Although there were reduced grass and crop fuel loads in most rural areas because of the below-average rainfall, very dry fuel conditions existed in bush, forest and plantation areas. The likelihood of fire in the Mt Lofty Ranges, on the Fleurieu Peninsula, in the lower south-east and on Kangaroo Island was significantly higher than for many years. The Country Fire Service declared a total fire ban for the Mt Lofty Ranges in September, one of the earliest such declarations ever made in South Australia.

There were five fires in mid-September, in the south-east of the state. These were reportedly escapes from burning slash heaps and caused extensive damage to pine plantations (over 600 hectares). In the north of the state a fire near Mintabie burnt about 800 000 hectares of pastoral country in less than a week, from late August to

²⁷ Based on Bureau of Meteorology media releases, reporting on monthly weather conditions in 2002–03, viewed 19 March 2004,

<www.bom.gov.au/announcements/media_releases/sa/index.shtml>.

²⁸ South Australian Government submission, December 2003, p. 3.

early September.²⁹ In late October and early November, lightning, coupled with unusually dry conditions, led to more than 30 bushfires in the south-east. Late spring rainfall brought an easing of conditions in many regions, although record high temperatures occurred in a number of centres during January. Rainfall was average throughout most of the state in February.

The total fire-affected area in South Australia in 2002–03 was 2.61 million hectares, most of which was in the arid north-west of the State. While significant in terms of size and possible environmental impacts, these arid-zone fires are not recorded by the Country Fire Service. The following information on the 2002–03 fire season refers only to fire events in the south and south-east of the state and is based on fires responded to by Country Fire Service brigades.

During 2002–03, 1311 rural fire incidents in the state were responded to – about 28 per cent fewer than in 2000–01 and 25 per cent fewer than in 2001–02.³⁰ In contrast, the total fire-affected area in 2002–03 was 49 855 hectares in the settled areas of the state, almost two-and-a-half times the area burnt in the previous fire season. This was due to the difficulty of suppressing a number of fires on public lands because of the drier than normal conditions. The average area burnt per fire in 2002–03 was almost four times greater than that for 2001–02.

There are several possible explanations for the fact that the peak risk period in South Australia – January and February – was relatively quiet and the overall fire season passed without major incident, despite the weather conditions. First, fuel loads in rural districts were low as a result of the drought and there was a reduced incidence of lightning strikes during the period. Second, prevention, education, publicity and preparedness programs such as Bushfire Blitz and Bushfire Watch appear to have increased public awareness and vigilance. Third, the combined Country Fire Service and South Australian Police Operation Nomad may have led to a reduced incidence of arson.

Distinctive features

- Conditions at the start of the 2002–03 fire season in South Australia suggested the worst year since the 1983 fires, but the season passed without major incident.
- The Country Fire Service and the South Australian Police increased their community education and awareness efforts through programs such as Bushfire Blitz and Operation Nomad.
- A South Australian government re-assessment of the value of prescribed burning in parks and conservation reserves led to the allocation of an additional \$10 million to the Department of Environment and Heritage for the next four years.
- Evidence of the strong political commitment to bushfire management and to reducing the risk to life, property and the environment was manifest in the first Premier's Bushfire Summit held in May 2003.

²⁹ Bureau of Meteorology 2002, October press release, viewed 19 March 2004 <www.bom.gov.au/announcements/media_releases/sa/20021001.shtml>.

³⁰ South Australian Government submission, p. 3.

2.2.8 Western Australia

The climatic situation leading up to the 2002–03 fire season in Western Australia was similar to that in south-eastern Australia. In the preceding four to five years much of Western Australia had experienced drought, which had greatly increased the dryness and flammability of ground fuels and vegetation.

In 2003–03 Western Australia experienced one of the most severe fire seasons since 1960–61, which saw the destruction of the south-west towns of Dwellingup, Karridale, Holyoake and Nanga.³¹ There was below-average rainfall during the winter of 2002, particularly in the south-west forests region. This, combined with higher than normal temperatures from September to December, resulted in higher rates of grass curing and increased soil moisture deficits. Perth recorded 37.9°C on 14 November 2002, its highest November temperature for 10 years. The Kimberley had experienced above-average rainfall in the tropical wet season, from December 2001 to March 2002, which increased vegetation growth and fire risk for the following dry season.

Above-average thunderstorm activity during the 2002–03 season resulted in a sixfold increase in the number of lightning-caused fires throughout the state. Extended periods of very hot, dry and windy conditions caused fire danger ratings for many fire weather subdivisions to reach very high and extreme on 438 occasions between November and March. There were 15 occasions on which a ‘blow-up day’ advice was issued – temperatures exceeding 35°C and wind speeds over 50 kilometres an hour – compared with just four for the 2001–02 season.

There were 656 fires, covering 2.1 million hectares of land managed by the Department of Conservation and Land Management throughout the state. In the south-west forests region 549 unplanned fires were suppressed, accounting for 140 000 hectares, with 126 000 hectares being land managed by the Department. The area burnt represented an eightfold increase on the average over the last 20 years.³²

The Fire and Emergency Services Authority of Western Australia reported that, in 2002–03, its personnel (including career and volunteer brigades and local government bushfire brigades) attended 10 859 bushfires throughout the state.³³ In the more populated areas, the physical size of the fires was generally kept small – less than 5 hectares. In the more isolated parts of the state (that is, the areas outside the South-West Land Division) the bushfires were large and burnt several hundred thousands of hectares.

Major fires occurred at Cape Arid National Park, near Esperance, with 130 000 hectares burnt; on crown land near Ravensthorpe, with 330 000 hectares burnt; at Jurien Bay and Cervantes, where three large fires burnt 53 000 hectares; in the Walpole Wilderness Area, on the south coast, where a number of fires accounted for 24 000 hectares; and in the Mt Cooke area, south-east of Perth, with

³¹ McNamara, K (ed.) 2003, ‘Submission to the 2003 House of Representatives Select Committee Inquiry from the Department of Conservation and Land Management and the Fire and Emergency Services Authority’, p. 5.

³² Department of Conservation and Land Management 2003, *Annual Report 2002–03*, CALM, Perth, p. 62.

³³ Fire and Emergency Services Authority of Western Australia 2003, *Annual Report 2002–03*, FESA, Perth, p. 1.

18 000 hectares burnt. There were also numerous small fires to the north-east of Perth.

Lightning strike was the main cause of ignition of unplanned fires – an increase of 14 per cent over the preceding two years, to 42 per cent in 2002–03. There was a corresponding decrease in the frequency of arson fires in terms of total incidents (327 in 2000–01 and 172 in 2002–03) and also as a percentage of total fires (from an average of 46 per cent of fires in the preceding two years to 26 per cent in 2002–03).³⁴ The reduction in the number of arson fires is thought to be a result of the success and expansion of the Fire and Emergency Services Authority’s bushfire arson-reduction program in 2002–03 to five more areas in the state, principally around the Swan Coastal District.³⁵

Distinctive features

- Western Australia experienced a continuation of drought across most of the state in 2002–03. Temperatures were above average, and there was a sixfold increase in lightning activity.
- The number and size of fires were significantly greater than the 20-year average.
- Lightning was responsible for a larger than normal number of fires.
- The significant reduction in fires caused through arson is interpreted to be a result of the success and expansion of the Fire and Emergency Services Authority’s bushfire arson-reduction program.

2.3 Distinctive aspects of the 2002–03 fire season

Having reviewed the 2002–03 fire season in Australia, the Inquiry identified several features that, when combined, made the season distinctive and could provide guidance for the management of future severe fire seasons.

2.3.1 Climate and the operational response

A prolonged and severe drought, especially throughout much of the southern half of Australia, is the stand-out climatic feature of the 2002–03 fire season. Fire agencies need to be responsive to macro indicators of this kind, using them to assist with annual planning and preparation activities, as well as to match their response capacity to daily weather conditions. Operational responses during drought periods should reflect the ‘worst case’ scenario and include optimum available resourcing. Although the full extent of the fire threat may not be realised, operational planning must take account of this possibility.

³⁴ Department of Conservation and Land Management 2003, *Annual Report 2002–03*, CALM, Perth, p. 102.

³⁵ Fire and Emergency Services Authority of Western Australia 2003, *Annual Report 2002–03*, FESA, Perth, p. 1.

2.3.2 Area burnt versus losses of lives and property

The 2002–03 fire season illustrates well the limited relationship between the extent of the fire-affected area and the extent of losses of lives and property – over 38 million hectares burnt in the Northern Territory alone, with very limited property losses other than fencing and pasture in some areas, compared with 3 million hectares that were fire affected in south-eastern Australia, with loss of life and extensive loss of property. The fires in both northern and southern Australia had substantial environmental impacts.

2.3.3 Extreme days within extensive firefighting campaigns

The 2002–03 fire season produced two of the most challenging elements of any Australian fire season:

- a prolonged campaign of fires over a number of weeks, with the Gippsland and north-east Victoria fires and the fires in southern New South Wales and the Australian Capital Territory – similar to the campaigns against fires in the Sydney region in 1994 and in the Sydney region and the South Coast of New South Wales in 2001
- a very severe event in a very short time – as experienced on a single afternoon in Canberra.

Despite these factors, several jurisdictions reported that losses were lower than expected losses, given the severity of the conditions, and attributed this to several factors:

- preparedness
- low fuel loads in pastoral areas because of the prolonged drought
- effective operational response
- community involvement – through both information sharing and recognition of individual responsibility.

2.3.4 The rural–urban interface

The Canberra fire (and some of the other fires) revealed the importance of the urban ‘landscape’ and the fuels in it. The penetration of fire into the suburbs and the vulnerability of urban landscapes was much greater than anticipated by residents, fire agencies and fire experts.³⁶ It had previously been considered that generally only the outer street of urban-interface zones would be vulnerable. Canberra graphically illustrated that in extreme conditions this is not the case, particularly with the flammability and continuity of fuel loads in gardens and with extensive areas of open space between and within suburbs. The sustained and intense ember attack on houses during this fire is well documented.

This knowledge should be used more generally to bring about improvements in planning, house design, garden layout, and maintenance and preparedness. The

³⁶ P Cheney, meeting with Inquiry, 10 March 2004.

fire penetration also raises questions about public information on the preparation of houses for ember attack, the implementation of stay-or-go policies, and the timing of any evacuations.

2.3.5 Aerial support

The 2002–03 fire season saw unprecedented use of air support. Over 140 aircraft were used by the states and territories at a total cost of over \$110 million. At the height of operations in New South Wales, 103 aircraft were deployed on a single day. Helicopters and fixed-wing aircraft gained extensive public exposure. The Australasian Fire Authorities Council and the Australian Government have developed the National Aerial Firefighting Centre to facilitate the deployment of state-based aerial assets to other jurisdictions and the provision of additional aircraft for 2003–04 fire season.

2.3.6 Cooperation between the states and territories

The 2002–03 fire season saw extensive interstate deployment of resources. Resources from overseas were also deployed, and Australian fire managers were deployed to the United States in August 2002.

2.3.7 Recovery

The fire events in the Australian Capital Territory and Victoria demonstrated the importance of beginning recovery activity concurrently with response operations. The need for a focused recovery structure and the prolonged recovery effort required – well beyond the passing of the immediate emergency – were highlighted in both cases.

2.3.8 Fire data

Compiling data for this chapter was difficult because of the current limitations in national bushfire data. Until the situation is remedied, the lack of an agreed, consistent data-collection process will hinder research, operational planning, and evidence-based funding of bushfire response capability.

Finding 2.1

The 2002–03 fire season, extending from May 2002 in northern Australia to April 2003 in southern and western Australia, was characterised by:

- a historically significant fire season
- the potential to be the most severe fire season in all states and territories for between 20 and 40 years
- major fires in all jurisdictions, affecting in excess of 54 million hectares, with vast areas being affected in central and northern Australia
- major campaign fires in New South Wales, the Australian Capital Territory and Victoria and a major disaster in Canberra on 18 January 2003.

In total, these fires claimed 10 lives, destroyed over 1200 structures, killed over 21 000 head of livestock, and resulted in great environmental damage and estimated insurance losses in excess of \$400 million.

The principal reasons for the severity of the 2002–03 fire season were the prolonged drought over much of Australia, which dried out available grassland and forest fuels, combined with above-average temperatures and a much higher incidence of lightning strikes.

Table 2.1 Fire season statistics for 2002–03, by state and territory

Description	NT	Qld	NSW	ACT	Vic	Tas	SA	WA
Unplanned grass and forest fires (no.)	2 886	2 778	>2 500 ^a	94	>3 000	1 500	1 311	11 515
Estimated area burnt (ha)	38 400 000	8 000 000	1 464 000	157 000	1 300 000	58 000	2 610 000	15 545 000
Duration of severe fire activity (days)	122	21	151	21	70	100	n.a.	149
No. of total fire ban days statewide	11	15	13	20	4	5	2	48
Percentage of bushfires for which arson or deliberate lighting was suspected	79	7–10	25 ^b	70	26	40	29	46 ^c
No. of convictions	0	n.a.	25	1	0	17	n.a.	d
No. of firefighter fatalities at firegrounds	0	0	0	0	1 ^e	0	0	1 ^e
No. of civilian fatalities	0	1	3	4	0	0	0	0
No. of structures (homes, sheds, and so on) damaged	60	77	28	800	n.a.	30	14	n.a.
No. of structures destroyed	2	17	307	580	292			n.a.
No. of vehicles, boats, caravans destroyed	53	113	102	300	n.a.	7	5	n.a.
No. of livestock killed	Unknown	270	3 400	4 185	13 153	>300	27	n.a.
Value of insurance claims (\$ million)	n.a.	n.a.	40	350	11.25	n.a.	n.a.	c
Suppression costs (\$ million)	0.47 ^g	n.a.	120	4.04	88 ^e	4.75	9.30	25 ^h

n.a. Not available.

a. Of these, 459 were major fires.

b. Out of 1 400 investigated.

c. Suspected.

d. 27 arrests and 49 charges. Does not include juveniles under 10 as no convictions are recorded

e. Vehicle accidents.

f. Ten claims made, value not available.

g. Bushfire Council costs.

h. Approximate figure.

Notes:

Northern Territory. Estimated area burnt collated from the NOVAA-AVHRR satellite. Fires affecting areas less than 400 hectares not included. 'Vehicles, boats, caravans destroyed' includes mobile homes. Landowners undertake significant fire management and suppression activities across the Territory, which, apart from the satellite information, are not recorded.

Queensland. Estimated area burnt collated from the NOVAA-AVHRR satellite. Fires affecting areas less than 400 hectares not included. 'Bushfires for which arson or deliberate lighting was suspected' includes only arson. Number of convictions is not a measure used by the Queensland Police Service: crimes of arson are counted on the basis of incidents reported, solved or cleared.

New South Wales. 'Structures destroyed' total is made up of 86 houses, 33 major structures, and 188 garages, sheds or outbuildings.

Victoria. Firefighter fatality caused by drowning during a flash flood while a crew was relocating vehicles from the fireground. In relation to arson convictions, there a considerable time lag in using the court system, and some cases could still be pending.

Tasmania. Reliability of data is affected by varied data parameters between agencies.

South Australia and Western Australia. Estimated area burnt collated from the NOVAA-AVHRR satellite. Fires affecting areas less than 400 hectares not included.

Part Two
Understanding and attitudes

3 Learning how to live with fire



Local residents attending a workshop to learn more about fire and biodiversity and to develop a property fire plan that involves other residents and the local rural fire brigade

(Photo: Paul Adcock, Qld Fire and Rescue Authority)

Given the inevitability of bushfires, Australians must learn how to live with them. This implies that all Australians must have at least a basic understanding of the place of fire in the Australian environment and of how to prepare for and survive a bushfire.

Among the benefits of greater understanding throughout the community are better informed attitudes and actions – including an appreciation of the imperative of sharing risk and responsibility for mitigating and managing fires between individuals, the community, and fire and land management agencies. This understanding is needed regardless of where Australians live: people who do not live in bushfire-prone areas now might do so in the future, and many Australians visit or travel through bushfire-prone areas for work or recreation.

Greater understanding and a more informed attitude to bushfire throughout the Australian community are the very foundations on which improved bushfire mitigation and management must be built. This chapter deals with school and community education as the means of achieving these objectives.

3.1 Educating Australians about bushfires

An integrated, nationwide program of school and community education is needed for Australians to learn how to live with bushfires. This has been a longstanding concern. Many elements of such a program are in place in the states and territories, but they have not been sufficiently coordinated and are not consistent nationally.¹ At present, responsibility for informing and educating the Australian community about bushfires lies principally with fire and land management agencies in each state and territory, supported by emergency management advice from Emergency Management Australia. As described in Chapter 7, a considerable range of community-based programs dealing with personal and community preparedness for bushfires and other natural hazards has been developed and delivered.

¹ The limitations of an uncoordinated and nationally inconsistent approach to community education were discussed by the House of Representatives Standing Committee on Environment and Conservation (1984, *Bushfires and the Australian Environment*, AGPS, Canberra, paras 131–40).

The Inquiry found that the degree of engagement of the community and the nature and effectiveness of education and awareness programs varied from place to place.² Australians who have participated in these programs are more likely to accept their responsibility for bushfire preparedness and safety, to have higher levels of awareness and knowledge about bushfires, and to engage in effective risk-reduction activities.³

While community-based programs are a vital component of a strategy to educate the public about bushfire, we cannot rely solely on these programs. The lack of recent experience of major bushfire events in a particular area, population movements, and individual psychology and community characteristics all limit the effectiveness of community-based programs and the extent to which their message endures.⁴

If Australians are to live more safely with bushfire and to make better informed decisions – as individuals and as a community – about bushfire mitigation and management, greater, more pervasive knowledge about personal and community preparedness for bushfire and about the place of fire in the Australian environment is necessary.

We note that successive inquiries – since at least the 1939 Streeton Royal Commission in Victoria – have made recommendations relating to the central importance of bushfire education at both school and community levels:

Probably the best means of prevention and protection is that of education, of both adults and children. ... It is suggested that in every school (the education of city children is as important as that of country children) fire prevention be made a real part of the curriculum and that the lessons in that behalf be given at the commencement of the summer season.⁵

Education was also canvassed in the 1984 Report of the House of Representatives Standing Committee on Environment and Conservation, which recommended that ‘the Department of Home Affairs and Environment co-operate with State Departments to develop a national awareness campaign dealing with bushfire survival, building protection, fire prevention and the role of fire in the Australian environment’ and ‘the Commonwealth Department of Education and Youth Affairs assist State Departments and authorities to develop video programs and education kits concerning bushfire topics ...’⁶

The Committee also noted that ‘the ecological role of fire and its place in the natural Australian environment should be strongly emphasised in all the education material produced by bushfire control authorities’. Similarly, the 2003

² See, for example, Cameron, JW (Auditor-General of Victoria) 2003, *Fire Prevention and Preparedness*, Auditor-General, Melbourne, p. 84.

³ Rohmann, B 2003, ‘Bushfire preparedness of residents: insights from socio-psychological research’, in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 115.

⁴ Cunningham, C & Kelly, SB 1995, ‘Awareness of bushfire hazards: a case study of the Blue Mountains, New South Wales, Australia’, *Proceedings of the New England – St Lawrence Valley Geographical Society*, vol. 24, pp. 67–83.

⁵ Streeton LEB 1939, *Report of the Royal Commission to Inquire into the Causes of and Measures Taken to Prevent the Bushfires of January 1939 and to Protect Life and Property and the Measures to be Taken to Prevent Bushfires in Victoria and Protect Life and Property in the Event of Future Bushfires*, p. 25.

⁶ House of Representatives Standing Committee on Environment and Conservation 1984, *Bushfires and the Australian Environment*, HORSCEC, Canberra, paras 131–40.

Report of the House of Representatives Select Committee on the Recent Australian Bushfires supported a comprehensive national education program.⁷

It is a matter of considerable concern that it remains necessary for this Inquiry to reiterate such recommendations.

There must be a national commitment to the development and implementation of these bushfire awareness and education programs throughout Australia. It is clear that education and knowledge about bushfires, their behaviour and how people can prepare and respond save lives. Further, all Australians need to have a deeper understanding of the role of fire in ecological systems and the use of fire in the management of the Australian landscape.

Although all bushfire awareness and education programs, be they school or community based, are demanding of both human and financial resources, the costs are modest in comparison with expenditure on bushfire response and the opportunity costs in terms of deaths, injuries and damaged assets. There is unequivocal evidence that increased investment in school and community-based education about bushfire is likely to be very cost-effective in the longer term.⁸

The Inquiry notes the potential to learn from Indigenous Australians' knowledge of bushfire and acknowledges the initiatives already taken in developing learning partnerships that both respect and build on their knowledge, principally but not only in northern Australia. While recognising the more fragmented nature of Indigenous knowledge of bushfire in southern Australia, the Inquiry agrees with those⁹ who suggest that such partnerships have considerable merit in helping to foster better community understanding of, and wiser attitudes to, bushfire.¹⁰

3.2 School-based bushfire education

Knowledge of 'living with bushfire' should be one of the life skills all Australian children acquire during their schooling, wherever they are educated.

The Inquiry acknowledges and commends the progress made in many states and territories in the development and implementation of bushfire education programs directed at both school and community audiences. A good example of the former is the initiative taken in the Northern Territory to support the curriculum component with internet-based learning resources; examples of the latter are noted in Chapter 7.

⁷ House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, recommendation 51, p. xxx.

⁸ *ibid.*

⁹ For example, chapters by Bowman, Hill AB, and Little in Cary G, Lindenmayer D & Dovers S, 2003, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

¹⁰ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 122.

Box 3.1 Fostering school and community learning about bushfire in northern Australia

Fire and natural resource management agencies in the Northern Territory, in collaboration with the Northern Territory Education Department, have developed a suite of web-based learning resources for schools. These resources promote and support an understanding of bushfire as a component of the Northern Territory's Tropical Knowledge for Schools curriculum program, which is aimed at students in upper primary and lower secondary levels. The web site <http://web2.entity1.com/fire_nt/> provides, through a common interface, material, specifically for teachers and students but also for the wider community, about all aspects of fire in northern Australia.

The learning resources are structured around topics that, when addressed within the curriculum structure, offer a comprehensive understanding of the particular features and aspects of fire in the various northern Australia landscapes.

One of the goals of the program is to encourage community-based initiatives to bring together different community and land user groups in order to better understand fire and develop solutions to regional problems.

There is ample evidence of good levels of understanding and knowledge being realised in particular communities.¹¹ There is also broad consensus among those working with bushfire that knowledge and understanding of bushfires, in terms both of their place in the Australian environment and of personal and community preparedness and survival, are still inadequate, particularly among new residents of rural-urban interface areas.¹² The Inquiry shares this view and considers that a nationwide school-based program is the best means of redressing this shortcoming.

The Inquiry notes the contrast between the relative lack of progress made in the case of education about bushfire and the progress made in educating Australians about other important aspects of living in our environment, such as learning to swim and sun protection.¹³ The Inquiry considers, as did the 1984 House of Representatives Standing Committee on Environment and Conservation, that bushfire education is of sufficient national importance to warrant the Australian Government playing a stronger leadership role in supporting the development of bushfire education in schools, while the states and territories remain responsible for delivery.

As noted, excellent educational material on bushfires is already available in a number of states and territories¹⁴, but it is not universally or consistently delivered. This may be a consequence of limited resources, conflicting bids for a place in school curricula, or a reflection of local attitudes and relative priorities. The Inquiry considers that the material should be consolidated and updated, drawing on best-practice approaches; the basic elements of the program should be nationally consistent while also reflecting regional variations in annual bushfire seasons and the nature of bushfire risks.

¹¹ For example, Cameron, JW (Auditor-General of Victoria) 2003, *Fire Prevention and Preparedness*, Auditor-General, Melbourne, part 5.

¹² Discussions with state and territory representatives, Melbourne, 17 March 2004.

¹³ The Inquiry notes that the Slip Slop Slap program, which is conducted by the Australian Cancer Council and is aimed predominantly at school children, is an excellent example of the way wider community attitudes can be changed in the long term by providing information and education to children.

¹⁴ For example, the resource materials on bushfires prepared for schools in Victoria by the then Department of Natural Resources and Environment from 1997 to 1999.

There is a considerable and evolving body of knowledge and experience within the states and territories about effective delivery of education on other forms of fire safety¹⁵, and there are opportunities to incorporate bushfire learning in curricula through various forms of partnerships.¹⁶

This type of program is so important it should be undertaken jointly by the Australian Government and the states and territories. Ideally, school-based education about bushfires should be part of a wider program dealing with a variety of major natural hazards.¹⁷ Adoption of an all-hazards approach should not, however, delay implementation of bushfire-specific programs, which are needed now.

Recommendation 3.1

The Inquiry recommends that state and territory governments and the Australian Government jointly develop and implement national and regionally relevant education programs about bushfire, to be delivered to all Australian children as a basic life skill. These programs should emphasise individual and household preparedness and survival as well as the role of fire in the Australian landscape. Program effectiveness should be audited by each state and territory after five years, with a national report to be provided to the Council of Australian Governments.

3.3 Community-based education

The many elements of community-based education about bushfire are discussed in Chapter 7. Education and training specifically relevant to firefighters, land managers and researchers are discussed in Chapter 11. The discussion in this section focuses on the underlying aspects of community education.

3.3.1 Shared responsibility and managed expectations

A recurring theme in the Inquiry's discussions with state and territory fire and land management agencies was the importance of embracing a philosophy of shared responsibility in preparing for and responding to bushfires. Well-informed and well-prepared individuals and communities complement the roles of land management and fire agencies and offer the best way of minimising harm to people and property. Fire and land agencies have a responsibility to communicate with the community, while members of communities also have a responsibility to seek information about the matters that affect them.

This understanding should be accompanied by realistic expectations of fire services' ability to suppress bushfires:

¹⁵ For example, the experience of fire agencies in promoting house-fire safety: children in the middle years of primary school are a receptive audience and are good at conveying the fire safety message to their families.

¹⁶ For example, the NSW Nature Conservation Council's Bushfire Education Program involves visit to primary and secondary schools in partnership with a local NSW Rural Fire Service brigade officer.

¹⁷ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra: see definition of 'natural hazards', p. 4.

We seek to reinforce the 'shared responsibility' and highlight the actions that agencies carry out (establish asset-protection zones; broader hazard reduction; access trails; operational planning; and having a suppression capability) and the actions that property owners should carry out (clean out house gutters; keep property rubbish free; sprinkler systems; etc). There are some actions that overlap (maintain asset-protection zones; access to property water supplies) and rely on a partnership.¹⁸

The significant demographic and social changes experienced in Australia in recent decades have led to fewer Australians living in rural areas and more living in cities and coastal areas. There appears to have been some decline in the historical 'shared responsibility' that led to the formation of rural fire brigades and the experience associated with living in the bush and understanding fires. Some community members now appear to consider they have no responsibility in bushfire management. Population growth around our larger cities is lengthening the rural-urban interface. In addition, the retirement intentions of Australia's 'baby boomer' population, especially in coastal areas, could significantly add to this extension of the interface zone during the next 10 years. Community education programs on bushfire awareness will become increasingly important.

Effective community education programs are fundamental to the development of informed, prepared communities with realistic expectations of both the potential impacts of a bushfire and the suppression capabilities of the fire services. Such communities demonstrate considerable capacity for sharing responsibility for bushfire mitigation and management, including the protection of life and property. Maintaining a sufficient level of interest in, and preparedness for, bushfires during extended periods without major fire events is a particular challenge to community education programs.

3.3.2 An all-hazards approach

The Inquiry supports the approach of the recent report, *Natural Disasters in Australia*, that community engagement and information about bushfires should be integrated with delivery of education about all natural hazards.¹⁹ As a matter of general principle, community engagement and information about bushfires should be reflected in an all-hazards approach. Individuals and communities need to know how to respond to other natural hazards (severe storms, for example) as well as bushfires. Such general advice does, however, need to be supplemented – particularly in high-bushfire risk areas – with more specific bushfire-related advice.

3.3.3 Engaging with communities and individuals

Attempts at engaging with communities are not always successful because a group of people in a locality does not necessarily constitute 'a community', with common interests and a will to work together. Divergent values between individuals challenge the very existence of a community, let alone views about bushfire mitigation and management. This tests the development and delivery of community-based strategies. Education programs need to be sufficiently inclusive

¹⁸ Howe, A, Assistant Commissioner, New South Wales Rural Fire Service, 19 January 2004.

¹⁹ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra, p. 4.

and flexible to engage with the diversity of individuals who may not consider themselves part of a community but live in a particular locality.

Individual attitudes and perceptions can have a strong influence on how people respond to bushfire risks.²⁰ Variations in attitudes and perceptions can be particularly strong in areas experiencing considerable demographic change – such as the rural–urban interface. Individuals’ attitudes to fires can be shaped by many factors, among them education, age, income, personal experience and knowledge of bushfires, peer group influences, emotions, beliefs and residential location. Economic and social circumstances can influence residents’ attitudes and behaviour to bushfires and their mitigation and management; for example, a stressed community is likely to have less capacity to respond to challenges than a more vibrant community.

Many community engagement programs are already informed by appropriate research²¹, and the Inquiry supports the work currently being done by CSIRO²² and the Bushfire Cooperative Research Centre²³, among others. In part, this work focuses on how individual and community attitudes towards acceptance of bushfire and bushfire management strategies are formed and how community education and information programs might be further improved. Programs focused on bushfire risk and preparedness are also benefiting from coordination and a greater degree of consistency with programs dealing with other natural hazards.

In addition, the Inquiry notes the value of social and psychological research and professional advice in the development of programs to promote community resilience. This is of particular importance at times of prolonged high bushfire risk, as occurred during the campaign fires of 2002–03, and during the recovery from major natural disasters. Research priorities are discussed further in Chapter 5.

Volunteer rural fire brigades have a very important role in facilitating community learning – largely because ‘people principally prefer interactive and personal communication approaches to passive reception of fire information’.²⁴ In addition to their participation in formal community education programs, volunteers have direct and indirect influence through personal interactions with members of the public – family, friends, neighbours, work colleagues, clients, and so on.

The potential contribution of volunteer brigades to community learning can be realised only if community engagement and education needs are seen as one of their major roles. The Inquiry considers that community engagement and education are a key role of local volunteer bushfire brigades but notes that past attraction and recruitment has probably focused on the response aspect of the role:

²⁰ Machlis, G et al 2002, *Burning Questions: A Social Science Research Plan for Federal Wildland Fire Management*, University of Idaho, Moscow, United States.

²¹ Rohrmann, B 2003, ‘Bushfire preparedness of residents: insights from socio-psychological research’, in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, ch. 14.

²² Gail Kelly, CSIRO Sustainable Ecosystems, current project on attitudes to preparedness: meeting with the Inquiry, 15 January 2004.

²³ Cottrell, A 2004, *Understanding Community Needs, Perceptions and Attitudes*, 2003–04 research project, Bushfire Cooperative Research Centre, viewed 3 March 2004, <www.bushfirecrc.com>.

²⁴ Rohrmann, B 2003, ‘Bushfire preparedness of residents: insights from socio-psychological research’, in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 115.

adjustment is needed, to include volunteers who are able and willing to provide community education. This important paradigm shift is necessary if greater effort is to be directed towards risk reduction. Brigades will require significant agency assistance to bring about this change.

Experience is a central factor in motivation, and the more recent the experience the better. Community awareness and preparation for the 2003–04 bushfire season were high in areas directly affected by the major 2002–03 fires. The challenge is to maintain these levels of engagement during years of low fire risk and limited fire activity.

Finding 3.1

Well-informed and well-prepared individuals and communities complement the roles of land managers and fire agencies. This shared responsibility offers the best way of minimising risks to people, property and the environment. Effective community education, awareness and engagement programs targeted to the needs of local communities are required to achieve this objective.

3.4 Conclusion: a better educated and prepared community

Improvements in bushfire mitigation and management will be significant only if the community is better educated and engaged. More effective education about bushfires is central to the realisation of the Inquiry's vision for bushfire mitigation and management in Australia.

Part Three
Mitigation and management

4 The risk-management process



Collaborative fire management program in western Arnhem Land, involving a 'two toolkits' approach—Indigenous knowledge and skills and remote-sensing products—for implementing strategic fire management. Project funded through the Natural Heritage Trust, the NT Government and community resources

(Photo: Jeremy Russell-Smith, Tropical Savannas Cooperative Research Centre)

Bushfire can cause harm to or loss of economic, social, and environmental assets and values. Given that living with bushfires is a part of life for Australians, decisions about mitigating the harmful impacts of fires on assets and values, and about effective management of fires that do occur, are critical.

A structured risk-management process provides the most appropriate framework for formulating effective mitigation and management actions in relation to bushfires, especially since risk management focuses not only on hazards and emergencies but also on communities, the environment and resources.¹ The Inquiry considers that the Australian Risk Management Standard – AS/NZS 4360:1999 – should be applied in relation to bushfire by all relevant agencies in all jurisdictions.²

4.1 Definitions

Even though they have precise meanings that are defined in the Australian Standard, terms such as *risk*, *risk assessment* and *risk management* and related concepts of threat, hazard and likelihood are frequently confused and used interchangeably. There is also considerable variation in the interpretation and use of risk assessment and risk-management processes.³

According to the Australian Standard, *risk* is the chance of something happening that will have an impact on objectives; it is measured in terms of likelihood and consequences. *Risk management* is defined as the culture, processes and structures that are directed towards effective management of potential opportunities and adverse effects. A *risk-management process* is the systematic application of

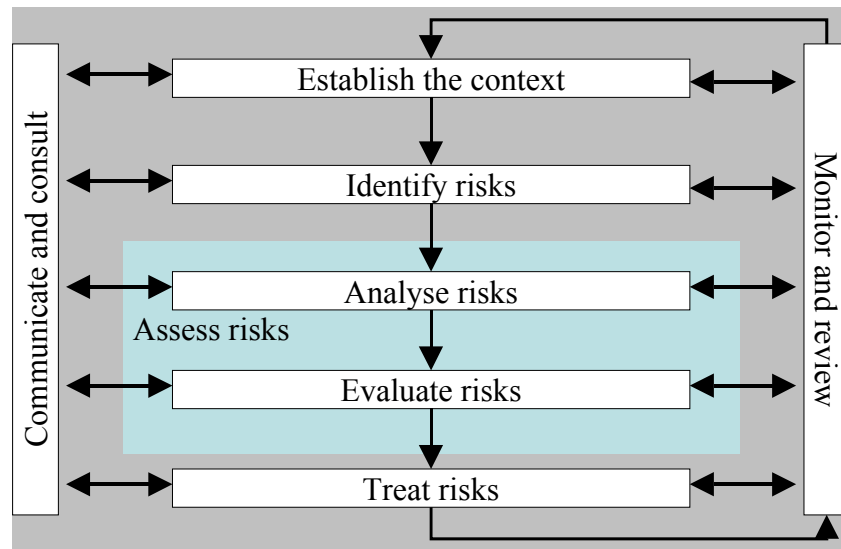
¹ EMA 2000, *Emergency Risk Management: applications guide*, Australian Emergency Manuals Series, Commonwealth of Australia, Canberra, p. 9.

² Standards Association of Australia 1999, AS/NZS 4360:1999 Risk Management.

³ For example, Braun, K 2003, 'Wildfire risk – Integrating community resilience to vulnerability attributes and hazard assessments, to provide a comprehensive risk model', Paper presented to the 3rd International Wildland Fire Conference, Sydney, 3–6 October.

management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risk. Figure 4.1 shows the linkages between the elements of the risk-management process and how monitoring and review and communication and consultation make it a continuous and inclusive process.

Figure 4.1 The risk management process



Source: Standards Association of Australia 1999, AS/NZS 4360:1999 Risk Management.

4.2 Application of risk management to bushfire

Application of risk management to bushfire should comprise the following steps, which are based on the Australian Standard for Risk Management, Emergency Management Australia's *Emergency Risk Management Applications Guide* and the Victorian Country Fire Authority's *Municipal Fire Prevention Planning Guidelines*.⁴

- *Establish the context.* Identify assets, their locations in the landscape and the particular objectives relating to each asset from the perspective of those groups that gain a benefit or value from the asset. Risk-evaluation criteria are derived from the objectives and can relate to economic impact, health impact, loss of biodiversity, infrastructure damage, loss of cultural and heritage value, and damage to community buildings and facilities. Important inputs are current management and strategic plans, relevant government policies, and key physical, biological, social and economic data. This stage of the process defines the boundaries for the risk assessment.
- *Identify the risks.* Investigate the characteristics of the hazards for the defined landscape, including factors contributing to the likelihood of ignitions and the probable progress of a bushfire – largely weather and fuel conditions. Identify and describe key characteristics of community groups and the environment (built, natural and social) within the defined area to determine the

⁴ Adapted for bushfire from AS/NZS 4360:1999; Emergency Management Australia 2000, *Emergency Risk Management: applications guide*, Commonwealth of Australia, Canberra; Country Fire Authority 2003, *CFA Municipal Fire Prevention Planning Guidelines*, CFA, Melbourne.

vulnerability of each asset. Assemble key data and information, including on the community's experience with fire, perceptions of bushfire, the level of exposure and susceptibility, the community's capacity to cope, and the existing level of mitigation and protection.

- *Analyse the risks.* Determine the likelihood of a bushfire event using historical information and data and past experience and determine the probable consequences or impacts of a fire for the set of identified assets and values (within a defined region). Likelihood and consequences are determined qualitatively and often with a view to the long-term future.
- *Evaluate the risks.* Compare the level of risks determined during the analysis and develop priorities for further action. As part of the comparison, assess how risks will change for various treatment options.
- *Treat the risks.* Select and implement treatment strategies to reduce the likelihood of harm to assets and values, including those that avoid the risk (for example, land use regulations), those that reduce the risk (for example, building regulations, fuel-reduction activities), those that spread the risk (for example, sharing responsibility for readiness between fire agencies and residents) and those that manage the residual risk (for example, effective fire-suppression plans, community readiness). Base selections on agreed criteria and rational analysis, considering the development and implementation costs of each option. Determine in qualitative or quantitative terms how the level of risk changes as a result of applying a particular treatment or combination of treatments. Document the agreed options in a plan with assigned responsibilities and accountabilities, the implementation time frame and performance measures. Box 4.2 presents a range of treatment options for mitigating and managing aspects of bushfire risk.
- *Monitor and review.* Risks and risk-treatment strategies need to be monitored to ensure that they remain relevant and effective because changing circumstances can affect the likelihood or consequences of a bushfire.
- *Communicate and consult.* Communication and consultation are critically important at each stage of the process. A communication plan should be developed early in the process to facilitate consultation between those involved in the process. The people responsible for implementing risk management, and those with a vested interest, need to understand the basis on which decisions are made and why particular actions are required.

The way the bushfire risk-management process is conducted and applied is critical to the degree to which the resulting decisions are accepted by all those with an interest in managing fire in the landscape. An effective process is one that is inclusive of all who are affected by bushfire. Lack of understanding of the fact that there are different objectives for different assets in the landscape inhibits resolution of debate – such as the debate about fuel-reduction burning. By engaging all interested parties and following the risk-management process described by the Australian Standard and Emergency Management Australia, greater understanding and acceptance can be achieved and debate resolved.

Box 4.1 Interpreting the terms and concepts of risk management for use in bushfire

Hazard is a source of potential harm or a situation with potential to cause economic, social and/or environmental loss. The conditions that combine to create a bushfire hazard are the state or condition of the fuel or vegetation (volume, moisture content, age, structure, continuity) and the weather (temperature, rainfall, lightning, humidity, wind). Thus, there are hazard-reduction strategies such as fuel-reduction burning and clearing. Residents in a fire-prone area may constitute a hazard if they are poorly informed and unaware of what to do in the event of a bushfire and do not have adequate capacity to withstand a fire.

Risk is the chance (probability or likelihood) of something happening that will have an impact on objectives. It is measured in terms of the likelihood of occurrence and the consequences or impacts. In the case of bushfire, risk is the likelihood of fire ignition and spread, causing harmful consequences for valued economic, social and environmental assets.

Threat is the chance of a negative impact on objectives occurring. It is the opposite of opportunity. Bushfire is most often seen as a threat. For some ecosystems, though, fire presents an opportunity for regeneration of particular plant species and maintenance of the overall health of the ecosystem. Bushfire is not necessarily a threat to all objectives.

Risk assessment combines the steps of *risk analysis* and *risk evaluation* (see Figure 4.1). Risk analysis measures or estimates the likelihood of a bushfire event and the possible consequences or impacts of a fire for the set of identified assets and values. Risk evaluation applies an agreed set of criteria to guide the process of determining *risk-treatment* priorities. For example, following evaluation, particular plant and animal species may be given the highest priority for protection on the basis of knowledge of the species in the region and their national status. Protection of particular buildings and facilities – such as hospitals, schools and telecommunication exchanges – might be assessed as a high priority. The choice of treatments is guided by the *risk evaluation* and can include actions by groups and individuals who gain some value from the asset. The treatment strategy might be a combination of actions.

Likelihood is a qualitative determination or description of the probability or frequency of occurrence.

Based on definitions and guidance from the Australian Standard for Risk Management, Emergency Management Australia's *Emergency Risk Management Applications Guide*, and feedback received on the Inquiry's draft report (Braun, K, pers. comm., 19 March 2004).

The success of participative planning and decision-making processes depends on the commitment of the participants, their willingness to cooperate, share information and listen to other views, and the strength of leadership that guides the process. Greater understanding of the way individuals think about risk and make decisions will help researchers and policy makers develop more effective structures and processes for engagement.⁵ The Bushfire Cooperative Research Centre's project on understanding community needs, perceptions and attitudes will provide valuable insights for bushfire risk-management planning. The process of preparing and implementing bushfire risk-management plans in New South Wales provides an example of good practice and is described in Box 4.3.

⁵ Tarrant, M 2003, 'Risk uncertainty and community', Paper presented to the EMA Australian Disaster Conference, Canberra, 10-12 September.

Box 4.2 Strategies for treating bushfire risk

- *Risk avoidance* – treatments that limit the likelihood or consequences of bushfire
 - land zoning – development restriction
 - land use prohibitions in high-risk areas
 - road siting and design
 - fire hazard mapping
- *Likelihood reduction* – treatments that reduce the likelihood of fire ignitions and fire spread
 - strategic burning – zoning (fire exclusion, asset protection zones)
 - vegetation clearing and thinning by machine or manually
 - grazing
 - arson reduction and control programs
 - restrict access to vulnerable areas
 - use of firebreaks and set-backs and fuel breaks to reduce fuel continuity
 - permits to light required
 - hazard-reduction notices
 - property inspections
 - land use diversification and fragmentation
 - pest and weed management programs
 - ecological burning
- *Consequence reduction* – treatments that reduce the economic, social and environmental impacts of bushfire
 - readiness
 - enforcement of Building Standard AS 3959-1999 in bushfire-prone areas
 - construction and maintenance of fire breaks
 - use of consistent fire danger warnings
 - insurance
 - maintenance of fire trails
 - water supplies identified
 - road design and siting
 - fire ban days
 - early fire detection
 - pre-emptive deployment of suppression resources
 - use of fire lookout towers
 - communications technologies
 - public information
 - training of firefighters
 - individuals and groups at risk – the elderly, the sick, and so on
 - occupational health and safety for firefighters
 - fire management planning integration into other processes
 - response
 - rapid initial attack
 - AIIMS Incident Control System
 - incident action plans
 - suppression cost management
 - recovery
 - integration of recovery and response
 - mopping-up crews
 - weed management
 - revegetation and erosion control

- *Risk transference* – treatments that share the responsibility for reducing the likelihood and consequences of bushfire
 - community awareness raising – mass campaigns
 - targeted education programs – preparedness
 - targeted education programs – prevention
 - targeted education programs – response (stay or go) and recovery
 - public warnings – Standard Emergency Warning Signal
 - mutual agreements and arrangements between agencies within a jurisdiction and between jurisdictions
 - fire refuges, evacuation and recovery centres identified
 - incident debriefing
 - post-event review or assessment process

Box 4.3 New South Wales Bush Fire Risk Management Plans

In New South Wales, each Bush Fire Management Committee is responsible for preparing and implementing a Bushfire Risk Management Plan. Bushfire Management Committees have been constituted under the *Rural Fires Act 1997* in 142 of the state's 170 local government areas. Each Committee includes representation from the Rural Fire Service, farmers and other land managers, utility and infrastructure operators, other relevant government agencies, and local government (representing other community interests). The term of the Plan is five years.

Each Bushfire Risk Management Plan covers all private and public land and deals with the likelihood of a fire event occurring in the local area and the consequences if it does. Assets considered include life, property (buildings, stock, crops and forests) and natural and cultural heritage.

Strategies for treating the risks are identified, including fuel reduction, programs to reduce accidental and deliberate ignitions, community awareness and education programs, and building regulations for fire-prone areas. Draft plans are placed on public display to elicit comments from local residents.

Public and private landowners and managers are required to implement the Plans. Local governments are required to ensure that owners or occupiers of private property reduce fire hazards on their property. Public land managers, such as councils, conservation agencies and infrastructure operators, need to develop specific programs for implementing relevant aspects of the Plan. In the case of conservation reserves, detailed fire management plans are developed in line with the Bush Fire Risk Management Plan as well as the plan of management for the reserve.

Each Bush Fire Management Committee is required to report annually on implementation of the Plan. The Rural Fire Service has established an audit process to support the Committees in two areas – review of the risks identified in the Plan and assessment of the progress of each treatment strategy.

Source: NSW Bushfire Coordinating Committee submission; Howe, A, NSW Rural Fire Service, pers. comm., 25 March 2004.

Establishing the context (the first step in the risk-management process shown in Figure 4.1) means understanding various factors across a landscape. Achieving this understanding requires: accurate historical knowledge of bushfires in a particular area; the season in which serious fires typically occur; the potential severity and behaviour of fires (based on characteristic weather in the fire season, topography and vegetation); typical ignition causes; and the fires' frequency and locations. It also requires knowledge of relevant policy at each level of government and of

community expectations and attitudes in relation to bushfire and its management. Planning for bushfires must also have a spatial component – accurate and comprehensive spatial data are critical for the mapping of bushfire risks across the landscape (see Chapter 5).

Under particular conditions (for example, weather, season and fuel conditions) bushfire is more likely to develop beyond the capacity to contain it. Fires of this kind pose a particularly high risk to people, buildings, infrastructure and the environment. The level of risk in these circumstances is dependent on several factors – the severity of the fire (intensity, rate of spread, spotting and size); the assets and values the fire is affecting; and the ability of the community, fire services, buildings, infrastructure and the environment to withstand the fire and to recover from it. The level of risk is higher where the number of days when fires cannot be contained by existing systems is greater, the likelihood of fires starting is greater (as a result of arson, accident or lightning), and the community's level of preparedness is not commensurate with the potential severity of the fire.

For example, a community in a moderate-hazard area might experience severe fire weather on relatively few days each year. However, if this community is inadequately prepared for a severe fire event, it will be at high to extreme risk. This was the case with the Canberra fire in January 2003 and also with the Mount Barker fire in Western Australia in December 2000. On the other hand, a community that is located in an area of high to very high hazard and is adequately prepared for a severe fire would have a moderate level of risk, even if severe fire weather occurred frequently.⁶

Our landscapes are highly complex matrices of different tenures, assets and infrastructure – much more complex than even 30 years ago. Bushfires are whole-of-landscape events that do not recognise boundaries. Risk assessment and consequent mitigation and management actions must therefore be designed as a whole-of-landscape process and not be confined to a single agency or tenure.

An added complication is the changing nature of the mix of land uses and settlement patterns. Large cities are expanding, producing longer perimeters. More Australians are moving to coastal locations: almost 20 per cent of the population was living in coastal areas outside capital cities in 2001.⁷ Furthermore, under probable climate change scenarios, projected changes to vegetation growth, and therefore fuel loads, will change fire regimes in some regions. Planning and risk-management processes therefore need to be flexible enough to respond to these and other changes in the environment.

In December 2003 the Council of Australian Governments endorsed in principle the recommendations of the *Natural Disasters in Australia* report.⁸ In support of one aspect of this initiative, in the 2003–04 budget the Australian Government announced a contribution of \$68.5 million over five years to a new Disaster Mitigation Australia Package. The Package represents a fundamental structural reform in disaster management that will move the focus beyond recovery and relief towards cost-effective, evidence-based disaster mitigation.

⁶ Braun, K, pers. comm., 19 March 2004.

⁷ Salt, B 2003, 'From city to surf: the new demographic trends', *B+FS*, April.

⁸ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra.

Most of the funding will be delivered as part of the new Natural Disaster Mitigation Program, which is being administered by the Department of Transport and Regional Services. As part of the development of the Program, the Department has signed a memorandum of understanding with Geoscience Australia to assist with the development and implementation of a five-year program of systematic and rigorous disaster risk assessments. This work will help in determining funding priorities for mitigation against a range of natural disasters, including bushfires. It will also provide the basis for a nationally consistent risk-assessment framework. The Program will generate databases and tools for conducting risk assessments and for indicating probabilities for the occurrence of bushfires and other natural hazards and their impacts on regions of Australia.⁹ Information and data from this work can inform risk-management processes for bushfire.

4.3 The 5Rs: a risk-management framework for bushfire

The Inquiry reviewed the prevention, preparedness, response and recovery framework of emergency management – commonly referred to as ‘PPRR’. It was pointed out to the Inquiry that the community is less interested in the terminology of, and the distinction between, emergency management phases than it is in direct support and action.¹⁰ Nevertheless, the Inquiry considers that some framework for risk management is essential to assist people responsible for decisions about bushfires and to aid in education. We therefore chose to modify the PPRR framework, to make it more relevant to bushfire mitigation and management, by defining the ‘5Rs’ as follows:

- **Research**, information and analysis
- **Risk** modification
- **Readiness**
- **Response**
- **Recovery**.

The 5R framework is consistent with AS/NZS 4360:1999.¹¹ The Inquiry acknowledges the emergency management sector’s investment in introducing PPRR and using that framework in education and awareness raising. The 5R framework is, however, consistent with PPRR and has the following advantages.

First, the fundamentally necessary research, information gathering and analysis element becomes an integral and explicit part of the risk-management process. Second, the Inquiry was concerned about the continued use of the word ‘prevention’ and the perception that fires can and should always be prevented.

⁹ Schneider, J, Hayne, M & Dwyer, A 2003, ‘Natural hazard risk models: decision-support tools for disaster management’, Paper presented to the EMA Australian Disaster Conference, Canberra, 10–12 September.

¹⁰ This was raised in discussions with representatives of Victorian government departments and agencies in Melbourne on 10 February 2004.

¹¹ The Inquiry was influenced by the approach of Moore, P, Hardesty, J, Kelleher, S, Maginnis, S & Myers, R 2003, ‘Forests and wildfires: fixing the future by avoiding the past’, paper presented to the 12th World Forestry Congress, Quebec, September.

Continuing use of this term simply reinforces an unachievable expectation in the community. Instead, the Inquiry considers that 'risk modification' and 'readiness' are much more useful concepts, especially in relation to the community. The potential of the 5R framework for adoption in bushfire mitigation and management might be worth exploring further in an all-hazards context, especially if it results in better engagement with the community.

The structure of the following chapters of the Inquiry's report follows the 5R framework:

- *Research, information and analysis.* Risk management cannot be applied effectively without some prior knowledge and relevant data and information. Planning and management cannot be improved without analysis of past events. Research provides valuable insights into critical factors and causal relationships. See Chapter 5.
- *Risk modification.* Modifying the risk (likelihood and consequence) posed by fire can have several components. The Inquiry classes these as risk avoidance, which covers land use planning for fire-prone areas; risk limitation, which includes limiting the number of ignitions by reducing the incidence of arson; and risk reduction, which relates to both reducing the hazard (for example, fuels) and reducing the vulnerability of assets through building design and construction regulations. See Chapter 6.
- *Readiness.* No matter how effective risk modification is, there is inevitably a residual risk of impact by bushfire. All residents and property owners therefore need information on which to base effective preparation and make informed decisions in the event of a bushfire. Fire services and recovery agencies also engage in readiness actions, independently and in association with other public and private sector organisations and residents. See Chapter 7.
- *Response.* Response is the firefighting part of the overall fire management process. This component receives the greatest media coverage and attention from the community. It is generally the role of the fire and land management agencies, although well-prepared residential and rural property owners can deploy effective measures to defend their properties. See Chapter 8.
- *Recovery.* Recovery is complex, dealing with social, economic, physical and environmental rehabilitation. It must be an integral part of the whole process and a conscious consideration at each other stage of the process. It calls for a recovery strategy and an operational plan. See Chapter 9.

Recommendation 4.1

The Inquiry recommends that a structured risk-management process based on the Australian Standard for Risk Management be further developed and applied in all aspects of bushfire mitigation and management, informed by a thorough understanding of the full range of assets.

5 Research, information and analysis



Research scientists from Forest Research New Zealand, the WA Department of Conservation and Land Management, CSIRO Forestry and Forest Products and the NSW National Parks and Wildlife Service preparing for an experimental fire in alpine forest near Tumbarumba, NSW, in late-February 2004. These fires were the first field experiments supported by the Bushfire Cooperative Research Centre

(Photo: Kevin Tolhurst, University of Melbourne)

Information and data, and their analysis and synthesis through various research processes, are the basis of knowledge and learning from which we can continuously improve the effectiveness and efficiency of bushfire mitigation and management. This chapter considers data and information needs and provision, and research capacity and activities, relevant to bushfire mitigation and management. It also looks at how gaps in current provision and activities might be redressed.

The use of knowledge derived from various databases, research and other sources is discussed throughout the report. Knowledge supports each element of the risk-management framework – for example, in informing community education programs, in planning ecological and fuel-reduction burning, in analytical and planning tools such as Wildfire Threat Analysis¹, in fire monitoring and firefighting, and in designing and maintaining recovery programs.

5.1 The historical context

In Australia, bushfire-related data and information gathering and research have been largely fragmented and nationally inconsistent², an unsurprising outcome of the lack of a national coordinating framework associated with the primary responsibility of the states and territories for these tasks. Over the past decade growing recognition of the benefits of consistent, reliable and timely information about all aspects of bushfire mitigation and management has led to a number of initiatives aimed at improving this situation. These have focused on the

¹ The Wildfire Threat Analysis tool, developed by Western Australia's Department of Conservation and Land Management, is discussed in Muller, C 2001, *Review of Fire Operations in Forest Regions Managed by the Department of Conservation and Land Management*, Report to the Executive Director of the Department of Conservation and Land Management, Perth, pp. 63–75.

² Institute of Foresters of Australia submission.

consistency and quality of bushfire-related data, usually in the broader contexts of natural resource information or an all-hazards approach.³

Australia has a strong history of research into aspects of bushfire mitigation and management⁴, although levels of expenditure and human resources are widely regarded as modest in both absolute and relative terms⁵ and efforts have largely been fragmented.⁶ Research has been undertaken variously by national agencies (for example, the Bureau of Meteorology and CSIRO⁷), state and territory land management and fire agencies, and universities. More recently, elements of it have been coordinated through new structures such as Cooperative Research Centres.⁸ Historically, research focused principally on understanding fire behaviour and fire ecology, fire weather, aspects of fire management and suppression, and building design. More recently, areas such as health and safety, spatial information sciences, and landscape-scale fire modelling have become complementary research focuses, and the research effort in northern and central Australian environments has expanded significantly.⁹ Social sciences research relevant to bushfire mitigation and management has been and remains more limited¹⁰, but it is increasingly recognised as critical to advances in fire science and management if education and communication efforts are to have greatest impact and are to feed back most usefully to fire agencies and researchers.

Coordination and collaboration between jurisdictions in bushfire research, information and analysis were largely informal and project specific until the past decade or so. Since then, a number of national or partially national entities – for example, the Australasian Fire Authorities Council, the Cooperative Research Centres and Geoscience Australia – have emerged and others such as Emergency Management Australia have assumed stronger national roles. These initiatives have been partly a response to the evident limitations of an uncoordinated approach, and they have been facilitated by technological advances such as those in the spatial information sciences and by a much greater level of national coordination in approaches to other forms of hazard and threat to the community.

³ For example, the Emergency Management Spatial Information Network Australia and the Australian New Zealand Land Information Council.

⁴ Nationally, dating from the initiation of AG MacArthur's work in the mid-1950s in the Commonwealth Forestry and Timber Bureau.

⁵ Adams, MA 2003, "Fire rules" and issues for resolution by government, industry and the community', Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December; Gould, J 2002, 'Bushfire research – the challenge to meet operational needs', Paper presented at AFAC 2002 Conference, Gold Coast, September.

⁶ Whelan, M 2003, 'Perspectives on fire research', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 236; Gould, J 2002, 'Bushfire research – the challenge to meet operational needs', Paper presented at AFAC 2002 Conference, Gold Coast, September; CSIRO submission, p. 127.

⁷ Relevant Bureau of Meteorology and CSIRO research activities are outlined in those organisations' submissions to the Inquiry.

⁸ CSIRO submission, p. 127.

⁹ Principally through the work of the Tropical Savannas CRC (and its predecessor) and the Key Centre for Tropical Wildlife Management over the past decade, building on earlier CSIRO and land management agency work – Russell-Smith, J, Whitehead, PJ, Williams, R & Flannigan, M 2003, 'Fire and savanna landscapes in northern Australia: regional lessons and global challenges', *International Journal of Wildland Fire*, vol. 12, nos 3,4, pp. v-ix.

¹⁰ Rohrmann, B 2003, 'Bushfire preparedness of residents: insights from socio-psychological research', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 113-18; though noting earlier work in various jurisdictions.

They have also been fostered by the increased interstate and international deployment of firefighting resources in the past decade.

Making the best use of existing data and information, generating new data and information that meet the needs of those engaged in bushfire mitigation and management, and identifying associated research priorities, require that we do the following:

- identify and refine information and knowledge needs
- assess the quality and utility of existing data, information and knowledge and identify gaps
- sustain processes and resources that help to meet data, information and knowledge needs efficiently and effectively.

5.2 Data and information relevant to bushfire mitigation and management

Decisions about bushfire mitigation and management are highly dependent on data and information and the knowledge derived therefrom. The knowledge base can include both traditional and local knowledge, as well as individual and organisational experiences. Data and information can be drawn from various datasets and databases, the results of scientific and social research, and decision-support tools and models. Data and information support both strategic and operational decisions, as well as the overall risk management process and each of its elements.

There are many different users of such data and information, among them firefighters, land managers, members of the community, policy makers and researchers. Their data and information needs vary, reflecting differences in roles and responsibilities, interests and purposes, and time frames and scope. These needs can be classified generally as spatial, meteorological, relating to fire behaviour and impacts, and relating to fire occurrences and agency performance. Data describing community characteristics, such as socio-economic information relevant to investments in recovery, are also important: this is dealt with in Chapter 9.

Spatial (spatially explicit) data can be geographically referenced to a location. Meteorological data are a form of spatial data about climate and weather conditions. Fire behaviour and fire impacts data describe fuel characteristics, fire intensity and spread, and the consequences for people and assets. Fire occurrence and agency performance data describe the status of fire events and of fire management and mitigation operations.

Spatial and meteorological data are relevant to decisions about many elements of the risk management framework. Data about fire behaviour and characteristics support knowledge models and tools such as decision-support systems. These tools are the product of research and rely on data collected from experimental and prescribed fires, from bushfires, and from model simulations. Fire occurrence and agency performance data are of most relevance to those involved in policy and planning and fire recovery processes.

In bushfire mitigation and management, as with other natural hazards, good decision making at the strategic and operational levels is critically dependent on several factors:

- the form, scope and availability of data and information
- the underlying information systems and processes, including infrastructure for data and information storage and dissemination
- the capacity of users – skills, technologies and tools – to convert the information into knowledge to guide decisions
- policy settings and governance arrangements for data and information collection, access and sharing.¹¹

5.2.1 The form, scope and availability of data and information

As with other hazards and threats to the community, strategic and operational decisions for bushfire mitigation and management call for spatial data and information. Spatial data and information for Australia are now readily accessible through the Australian Spatial Data Directory, which links 25 nodes¹² maintained by agencies of the Australian Government and state and territory governments. The Directory has more than 33 000 records describing the datasets it holds; these can be searched on the internet via a national gateway maintained by Geoscience Australia.¹³

The scope of data and information available through the Australian Spatial Data Directory is extensive, ranging from digital spatial data such as remotely sensed data on fire footprints to text records such as fire management plans. Spatial data have the significant advantage that, subject to compatibility of scale, currency and format, different data layers from unrelated sources can be represented visually and interpreted in a consolidated dataset. The format of spatial data ranges from digital data that are readily downloaded to computer models and decision-support systems to non-digital data and text information that have to be converted or interpreted, or both, before they can be integrated with other data. Digitisation of existing data sets greatly enhances their value and facilitates ongoing maintenance of data accuracy and currency. The Inquiry also notes the rapid advances in access to and interpretation of remotely sensed data, which are discussed in the next section.

ANZLIC, the Australian New Zealand Land Information Council, is responsible for establishment of spatial data standards; its role is discussed in Section 5.2.4. The Emergency Management Spatial Information Network of Australia was

¹¹ The Inquiry acknowledges advice from Dr John Busby, General Manager, Office of Spatial Data Management, 17 February 2004.

¹² A 'node' is a collection of searchable metadata documents.

¹³ Australian Spatial Data Directory, <<http://www.ga.gov.au/asdd/>>, viewed 13 February 2004. A 'dataset' is an organised collection of data with a common theme; it may include digital spatial data, research reports or a collection of maps. 'Metadata' is a description of the dataset but not actual data itself; it is like a reference card in a library catalogue and includes various descriptive information. A 'record' is a set of related data fields, normally within a database. A 'database' is a collection of data organised according to a formal structure describing the characteristics of the data and the relationships between their corresponding entities.

established in 2002 to represent GIS user groups from the states and territories and the national-level emergency management sector. Among other things, the Network promotes the benefits of common operating procedures and supports the development of relevant standards for spatial data. Adoption of common procedures and standards for spatial mapping by all states and territories offers a number of advantages, among them greater operational efficiencies, facilitation of national reporting, and enhanced effectiveness of inter-jurisdictional deployments.

Data at a scale of 1:100 000 may be useful for strategic planning purposes but are of limited use for operational fire activities. As a result, fire agencies have developed maps at scales consistent with their specific planning and operational needs, generally at scales of 1:50 000 and 1:25 000.

Box 5.1 Advances in bushfire mapping: examples from Queensland and South Australia

In both Queensland and South Australia geospatially accurate maps are being developed to facilitate rapid and informed assessment of conditions facing operational personnel in the field.

From the start of the 2004–05 fire season, incident management teams in Queensland will have access to up-to-date maps to support decision making in the field, and personnel in the incident command centre will be able to receive spatial information on individual fires at the time they are being fought. These maps will also be a useful basis for briefing the media and the public with timely and accurate information on current fires. The Queensland Government is developing a spatial data bank to encourage greater use of data and information collected by its departments and agencies.

Similarly, in South Australia the Spatial Projects Unit has developed specific maps for National Parks and Wildlife South Australia for vegetation type and distribution, fire history and fire frequency to inform planning and operational decisions. The Unit plans to prepare maps of critical habitat areas and species richness from numerous existing databases in the state. The resulting datasets will be used by National Parks and Country Fire Service managers to protect vulnerable ecosystems and species from fire. This is in addition to the Map Books project sponsored by the Country Fire Service, which provides up-to-date digitally based map books covering the settled areas of the state.

For many important datasets, such as those covering fuel condition, human settlement, property locations and weather conditions, it is critical that up-to-date data and information be available to support bushfire-related decision making. For example, lack of up-to-date maps was identified as a limitation to effective response by firefighters in the 2003 fires¹⁴, hampering local and interstate units' capacity to work efficiently in unfamiliar territory. The Inquiry notes recommendation 33 of the House of Representatives Select Committee's report on the Bushfires of 2002–03, to accelerate the 1:100 000 national mapping program. While the Inquiry agrees that 1:100 000 maps are important, we note the advice of the Emergency Management Spatial Information Network Australia:

- The currency of 1:50 000 and 1:25 000 is more critical for operational use.

¹⁴ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, p. 96; House of Representatives Select Committee on Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, paragraphs 6.125–6.136.

- Topographic maps at these scales can now be produced directly from GIS databases, greatly facilitating their regular updating.
- The accuracy, currency and accessibility of state and territory digital mapping databases are therefore the most critical element of providing up-to-date mapping products.¹⁵

Finding 5.1

The quality and currency of digital mapping databases are critical for the provision of up-to-date mapping products. The Inquiry supports and encourages state and territory and Australian Government initiatives to digitise existing spatially explicit data and develop digital mapping databases according to nationally agreed procedures and standards and to make these products available in operationally useful form. The Inquiry strongly supports the role of national bodies and representative groups in facilitating nationally consistent and accessible spatial data and data products.

Spatial data from satellite remote sensing

Spatial data acquired from satellite remote sensing are particularly valuable for bushfire mitigation and management. Western Australia's Department of Land Information has pioneered the development and delivery of bushfire-related satellite data products in Australia, to both public and private sector clients, including remote communities.¹⁶ The current and potential value of such data for bushfire mitigation and management is illustrated in Figure 5.1, drawing principally on experiences in northern and Western Australia.

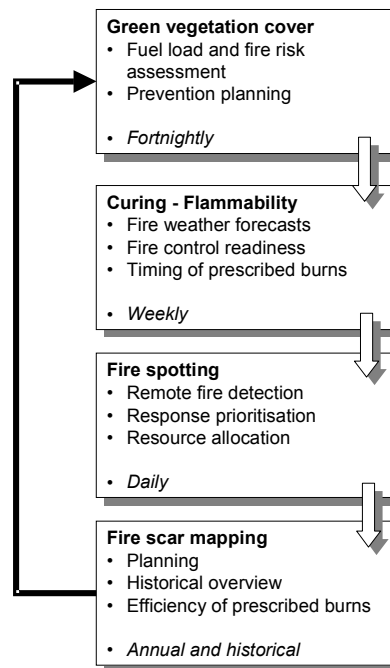
The use of satellite remote-sensing data to provide information relevant to bushfire mitigation and management has developed rapidly, principally in sparsely populated areas of northern and central Australia, where remote sensing offers the only practical means of data acquisition. Progress in northern and Western Australia has been achieved principally through the efforts of agencies in the Northern Territory and Western Australia¹⁷, in conjunction with CSIRO, the Tropical Savannas CRC and others; results have been made available through the North Australia Fire Information website.

¹⁵ EMSINA submission, 'A review of geographic information system technologies in bushfire management', 24 February 2004.

¹⁶ See Department of Land Information, Western Australia, <<http://www.dola.wa.gov.au/corporate.nsf/web/satellite+imagery>>, viewed on 15 March 2004. The Department provides a range of satellite remote-sensing services; it delivers raw and processed satellite data at 1 km² resolution and provides a daily fire fax or email service to clients on fire hot spot locations for active fires. It also supplies fire-affected area history maps, grassland-curing maps for assessing flammability, and maps of relative fuel load accumulation.

¹⁷ Notably the Western Australian Department of Land Information, <<http://www.dli.wa.gov.au/corporate.nsf/web/satellite+imagery>>, viewed 15 March 2004.

Figure 5.1 Uses of satellite remotely sensed data for bushfire mitigation and management in Australia



Note: based on data from NOAA-AVHRR.

Source: Justice, CO, Smith, R, Gill, AM & Csiszar, I 2003, 'A review of current-spaced-based fire monitoring in Australia and the GOFc/GOLD program for international coordination', *International Journal of Wildland Fire*, vol. 12, pp. 250.

This work has taken fire monitoring in Australia from a position of no information for the majority of the continent a decade ago 'to now having some information that is proving to be very useful on fire location, timing and annual extent'.¹⁸ An important and exemplary element of the approach adopted was the development of 'user-friendly, readily accessed, web-based products for disseminating this [fire mapping and hot spot] information'¹⁹, including to remote communities through standard telecommunications infrastructure. While it has been suggested that 'the current satellite assets are significantly under-used for operational monitoring and the various current fire monitoring activities fall largely in the research domain'²⁰, this situation is changing rapidly.

¹⁸ Justice, CO, Smith, R, Gill, AM & Csiszar, I 2003, 'A review of current-spaced-based fire monitoring in Australia and the GOFc/GOLD program for international coordination', *International Journal of Wildland Fire*, vol. 12, p. 253.

¹⁹ Tropical Savannas CRC, summary of Project 2.4.1, <http://savanna.ntu.edu.au/research/projects/fire_savannas.html>, viewed 15 March 2004.

²⁰ Justice, CO, Smith, R, Gill, AM & Csiszar, I 2003, 'A review of current-spaced-based fire monitoring in Australia and the GOFc/GOLD program for international coordination', *International Journal of Wildland Fire*, vol. 12, p. 250.

Box 5.2 The North Australia Fire Information Website



The North Australia Fire Information website <<http://www.firenorth.org.au/nafi/>> provides extensive information on fire hot spots and fire-affected areas for several regions of northern Australia. It provides explanations of fire mapping and links to other useful sites. For example, a user can access the site and request a map of hot spots or fire-affected areas for a particular location. A map server then retrieves the necessary information from the database to make a map of that area, with the hot spots and fire-affected areas displayed. It then sends this map to the user's browser as a compact image that can be transmitted over standard telecommunications links and viewed with appropriate software.

The main participants in the website are the Bushfire Council of the Northern Territory, the Cape York Peninsula Development Association, the Western Australian Department of Land Information, Charles Darwin University, Sentinel Fire Mapping, and the Tropical Savannas Cooperative Research Centre.

Since 2002 the northern Australian information just described has been complemented by a partnership consisting of CSIRO, the Defence Imagery and Geospatial Organisation and Geoscience Australia, which developed the Sentinel Hotspots fire mapping system and website.²¹ Sentinel can provide fire location data within one hour of overpass, using the MODIS sensors on NASA satellites that scan Australia nearly four times during a 24-hour period. The data are available to the community via Sentinel's public website. There is also a secure website for access by authorised organisations involved in fire mitigation and management. The accuracy of fire location is currently within about 1.5 kilometres, but during the coming 12 months accuracy is expected to improve to 250 metres following enhancements to the MODIS sensor processing capability.

Satellite data are complemented by other forms of airborne remote-sensing data (such as infra red line scanning fire data from aircraft), which are also becoming more widely available. Both the Western Australian Department of Land Information and the CSIRO Office of Space Science and Applications/Earth Observation Centre have separate and complementary plans to improve the precision and utility of satellite-derived information.²² The Department of Land Information is proposing to produce near-real-time burnt-area mapping for use in fire management, as well as improvements in the fire history mapping product. CSIRO is proposing to develop Sentinel Hotspots MkII, including further validation of the accuracy of the NASA MODIS sensor systems (and other sensor systems) for Australian vegetation and atmospheric conditions and additional image products associated with more rigorous measurement of the heat release of

²¹ Sentinel Hotspots, <www.sentinel.csiro.au>, viewed 15 March 2004.

²² Smith, R, Manager, Satellite Remote Sensing Services, Department of Land Information, Western Australia, pers. comm. 22 March 2004; Held, A, Head, Office of Space Science and Applications/Earth Observation Centre, pers. comm. 22 March 2004.

Australian fires (such as fire intensity, fuel load, and ecosystem recovery after a fire event). Investment of approximately \$1 million over three years is required to develop this additional capacity and precision.

Finding 5.2

The Inquiry supports the use of remotely sensed data to provide more extensive, objective and timely data for informing strategic and operational decisions about fire mitigation and management. It also supports the development and delivery, in user-friendly forms, of data products that facilitate access by the community, as well as the staff of fire, land management and emergency services agencies.

Meteorological data and information

The Bureau of Meteorology, which maintains a node on the Australian Spatial Data Directory, provides general climatic information and fire weather services in each jurisdiction, according to a national template developed in close consultation with state and territory fire authorities. The Bureau offers to fire, other emergency and land management agencies a broad range of services relevant to bushfire mitigation and management – routine weather forecasts during the fire season, fire danger warnings, forecasts to assist firefighting, forecasts for planned fires, specialist advisory services, and so on. Some agencies establish and maintain their own weather observation sites using their own instrumentation; in other cases, the Bureau co-funds additional observation sites with fire or land management agencies.

The Bureau provides fire weather forecasts that include predictions of lightning activity for the forecast period. Real-time measurements of actual lightning activity are supplied, at a cost, to the Bureau by a private provider.²³ The Bureau does not currently have the resources to buy a higher level of lightning activity data, so fire and land management agencies that require such data must buy it from the provider. Some agencies regard this as a cost they should not have to bear. The Inquiry considers that the matter should be assessed against the criterion of whether coordinated purchasing of such information, in terms similar to those discussed in Chapter 10 for other acquisitions, would lessen the overall costs to agencies.

The Bureau of Meteorology expressed concern to the Inquiry about the potential for inconsistent weather forecasts arising from multiple sources during fire events.²⁴ The Inquiry suggests that the Bureau pursue discussions with individual jurisdictions to ensure that consistency is realised.

Fire and land management agencies informed the Inquiry that they are well served by the Bureau of Meteorology, that they value the cooperative and regionally specific approach the Bureau takes, and that they consider it imperative that both the quality and the regional focus of the Bureau's work be maintained.

Because of both regional variation and the differing requirements of the individual fire and land management agencies, there is currently a lack of national uniformity

²³ Bureau of Meteorology advice to the Inquiry, 23 March 2004.

²⁴ Bureau of Meteorology advice to the Inquiry, 23 March 2004.

in fire weather advice provided by the Bureau of Meteorology. This may hinder some aspects of inter-jurisdictional collaboration. The Bureau is currently assessing whether a more nationally consistent approach to fire weather forecasting – which still meets the needs of individual fire and land management agencies – would be advantageous and feasible.²⁵

Finding 5.3

The Inquiry notes the following:

- the fundamental importance of high-quality, locally specific weather information and forecasting services to bushfire mitigation and management
- the high quality of services provided by the Bureau of Meteorology
- the potential cost and the consistency implications of some weather services being provided by commercial suppliers.

The Inquiry supports the following:

- the continuation and further enhancement of Bureau of Meteorology fire weather forecasting
- the resourcing of the Bureau at a level sufficient for it to maintain and develop these services, particularly at the regional level
- further exploration of the potential benefits of a more strongly coordinated national fire weather forecasting system.

Data on vegetation, fuel and fire behaviour

Vegetation – living and dead – is the main source of fuel for a bushfire, and it varies significantly across the landscape and over time. Fuel loads accumulate at different rates in different ecosystems, and their distribution, level and persistence depend on both ecosystem processes and fire regimes.²⁶ A ‘spatial and temporal description of fuel is fundamental in assessing fire hazard and risk across a landscape’²⁷, in predicting fire behaviour, and thus in making bushfire mitigation and management decisions.

Although a substantial body of work, dating from the early 1960s, has sought to characterise fuel loads and associated fire behaviour²⁸, adequate data are not yet available for the wide range of Australian ecosystems and fire regimes. This basic knowledge – about fuel loads and dynamics, fire behaviour, and ecological responses to fire – is currently best, but incompletely, developed for some forest and savanna ecosystems; it needs to be extended both in these ecosystems and to

²⁵ Bureau of Meteorology submission.

²⁶ See, for example, CSIRO submission, pp. 71–3.

²⁷ Gould, J 2003, ‘Fire behaviour: integrating science and management’, in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 59.

²⁸ Including, for example, McArthur, AG 1962, *Control Burning in Eucalypt Forests*, Leaflet 80, Forestry and Timber Bureau; Cheney, NP & Sullivan, A 1997, *Grassfires: fuel, weather and fire behaviour*, CSIRO, Melbourne; Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams RJ (eds) 2002, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin; Sneeuwjagt, R & Peet, GB 1998, *Forest Fire Behaviour Tables for Western Australia*, 3rd edn, Department of Conservation and Land Management, Perth.

ecosystems dominated by grasses, litter and shrubs.²⁹ In the case of ecosystems for which such knowledge is poor, the priority is for research to generate the basic data and information. In other situations the priority is to assemble existing knowledge in forms suitable for practical application, such as 'burning guides'.³⁰ Each of these activities is necessary to achieve optimal implementation of both fuel reduction and ecological burning across Australia.³¹

A related matter concerns the long period over which many ecological studies need to be conducted to yield valid results. Australia has few long-term ecological research sites or programs³² such as those supported by the US Long-Term Ecological Research Program.³³ The establishment of and sustained support for a national network of long-term ecological research sites would greatly facilitate monitoring of the impacts of fire regimes and fire events.

The Inquiry notes the previous and current work of CSIRO and state and territory land management agencies³⁴ and the Tropical Savannas Cooperative Research Centre³⁵, and the proposed work of the Bushfire Cooperative Research Centre³⁶, in addressing information needs about fuel loads and dynamics, associated fire behaviour and ecological responses, and the consequent development of burning guides. We support these initiatives but recognise that the resources committed are limited in relation to the magnitude and importance of the task. The House of Representatives inquiry into the bushfires of 2002–03 also identified this work as a priority.³⁷ The Inquiry estimates the additional resources required to be \$1 million annually for a five-year initial phase.

²⁹ Cary, G, Lindenmayer, D & Dovers, S 2003, 'Research and policy priorities: a synthesis', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 252–65.

³⁰ A 'burning guide' is a manual to guide prescribed burning for a particular area and/or vegetation type. It is based on fire behaviour and fire control research and covers measurement and prediction of fuel moisture, fuel load, rate of fire spread, weather forecasting, and fire suppression resourcing.

³¹ The CSIRO submission (p. 9) noted the existence of burning guides for some ecosystems in Western Australia and suggested these might serve as models for other parts of Australia.

³² Cary, G 2003, 'Australia burning: a discussion summary', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 248–51; Lindenmayer, D 2003, 'Fire behaviour, forest management and biodiversity conservation', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 82–8.

³³ International Long Term Ecological Research Sites Network, <<http://lternet.edu>>, viewed 24 March 2004.

³⁴ CSIRO and state and territory submissions and discussions.

³⁵ Tropical Savannas CRC, <http://savanna.ntu.edu.au/research/projects/fire_savannas.html> and <<http://savanna.ntu.edu.au/research/projects/fireplan.html>>, viewed 15 March 2004.

³⁶ Bushfire CRC project plans include development of a single fuel classification system based on plant species, fuel age, structure and quantity; improved fire danger rating systems; a national fire behaviour prediction system; and prescribed burning guides for south-eastern fuel types, including hardwood plantation species, for use in fire behaviour models.

³⁷ House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, recommendation 1.

Recommendation 5.1

The Inquiry recommends the provision of additional resources jointly by the Australian Government and the state and territory governments for the following purposes:

- to accelerate the research necessary for the characterisation of fuel loads and dynamics for Australian ecosystems (both natural and exotic), the characterisation of fire behaviour and ecological responses, the development of 'burning guides' from this information, and the compilation of this information and knowledge in nationally accessible databases
- the establishment of a national network of long-term ecological research sites to provide a basis for long-term monitoring of the impacts of fire regimes and fire events.

Fire regimes

The concept of the fire regime – the frequency, intensity, seasonality and type of fire – is now recognised as central to our understanding of the ecological impacts of fire³⁸, for defining risk to people and property, and for mitigation and management decisions. To understand fire regimes, we need to acquire, summarise and interpret information describing fire history and intensity across the landscape.

Fire regime information is currently very limited for most of Australia, making it very difficult to learn as much as we might from past fire events and to make fully informed fire mitigation and management decisions now.³⁹ Fire-affected area⁴⁰ mapping exists at different scales and for different periods for various parts of Australia. It is perhaps best documented at the landscape scale in the forests of south-western Western Australia, where there has been fire history mapping at the forest management unit level for almost 70 years; fire regimes might also be well known for other specific parts of the landscape, typically particular state forests or national parks.

Consistent fire mapping on a large (regional and national) scale has become possible only with technological advances, notably the availability of satellite data and the development of user-friendly interfaces, since 1997.⁴¹ Advances in sensor technologies and methods for analysing data should soon allow interpretation of remote-sensed satellite imagery to estimate or approximate fire intensity⁴² (another component of the fire regime) and more cost-effective acquisition of other relevant data.

As Cary, Lindenmayer and Dovers note, nationally consistent fire regime mapping would assist bushfire mitigation and management in a variety of important ways – including fire threat analysis, estimates of greenhouse emissions, enhanced

³⁸ Gill, AM & Bradstock, R 2003, 'Fire and biodiversity: a set of postulates', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 65–81.

³⁹ Lindenmayer, D 2003, 'Ecology and the environment: a discussion summary', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 52.

⁴⁰ Hitherto described as fire scar mapping, but we prefer a less value laden term.

⁴¹ Pioneered by the Western Australian Department of Land Information.

⁴² Advice from Western Australia Department of Conservation and Land Management, at Inquiry's WA consultation meeting 30 January 2004.

ecological understanding, environmental monitoring and model validation.⁴³ Such mapping is consistent with part of recommendation 14 of the House of Representatives inquiry into the 2002–03 bushfires.

Although development and maintenance of fire regime mapping requires further technical and analytical input, progress to date has been encouraging. A national program also requires agreement about standards, coordination, responsibilities and resourcing. There are a number of existing models for such collaboration, among them the National Forest Inventory⁴⁴ and the National Land and Water Resources Audit.⁴⁵

As noted, the Western Australia Department of Land Information has pioneered continental-scale fire mapping in Australia, and its work is now complemented by that of the CSIRO Sentinel Project. The Inquiry received advice from the Department that a national burnt-area mapping system using data from the MODIS sensor would cost about \$600 000 to establish and a further \$600 000 annually to operate.⁴⁶ This system would provide the basis for fire regime mapping, although further data analysis and interpretation would be necessary to provide complete fire regime information. The Inquiry estimates the cost of this initiative to be \$4 million over five years.

Recommendation 5.2

The Inquiry recommends that the Australian Government and the state and territory governments jointly provide additional resources and work in partnership to establish and refine a national program of fire regime mapping.

Climate change

Data and information about bushfires and climate change need to describe both the contribution of bushfires to greenhouse gas emissions and the likely impacts of climate change on bushfire events and regimes. The contribution to greenhouse gas emissions is estimated and reported under the Australian Greenhouse Office's National Greenhouse Gas Inventory process.⁴⁷ The burning of tropical savannas and temperate grasslands makes a small but significant contribution to national CO₂-equivalent emissions, at 3.2 per cent. Information about the likely impacts of climate change on bushfire events and regimes necessarily relies on modelling and therefore remains principally a matter of research at present.

Research is discussed in Section 5.3; broader aspects of climate change and bushfire are discussed in Chapter 6.

⁴³ Cary, G, Lindenmayer, D & Dovers, S 2003, 'Research and policy priorities: a synthesis', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 252–65.

⁴⁴ National Forest Inventory, <<http://www.affa.gov.au/content/output.cfm?ObjectID=D52EDDBA-23DF-485A-B1C968D1C08E79D1>>, viewed 29 March 2004.

⁴⁵ National Land and Water Resources Audit, <<http://www.nlwra.gov.au>>, viewed 21 March 2004.

⁴⁶ Smith, R, Manager, Satellite Remote Sensing Services, Western Australia Department of Land Information, pers. comm. 22 March 2004.

⁴⁷ Australian Greenhouse Office 2003, *National Greenhouse Gas Inventory 2001*, AGO, Canberra.

Local knowledge

'Local knowledge' refers to the thoughts, perceptions, experiences and beliefs of residents, landholders, volunteer firefighters and others involved in fire mitigation and management at the local level. It embraces individuals' memories and experiences of past fire events and specific knowledge of elements and processes in the current environment. The value of local knowledge is discussed in Chapter 8.

As noted by earlier inquiries⁴⁸, there is a danger that this knowledge is undervalued and is not effectively captured or recorded for decision making, especially as developments in information and communications technologies influence patterns of information and knowledge management. Information and data from past fire events are invaluable for future decisions. Fire regimes and fire history information, which are increasingly being obtained from remotely sensed data, should be complemented by the information and knowledge of local people who have experienced past fires, as well as by other recorded data and information.

The Inquiry makes recommendations in this regard in Chapters 8 and 11. We also note that the foregoing discussion applies equally to Indigenous Australians' traditional knowledge, which is discussed in Chapter 11.

Performance data

'Performance data' includes measurement of bushfire events and of the operational performance of fire agencies. Measurement of the former is problematic, not just in Australia but more widely: despite concerns about the increasing incidence and impact of fires, 'there is a paucity of accurate and timely information on the numbers of fires, area burned and phytomass consumed annually at national, regional and local scales and on the social, economic and environmental costs'.⁴⁹ Such national data on bushfires are not readily available for Australia, notwithstanding the recommendation of the 1984 House of Representatives Standing Committee on Environment and Conservation.⁵⁰

Although a national incident reporting system exists within the fire services – the Australian Incident Reporting System – the Inquiry was advised that it is not used by land management agencies and does not meet all requirements for bushfire. The Institute of Foresters advised the Inquiry:

We are aware of attempts some years ago to establish the Australian Incident [Reporting] System (AIRS). This did not prove to be successful, as it was too ambitious, and too demanding on people in the field. Fire statistics must be

⁴⁸ For example, Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 20; House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, recommendation 23.

⁴⁹ Goldammer, JG 2003, 'Closing paper: summary of the findings of the 3rd International Wildland Fire Conference and Directions for the Global Wildland Fire Summit and the Follow-up Process', Paper presented to the 3rd International Wildland Fire Conference, Sydney, 3–10 October, pp. 1–2.

⁵⁰ House of Representatives Standing Committee on Environment and Conservation 1984, *Bushfires and the Australian Environment*, HRSCEC, Canberra, para. 166, recommendation 12 – 'the Australian Bureau of Statistics examine the need for, and the problems involved in, a national bushfire statistics series'.

few and relevant to be collected and to be useful. AIRS should not be resurrected ...⁵¹

The Incident Reporting System remains in operation and is used by fire agencies for the total range of emergency responses, such as house fires, hazardous incidents, vehicle accidents and bushfires. The Inquiry understands that the System works well for many other forms of incident data, but it does not appear to be well suited to the needs and constraints of local rural brigades and land management agencies. The Institute of Foresters said that, in part as a consequence, 'there is no comprehensive national database for bushfire occurrence, cost and damage. This is despite a recommendation that this be done in 1984 by the Standing Committee on Forestry in the wake of the Ash Wednesday Fires'. The lack of such a database, which the Inquiry also notes in Chapter 2, impedes analysis of information that is important to bushfire mitigation and management.

Some of the difficulties associated with bushfire data collection can be overcome by using objective data sources on a national basis. Advances in technology facilitate this; for example, remotely sensed satellite data can be used to measure numbers of fires, the extent of the fire-affected area and fire regimes.

In contrast, performance and administrative data describing agency activities and response are generally good for the emergency management sector, including fire agencies. The Inquiry notes that the Australian emergency sector has recently commissioned a needs analysis by the Australian Bureau of Statistics⁵² and in Chapter 13 makes comment on the role of the Productivity Commission in reporting agency performance.

The trend in the emergency management sector to a whole-of-government approach to data and information management will benefit fire management agencies by providing the impetus and resources for creating data infrastructures and data and information standards and protocols. There is, however, a danger that data collected and used to represent the status of disasters and emergencies and the performance of organisations will not capture the distinctiveness of bushfire and bushfire organisations. The Inquiry makes a recommendation in this regard in Chapter 13.

Finding 5.4

The Inquiry supports the development of whole-of-government initiatives to improve aspects of information and data collection, storage, exchange and reporting. These initiatives should recognise the agencies involved in bushfire mitigation and management and take into account the particular characteristics of bushfires in the design and implementation of reporting systems.

⁵¹ Institute of Foresters of Australia submission, p. 23.

⁵² The aims of the analysis include improving the availability of relevant data and information to inform research, decision making and interactions with government and the community; and facilitating coordination and uniformity across the jurisdictions in relation to emergency management.

5.2.2 Information systems and processes

Information systems and processes include both physical infrastructure and management systems. The potential value of a national information system supporting bushfire mitigation and management is demonstrated by the systems in use in countries such as Canada.⁵³

Adoption of all-hazards and whole-of-government approaches, both nationally and in the states and territories, is greatly facilitating the efficient development of information systems and processes.

Advances in information and communications technologies, satellite remote sensing and geographical information systems are assisting the development of much-improved fire information systems and processes and consequently improving the reliability, consistency and timeliness of information for use in strategic planning and fire operations.

Information technology and digitisation have increased the value and power of spatial data. Large amounts of data can be stored, analysed, updated and distributed. Up-to-date spatial data can be accessed online, downloaded and integrated with other data in models and decision-support tools. The systems extend the utility of individual datasets by exploiting the capacity of technology to transform and integrate data into information in near-real time. This capacity will continue to grow, and these improvements will aid more effective and efficient decision making.

The Inquiry notes relevant initiatives already taken, such as the establishment of the Emergency Management Spatial Information Network of Australia, and the adoption of recommendation 2 of the Report on *Natural Disasters in Australia*.⁵⁴

5.2.3 The capacity of users

Fire and land management agencies and research centres have been among those at the forefront of developing and applying spatial information and related information and communications capabilities for operational and planning purposes. Nevertheless, rapid advances in data and information technology capabilities challenge their capacity, as they do the capacity of other organisations. This means that enhancing the capacity of the users of data and information is both a necessary and an ongoing activity, to ensure that the best possible use is made of available data and information. Capacity development has a number of elements in this context – within the community, within public sector agencies, and in the private sector.

⁵³ For example, Lee, BS, Alexander, ME, Hawkes, BC, Lynham, TJ, Stocks, BJ & Englefield, P 2002, 'Information systems in support of wildland fire management decision making in Canada', *Computers and Electronics in Agriculture*, vol. 37, pp. 185–98.

⁵⁴ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra – 'establish a nationally consistent system of data collection, research and analysis to ensure a sound knowledge base on natural disasters and disaster mitigation'.

Community capacity

Community capacity can be developed in a variety of ways, as part of the community education programs discussed in Chapters 3 and 7. Current examples of initiatives to develop community capacity are as follows:

- those developed and delivered to northern Australian communities by a broad partnership of land management and fire agencies and research organisations⁵⁵ – such as the Natural Heritage Trust-funded project ‘Developing Knowledge-based Fire Management for Northern Australia Savanna Communities’, which is managed by the Northern Territory Regional Natural Heritage Trust Committee on behalf of six regional Natural Heritage Trust committees
- the Nature Conservation Council of New South Wales Bushfire Community Education Program⁵⁶
- the South East Queensland Fire and Biodiversity Consortium, which is described in Chapter 6.

Public sector agency capacity

Public sector agency capacity⁵⁷ can be developed through means such as:

- use of specialist briefings and secondments of individuals with specialist skills, such as already occurs throughout the sector. These are an effective way of bridging capability differences and ensuring that data are accurately interpreted. For example, the Bureau of Meteorology supplements its weather forecast products with detailed briefings for fire agency staff, to ensure that interpretations of satellite and radar imagery and numerical model outputs are understood⁵⁸
- whole-of-government and all-hazards approaches to information management, which will lead to skill development opportunities through on-the-job learning, staff exchanges and access to specialists in other agencies. These integrated approaches have many advantages in terms of building critical mass and capacity across agencies
- development and nurturing of networks such as the recently established Emergency Management Spatial Information Network, which will improve staff capability, interoperability between agencies, and system effectiveness. For example, the Spatial Information Network proposes to give GIS practitioners a voice in national consultative processes, establish common operating procedures and assist in the development of standards, establish a skills register, and organise workshops on the use of GIS.⁵⁹ There are also other specialist networks in the research community – for example, Research Working Group No. 6 of the Forestry and Forest Products Committee and the

⁵⁵ For example, Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F, Cooke, P 2003, ‘Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management’, *International Journal of Wildland Fire*, vol. 12, pp. 415–25.

⁵⁶ Nature Conservation Council of NSW submission; <<http://www.nccnsw.org.au>>.

⁵⁷ Other elements of agency capacity development are discussed in Chapter 11.

⁵⁸ Bureau of Meteorology submission, p. 22.

⁵⁹ EMSINA submission.

Australian network of fire and remote-sensing researchers linked via the Global Observations of Forest Cover/Global Observations of Land Dynamics initiative.⁶⁰

Private sector capacity

Private sector capacity development reflects the private sector's increasing role in the spatial information realm. For example, members of the Australian Spatial Information Business Association are active in supporting the establishment of national standards and policy for spatial data and associated geospatial information technology. Use of private sector services, especially in specialist areas, is likely to increase.

Delivery and coordination

Increasingly, providers of spatial products and services will deliver integrated information and knowledge packages, with a high level of interpretation and processing embodied in the product. The less demanding requirements of users thus allow a greater number of users to connect with the information packages. Hand-held devices and other mobile instruments that can receive, process and transmit data and information between the field and the command centre offer great promise for fire mitigation and management.

The Inquiry notes the Council of Australian Governments' in-principle endorsement of the *Natural Disasters in Australia* report and that implementation of that report's recommendations⁶¹, as well as ongoing efforts in relation to national security and counter-terrorism, will deliver benefits to bushfire mitigation and management through enhancing nationally coordinated initiatives.

Finding 5.5

The Inquiry strongly supports further capacity building relevant to bushfire data and information among communities and the public and private sectors.

5.2.4 Policy settings and governance arrangements

The Australian Spatial Data Infrastructure is a national framework for linking users with providers of spatial information; it is similar to other national infrastructures in areas such as transport, communications and utilities.⁶² The concept of the Spatial Data Infrastructure is a distributed network of databases managed by individual government and industry custodians. The Infrastructure

⁶⁰ Formed by the Committee on Earth Observation Satellites to connect data providers and information users in order to improve access to and use of satellite and ground-based observations on forest and fire; see Justice, CO, Csiszar, IA, Goldammer, JG & Lee, B 2003, 'GOFCC/GOLD-Fire: a program for international coordination of fire observations', Paper presented to the 3rd International Wildland Fire Conference, Sydney, September.

⁶¹ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra, recommendation 2—'establish a nationally consistent system of data collection, research and analysis to ensure a sound knowledge base on natural disasters and disaster mitigation'.

⁶² Australian Spatial Data Infrastructure, <http://www.anzlic.org.au/infrastructure_ASDI.html>, viewed 2 March 2004.

comprises the people, policies and technologies necessary to enable the use of spatially referenced data through all levels of government, the private sector, non-profit organisations and academia. All Australian governments are contributing.

The role of the Infrastructure is to ensure that Australia's spatial data, information products and services are readily available and accessible to all users. It facilitates access to consistent data sets to meet users' requirements, even though the data are collected and maintained by different authorities.

Implementation of the Infrastructure requires a solid foundation based on policy and administrative arrangements, people and technology and a means whereby spatial data are made accessible to the community. Through the Infrastructure, it is hoped that all jurisdictions will respond in a coordinated way to policy considerations such as access and pricing, liability, copyright and privacy. The Infrastructure encourages coordinated development and adoption of a core set of standards focused on documented data quality and interoperability.⁶³

ANZLIC is responsible for promotion and coordination of standards for spatial data. Other initiatives, such as the National Land and Water Resources Audit's National Resources Information Management Toolkit⁶⁴, provide support for this process. For example, the Toolkit identifies best-practice measures for the development and maintenance of nationally consistent map data.

State and territory spatial data infrastructures, which are complementary to the Australian Infrastructure, are increasingly driven by a whole-of-government approach. In many jurisdictions land management agencies are among the strongest proponents of a coordinated approach.

The Department of the Environment and Heritage reflected the views of a number of submissions to the Inquiry in its statement that 'Nationally consistent data are required to support effective planning, rapid response and recovery across regional and State borders' and 'nationally agreed standards or guidelines for data will improve data sharing, data integration and interoperability'.⁶⁵

This intent has already been given effect by the *Natural Disasters in Australia* report, which recommended 12 initiatives as part of coordinated reform of the way Australia manages natural disasters.⁶⁶ Among these was the recommendation to 'establish a nationally consistent system of data collection, research and analysis to ensure a sound knowledge base on natural disasters and disaster mitigation'.

Provision of consistent data to users also requires that there be adequately resourced national coordinators of data sets relevant to bushfire mitigation and management.⁶⁷

⁶³ Williams, N 2003, 'The Australian Spatial Data Infrastructure', Paper presented to the Australian Disaster Conference, Canberra, September.

⁶⁴ National Resources Information Management Toolkit, <<http://www.nlwra.gov.au/toolkit>>, viewed 28 March 2004.

⁶⁵ Department of Environment and Heritage submission, p. 12.

⁶⁶ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra, p. 14.

⁶⁷ Department of Environment and Heritage submission, pp. 12-13.

Recommendation 5.3

The Inquiry recommends that the Australian Government and the state and territory governments continue to develop national consistency in data sets relevant to bushfire mitigation and management under the Australian Spatial Data Infrastructure framework, and within this context, identify and resource national bushfire data set coordinators.

5.3 Research relevant to bushfire mitigation and management

The principal factors associated with research relevant to bushfire mitigation and management are interrelated – the level of investment in research and development; coordination of and setting priorities for research; gaps in the research portfolio; communication and the uptake of research results; and research capacity. The quality of Australian research related to bushfires is highly regarded internationally⁶⁸, although there remain longstanding concerns about sustaining a critical mass of research scientists.⁶⁹

5.3.1 The level of investment in bushfire-related research

Comprehensive expenditure data for bushfire-related research and development are not available for Australia. The best approximation is that provided by reporting against the Australian Standard Research Classification under the Fire Management field of the Forest Science research category (1998).⁷⁰ R&D expenditure and human resources data based on this classification were obtained from the Australian Bureau of Statistics for the period 1990–91 to 2000–01. Data are available for the higher education, Australian Government, and state and territory government sectors⁷¹ but not for the business sector. The analysis of the available data is presented in Figures 5.2 to 5.6. Note that the data could under-report expenditure because some research (for example, ecological research) might not have been classified to this field and because private sector expenditure is not accounted for. The former expenditure is likely to be greater than the latter. Note, too, that the most recent reporting period precedes the establishment of the Bushfire, Desert Knowledge and Spatial Information Cooperative Research Centres.

The Fire Management data are useful for showing general patterns in expenditure and human resource involvement in bushfire research between 1990–91 and 2000–

⁶⁸ Adams MA 2003, ‘“Fire rules” and issues for resolution by government, industry and the community’, Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December; Pyne, SJ 2003, ‘Fire’s lucky country’, in I Abbott & N Burrows (eds) 2003, *Fire in the Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden, pp. 1–8.

⁶⁹ Adams MA 2003, ‘“Fire rules” and issues for resolution by government, industry and the community’, Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December; Gould, J 2002, ‘Bushfire research – the challenge to meet operational needs’, Paper presented at AFAC 2002 Conference, Gold Coast, September.

⁷⁰ Australian Bureau of Statistics 1998, *Australian Standard Research Classification*, cat. no. 1297.0., ABS, Canberra. The specific records are for Fire Management, which according to the Research Classification ‘includes forest fire prevention and control’.

⁷¹ The data are available every two years (the interval between surveys). The data for the higher education sector are on a calendar-year basis, while those for the government sector are on a fiscal-year basis.

01. In 2000–01 total research and development expenditure was approximately \$3 million.⁷² Expenditure fluctuated over the decade, a pattern familiar to the research community. This is accentuated by the significant apparent decline in funding in the Australian Government sector from 1990–91 to 1992–93⁷³ and an increase in expenditure by the states and territories towards the end of the period.

In real or constant dollar terms, expenditure declined by almost 40 per cent during the decade. This fall is strongly influenced by the decline in expenditure in the Australian Government sector from 1990–91 to 1992–93. Since 1992–93 the real trend in expenditure across the three sectors has been virtually flat, indicating that expenditure has kept pace with inflation. Over the decade, the Australian Government sector's share of total research and development expenditure declined steadily in current dollar terms, from 66 per cent to 37 per cent; that of the states and territories grew from 31 per cent to 55 per cent. Higher education sector expenditure grew from 4 per cent to 8 per cent over the decade; its share peaked at 17 per cent in 1998–99, providing further evidence of the extent to which the level of research activity varies from year to year.

A comparison of total expenditure per person reveals the much lower cost of research in the higher education sector relative to the other two sectors. For example, in 2000–01 total R&D expenditure per person in the higher education sector was about one-third of that in the Australian Government and state and territory sectors, reflecting (presumably) both relative university salaries and the use of research students.

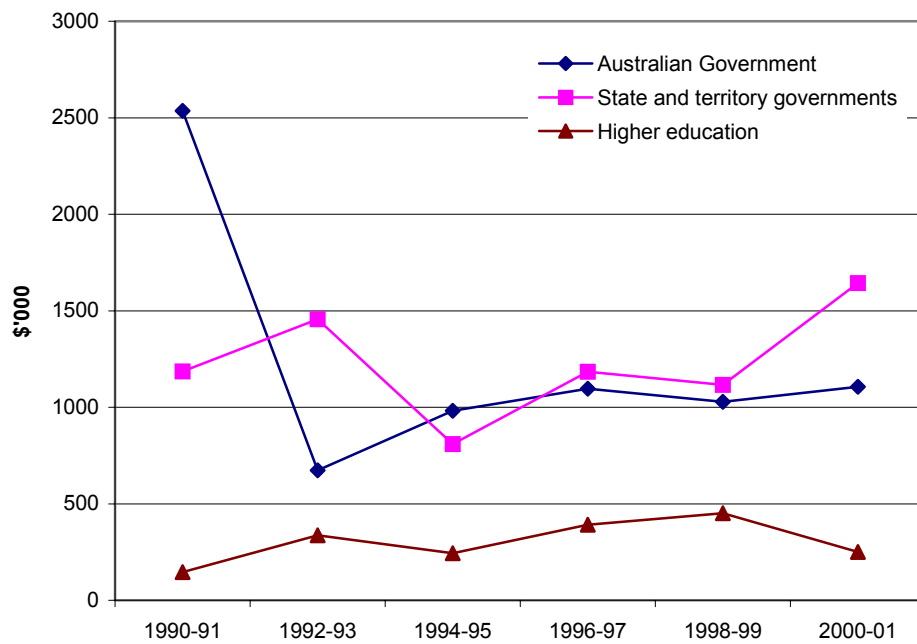
Between 1990–91 and 2000–01 the total person-years engaged in fire management research across the three sectors fell by 45 per cent, strongly influenced by the decline in the Australian Government staff commitment. Consistent with expenditure patterns, the states and territories engage the greatest number of research personnel, followed by the Australian Government and higher education sectors. Although small, total person-years in the higher education sector doubled during the decade, from 2.6 to 5.3, with a peak of 13.8 in 1998–99.

Since 2001 there has been a significant increase in investment in bushfire-related research and development with the establishment of three new cooperative research centres in 2003 – Bushfire, Spatial Information and Desert Knowledge – and the renewal of the Tropical Savannas Cooperative Research Centre in 2001. While data comparable with those just discussed are not yet available, this increased investment obviously goes some way towards redressing the decline in Australian Government funding during the 1990s. Questions of continuity and the sustainability of research funding beyond the lives of the Cooperative Research Centres do, however, remain. This is discussed in the following sections.

⁷² As noted, this is likely to be an underestimate of the total research effort in Australia because of the limitations of the data.

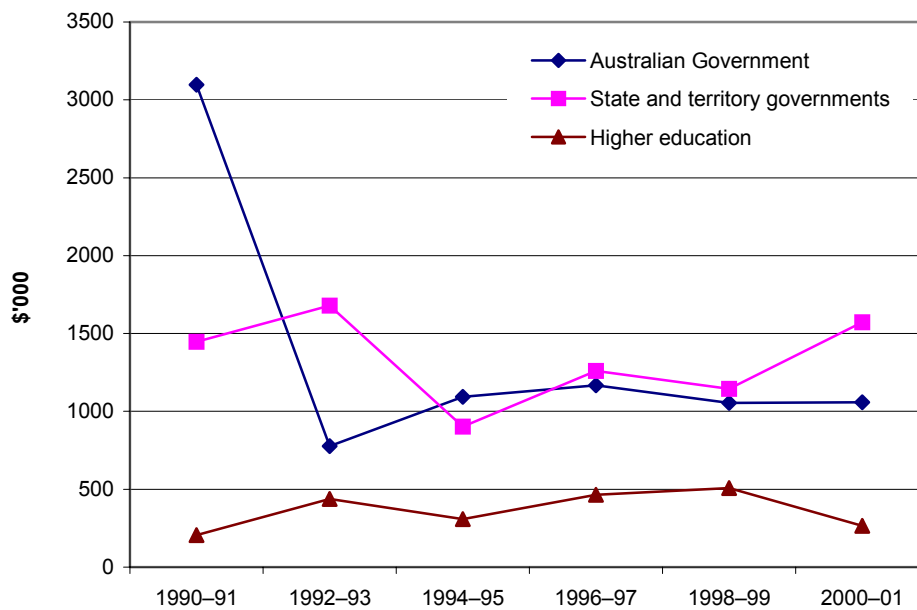
⁷³ The Inquiry was not able to establish the extent to which data for this period represent an anomaly. Comparable data are not available for the preceding periods.

Figure 5.2 Fire management R&D expenditure, by sector (current dollars)



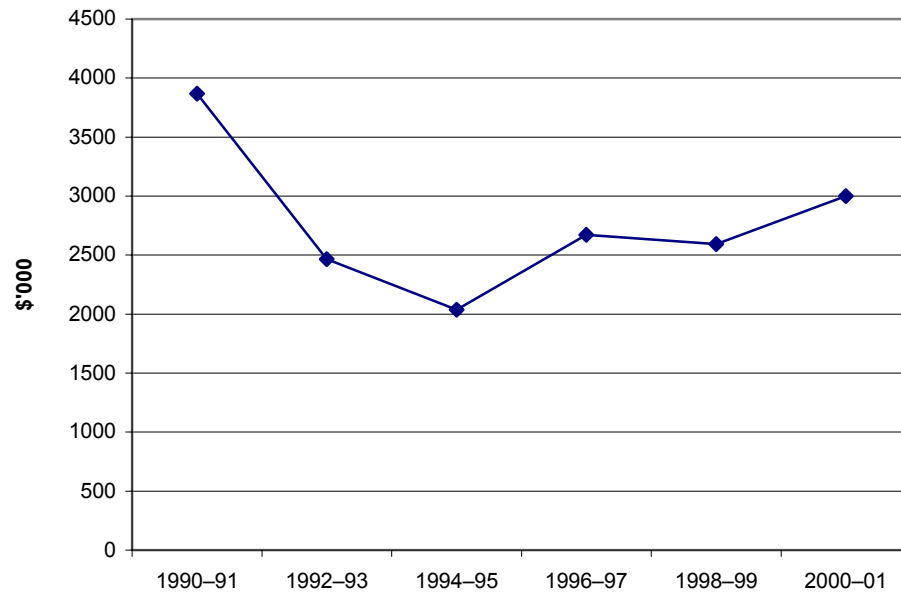
Source: Australian Bureau of Statistics

Figure 5.3 Fire management R&D expenditure, by sector (constant 1999–2000 dollars)



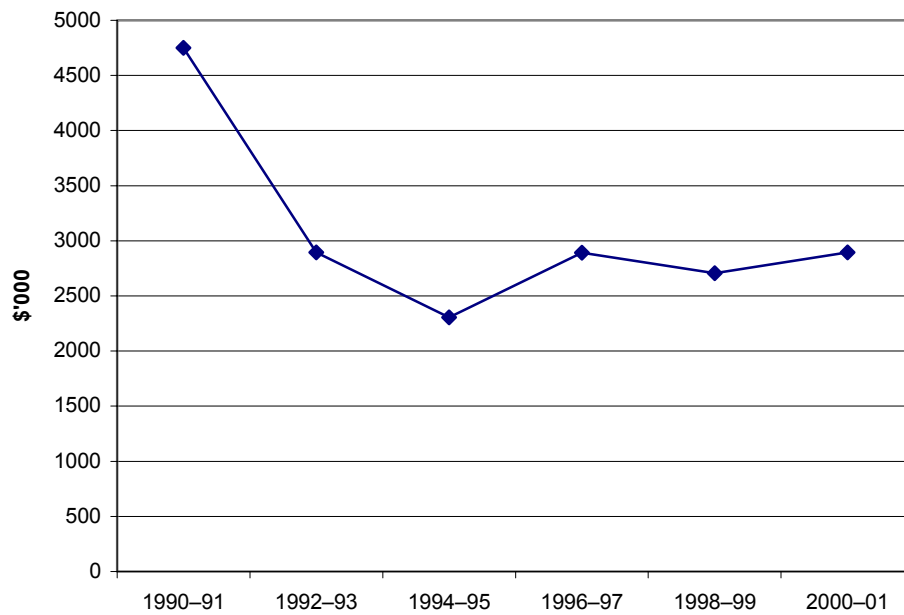
Source: Australian Bureau of Statistics

Figure 5.4 Fire management: total R&D expenditure (current dollars)



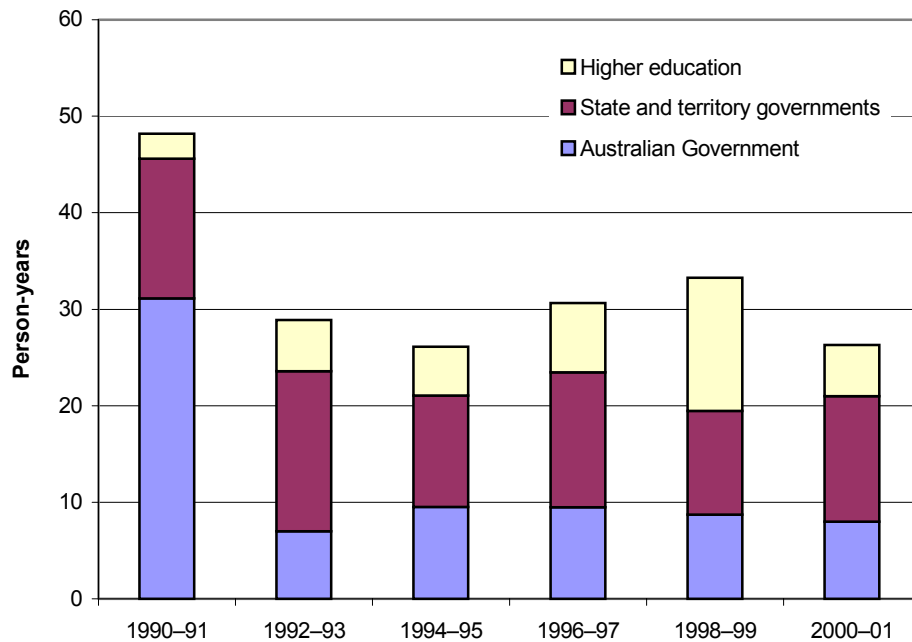
Source: Australian Bureau of Statistics

Figure 5.5 Fire management: total R&D expenditure (constant 1999-2000 dollars)



Source: Australian Bureau of Statistics

Figure 5.6 Human resources devoted to R&D for fire management, by sector



Source: Australian Bureau of Statistics

5.3.2 Coordinating, setting priorities for and organising research expenditure

There have been a number of attempts to better coordinate the historically fragmented efforts in research relevant to bushfire mitigation and management, but few of them have endured. Sub-committees and working groups⁷⁴ under the aegis of what is now called the Primary Industries Ministerial Council, focused primarily on land management, are the coordinating structures of longest standing but their role is purely advisory. CSIRO established a National Bushfire Research Unit in 1984 but it was not continued beyond its initial five-year term.

A ministerial-level Bushfire Research Advisory Group⁷⁵ was established in 2002 but was disbanded after the establishment of the Bushfire Cooperative Research Centre in 2003. Since its establishment in 1993 the Australasian Fire Authorities Council has played an increasingly strong role in facilitating and coordinating research relevant to its members, culminating in the establishment of the Bushfire Cooperative Research Centre in 2003.

The Cooperative Research Centres Program⁷⁶ is a good model for much bushfire-related research because of its explicit linkage between industry and researcher partners and its focus on research and research training to meet the needs of industry partners. The work coordinated and facilitated by the Tropical Savannas Cooperative Research Centre on bushfires in northern Australia's savanna

⁷⁴ Forestry and Forest Products Committee: Forest Fire Management Group; Research Working Group 6—Fire Management.

⁷⁵ The Bushfire Research Advisory Group was chaired by the Australian Minister for Science and comprised six representatives from fire and land management agencies and research organisations.

⁷⁶ See the Cooperative Research Centre website <<http://www.crc.gov.au>>.

landscapes exemplifies this.⁷⁷ The Centre's geographical focus on northern savannas is now complemented by bushfire research aimed at Australia's arid lands, through the Desert Knowledge Cooperative Research Centre, and by the wider national focus of the Bushfire Cooperative Research Centre.

The Bushfire Cooperative Research Centre is, as its name suggests, the Centre focused most strongly on the breadth of bushfire research, involving around two-thirds of Australasian Fire Authorities Council members and most relevant research providers. The Cooperative Research Centre for Spatial Information – with programs dealing with the acquisition, interpretation and delivery of spatial information to users – is also doing work relevant to bushfires. The research programs of each of these Centres are summarised in Table 5.2 and detailed in Appendix F.

For all Cooperative Research Centres the research priorities and activities represent the outcome of dialogue between industry and research partners. The Centres are a logical vehicle for coordinating and setting priorities for research within their field of work. Although there are already project-specific collaborations between Centres⁷⁸, there is no established, recognised and durable national process for coordinating work between Cooperative Research Centres or with other researchers. In recognition of this, the Bushfire Cooperative Research Centre has initiated dialogue with other Cooperative Research Centres working on bushfire to consider options for research coordination.

Other funding for bushfire-related research necessarily follows the priorities and is judged against the criteria of particular funding and research agencies. The following are examples:

- Researchers in universities and some research institutes compete for Australian Research Council funding, which is allocated on the basis of scientific merit consistent with the National Research Priorities, one of which is 'An Environmentally Sustainable Australia'.⁷⁹
- The rural sector research and development corporations' priorities are determined by their boards and reflect their charters.⁸⁰

⁷⁷ Summarised in Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams RJ (eds) 2002, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin; also reviewed by Russell-Smith, J, Whitehead, PJ, Williams, R & Flannigan, M 2003, 'Fire and savanna landscapes in northern Australia: regional lessons and global challenges', *International Journal of Wildland Fire*, vol. 12, pp. 1-5.

⁷⁸ For example, 'Carbon Economy for Northern Australia', CSIRO press release 2004/32, describing collaboration between Bushfire CRC, the Greenhouse Accounting Office and the Tropical Savannas CRC.

⁷⁹ National Research Priorities, <<http://www.dest.gov.au/priorities/>>, viewed 29 March 2004.

⁸⁰ Indicative levels and current areas of investment: the Forest and Wood Products Research and Development Corporation – approximately \$150 000 a year on codes and standards for construction in bushfire-prone areas and on combined fire retardant – preservative treatments for timber for use in construction in bushfire prone areas; Land and Water Australia – approximately \$100 000 a year on aspects of ecological use and impacts of bushfire; the Rural Industries Research and Development Corporation – approximately \$150 000 a year on aspects of capacity development in rural industries with relevance to bushfire preparedness.

Table 5.2 Cooperative Research Centre research programs most relevant to bushfires

Centre	Research programs or projects
Bushfire CRC < http://www.bushfirecrc.com >	<ul style="list-style-type: none"> A. Safe prevention, preparation and suppression of fires B. Management of fire in the landscape C. Community self-sufficiency for fire safety D. Protection of people and property E. Education, training and communication
Desert Knowledge CRC < http://www.desertknowledge.com.au >	<ul style="list-style-type: none"> • Documentation of knowledge and aspirations of pastoral, Aboriginal and conservation interests with respect to fire • Knowledge of combined effects of weeds and fire on biodiversity and economic values • Historical patterns of fire and their effects on biota • Implementation of long-term projects examining the effects of different fire regimes on biodiversity and production in remote desert areas • Evaluation of preliminary data from projects examining the effects of fire on biodiversity
Spatial Information CRC < http://www.spatialinfocrc.org >	<ul style="list-style-type: none"> 4. Earth observation for renewable natural resource management 5. Modelling and visualisation for spatial decision support
Tropical Savannas CRC < http://savanna.ntu.edu.au >	<p>FIREPLAN:</p> <ul style="list-style-type: none"> • Developing, implementing and evaluating fire management in woody vegetation in Queensland's northern Gulf region • Investigating prescribed burning and wildfire control – training skills development for on-ground property-level fire management in the Kimberley • Evaluating fire management in conservation reserves, in partnership particularly with the Queensland Parks and Wildlife Service • Fire management planning associated with energy supply in north-west Queensland • Impacts of fire and its use for sustainable land and forest management in Indonesia and northern Australia • Fire information products for the savanna community • The Arnhem Land Fire Abatement project

Note: See Appendix F for details. All four centres also have education and training programs.

- CSIRO is aligning its research with the National Research Priorities and its international competitive advantage.
- The Department of the Environment and Heritage's priorities are determined by its responsibilities for national environmental and heritage objectives, which include improving fire management for biodiversity conservation through the Natural Heritage Trust.⁸¹
- The Bureau of Meteorology's research priorities are determined by both its internal processes and its membership of the Bushfire Cooperative Research Centre.
- The states and territories also fund research directly, according to their needs, priorities and resources.

⁸¹ Over \$1.2 million has been allocated under the Natural Heritage Trust for bushfire research projects.

Some components of research funding follow a ‘boom and bust’ cycle associated with major fire events, and there are also tensions between the time scales of much research in the environmental sciences and the time scales within which fire agencies operate.⁸² As discussed in Section 5.2, this tension is especially problematic in the case of some elements of ecological and land management research and monitoring, which is inherently long term.

In a research funding environment that has such a diversity of funding sources and priorities, and consequently the potential for continuing fragmentation of efforts, a mechanism that encourages coordination is desirable. A number of such coordinating mechanisms already exist in other arenas.⁸³ In the case of bushfire-related research, the former Bushfire Research Advisory Group was the closest approximation to such a mechanism: its terms of reference included provision of advice on research activities, needs and priorities.⁸⁴

The Advisory Group was discontinued largely because it was believed its role would be assumed by the Bushfire Cooperative Research Centre. But the latter has no such formal role, mechanism or resources for engaging with others who fund or conduct bushfire-related research. The Inquiry notes that the Centre is aware of this difficulty and is seeking to establish a consultative mechanism in partnership with other relevant Cooperative Research Centres in order to resolve the situation.

Any coordinating mechanism should recognise and respect the diversity of research groups and research work nationally. There is currently no obvious functional national model to recommend. One possible model for a coordinating mechanism is a body similar to the Research Working Groups established under the Forestry and Forest Products Committee of the Primary Industries Ministerial Council; these Groups have national representation and the chairperson’s role rotates.

Finding 5.6

A national coordinating mechanism representing the principal interests and organisations in bushfire research is necessary to maximise the national benefit from investments in bushfire research.

5.3.3 Gaps and priorities in bushfire-related research

Those who carry out and use the results of bushfire-related research have recently reviewed priorities for and gaps in the research through mechanisms such as research collaborations⁸⁵, symposia⁸⁶, and the process of establishing Cooperative

⁸² Gould, J 2002, ‘Bushfire research – the challenge to meet operational needs’, Paper presented at AFAC 2002 Conference, Gold Coast, September.

⁸³ For example, the Joint Venture Agroforestry Program, between the Forest and Wood Products Research and Development Corporation, Land and Water Australia, the Rural Industries Research and Development Corporation and the Murray-Darling Basin Commission.

⁸⁴ Minutes of Bushfire Research Advisory Group meeting, 13 June 2003.

⁸⁵ For example, Bradstock, RA, Williams, JE & Gill, AM eds 2002, *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK.

⁸⁶ For example, Abbott, I & Burrows, N (eds) 2003, *Fire in the Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden; Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

Research Centre programs.⁸⁷ As Bradstock and colleagues observed of bushfire-related ecological research:

Both research and management could benefit from a national focus. This does not mean we advocate centralisation of these disciplines but we do encourage a view beyond the local patch. Indeed, our capital of knowledge may expand more rapidly if limited national resources can be harnessed to study more effectively the problems of fire-regime effects on ecosystems and disseminate such knowledge.⁸⁸

The Inquiry considers that this argument applies similarly across the spectrum of bushfire-related research and notes that much nationally focused research is already under way – through, for example, the Australasian Fire Authorities Council, the Bureau of Meteorology, the cooperative research centres, CSIRO, and the Department of the Environment and Heritage. There remain, however, a number of national-scale and nationally important research⁸⁹ topics about which there has been a high degree of consensus in recent reviews⁹⁰ but that are not currently receiving sufficient attention; the most important of these are summarised in the following paragraphs.

National mapping of fire regimes. This priority is discussed and a recommendation made in Section 5.2.

Knowledge to predict fire behaviour and vegetation responses across a range of ecosystems. This priority is discussed and a recommendation made in Section 5.2.

Development of regional climate models and assessment of climate change impacts. Regional climate models are necessary to provide predictions of finer scale than is currently available.⁹¹ The models would inform fire management and threat analysis, under both current and changed climate scenarios. Climate change predictions for Australia – which suggest hotter, drier and more frequent extreme conditions⁹² – emphasise the importance of understanding the likely consequences of climate change for bushfire regimes and their impacts. This is discussed further in Chapter 6.

Theory and models for better understanding and predicting fire behaviour and the impacts of fire. Developing more robust theory and models in order to better understand and predict fire behaviour and the ecological impacts of fires, across the range of scales and intensities, is necessary for a number of reasons. One is the great diversity of fire regimes and ecosystems; another is that there are limits to experimentation with high-intensity fires. Consequently, we cannot conduct all the

⁸⁷ For example, CSIRO submission, app. 1; Bushfire, Desert Knowledge and Tropical Savannas Cooperative Research Centre programs.

⁸⁸ Bradstock, RA, Williams, JE & Gill, AM (eds) 2002, *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK, p. 441.

⁸⁹ 'Research' in this context implies a research and/or development component of the work necessary to operationalise these proposals.

⁹⁰ Bradstock, RA, Williams, JE & Gill, AM (eds) 2002, *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK; Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

⁹¹ Lindesay, J 2003, 'Fire and climate in Australia', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 32–40.

⁹² CSIRO submission.

empirical science we need to answer the suite of fire behaviour and fire ecology questions.⁹³ We need instead to develop stronger theories and better models, informed and updated by empirical studies such as those already undertaken by the current Project Vesta.⁹⁴

Learning from Indigenous Australians' knowledge and use of fire. In recent decades there have been important advances in both scientific and land management agencies' understanding of Indigenous Australians' knowledge and use of fire.⁹⁵ The opportunities for and the difficulties associated with applying Indigenous bushfire knowledge and practices are the subject of extensive discussion and debate⁹⁶ and of initiatives in Australia's northern savannas and arid zones.⁹⁷ This is discussed further in Chapters 6 and 11.

There is considerable potential for both Indigenous and non-Indigenous Australians to benefit substantially from better understanding of Indigenous Australians' knowledge and use of fire and of how this might be adapted and implemented in contemporary Australia. Such research – much of which would be action oriented and be conducted in partnership with Indigenous Australians – should include a focus on the process of co-learning between Indigenous and non-Indigenous Australians, and on operationally feasible ways of integrating customary and modern practices and technologies to support bushfire mitigation and management.⁹⁸

Building design, construction, materials and protection. Research challenges in relation to building design, construction, materials and protection are less about understanding these factors themselves and more about 'utilising the body of knowledge to effect real outcomes in relation to building protection in bushfires'.⁹⁹

⁹³ Cary, G, Lindenmayer, D & Dovers, S 2003, 'Research and policy priorities: a synthesis', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

⁹⁴ CSIRO submission.

⁹⁵ For example, Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary roles in savanna management', *International J Wildland Fire*, vol. 12, nos 3,4, pp. 415–25; Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, Part V, 'Indigenous land and fire management', CSIRO Publishing, Melbourne; Baker, R, Davies, J & Young, E (eds) 2001, *Working on Country*, Oxford University Press, South Melbourne.

⁹⁶ For example, Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary roles in savanna management', *International J Wildland Fire*, vol. 12, nos 3,4, pp. 415–25; Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 12.

⁹⁷ Relevant Tropical Savannas and Desert Knowledge CRC programs, as described in Appendix F; Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary roles in savanna management', *International J Wildland Fire*, vol. 12, nos 3,4, pp. 415–25.

⁹⁸ Some of these concerns are discussed in relation to northern Australia by Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F, Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25, and in Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, Part V, 'Indigenous land and fire management', CSIRO Publishing, Melbourne.

⁹⁹ Leonard, JE & Bowditch, PA 2003, 'Findings of studies of houses damaged by bushfire in Australia', Paper presented to 3rd International Wildland Fire Conference, Sydney, 3–6 October.

As Leonard and Powditch note, this implies ‘integrated research, communication and education’¹⁰⁰; this itself is a research issue, as discussed below.

Social, psychological and economic research relevant to bushfire mitigation and management. Although social science research programs dealing with various aspects of bushfire risk reduction, readiness, response and recovery are under way through the Bushfire Cooperative Research Centre, the Centre for Risk and Community Safety and other institutions¹⁰¹, the limited extent of such research to date, and its evident potential, suggest that investment in a greater research effort would be both prudent and productive. The value of such work spans the breadth of bushfire issues, from arson through education to individual and community behaviour.

Refining the risk-management framework. Developing the risk-management framework the Inquiry advocates at Chapter 4 will itself require research and refinement through adaptive management.¹⁰² Given the centrality of the risk-management framework to the Inquiry’s vision of future bushfire mitigation and management, research that informs and refines implementation of the framework is a high priority, both in its own right and in terms of informing other research priorities.

Learning from experience. Bushfire researchers and managers are increasingly recognising the benefits of structured processes for fostering effective learning from bushfire mitigation and management experiences. This learning both underpins and complements the research just described. The Inquiry makes a recommendation in relation to this in Chapter 11.

5.3.4 Responding to these research priorities

These research priorities are unlikely to be responded to systematically and efficiently without a coordinated and strategic national approach – integrating research to accommodate the priorities just identified with that which is already under way or planned and supporting further development of research capacity. This is discussed in Section 5.3.2. As noted, no such coordinating structure (and no satisfactory model for one) exists, although closer collaboration between the bushfire-related Cooperative Research Centres, as currently planned, would help resolve this situation in the short term.

The longer term national-level championing, strategic planning and coordination of bushfire-related research remains of concern to the Inquiry, particularly in relation to research that has longer, rather than shorter, time horizons. Climate change, long-term ecological and social sciences research are three examples relevant to bushfire, and they have all suffered from market failure to varying degrees. This is discussed further in Section 5.3.6.

¹⁰⁰ *ibid.*

¹⁰¹ Handmer, J 2003, ‘Institutions, and bushfires: fragmentation, reliance and ambiguity’, in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, pp. 139–49.

¹⁰² See, for example, chapters 13, 15 and 23 in Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne; Russell-Smith, J, Whitehead, PJ, Williams, R & Flannigan, M 2003, ‘Fire and savanna landscapes in northern Australia: regional lessons and global challenges’, *International Journal of Wildland Fire*, vol. 12, nos 3,4, pp. v–ix.

5.3.5 Communication and uptake of research results

As noted, the Cooperative Research Centres are designed to foster communication and the adoption of research results. They are widely regarded as a successful model for achieving this, in part because of the involvement of research users in establishing research priorities and designing and conducting the research itself. The Cooperative Research Centres that do work relevant to bushfires illustrate this model and its benefits well. Similarly, the role of Australasian Fire Authorities Council in linking fire and land management agencies and acting as a research and knowledge broker is invaluable in facilitating communication and the uptake of research results. Emergency Management Australia plays a similar role in the broader all-hazards area. The Bushfire Cooperative Research Centre intends to convene national bushfire conferences; this will provide a national forum for communication and the uptake of research results that has previously existed only on an ad hoc basis.

Regional and local processes are also important in communicating and fostering the adoption of research results. For example, the development of regional and local bushfire management plans with high levels of community engagement¹⁰³ and the conduct of other effective forms of community dialogue and education¹⁰⁴ offer pathways for communicating research results and fostering their uptake in regional and local-level risk-reduction planning, preparedness, response and recovery. Adams'¹⁰⁵ suggestion that such multi-stakeholder groups should have greater access to funding for bushfire-related research under national funding arrangements such as the Natural Heritage Trust would further facilitate communication and the uptake of research at these levels. This is discussed further in Chapter 6.

5.3.6 Research capacity and the ability to sustain research efforts

There have been recurrent concerns about the level of Australia's capacity in bushfire-related research and the related question of relevant tertiary education.¹⁰⁶ The data presented in Section 5.3.1 suggest little change in capacity during the decade preceding the establishment of the new Cooperative Research Centres working on bushfire.

The establishment and continued operation of relevant Cooperative Research Centres has to some degree allayed concerns about research capacity—for the moment. But individual Centres have a limited life (seven years) and there is no

¹⁰³ The New South Wales Central West Bushfire Management Project (NSW Nature Conservation Council submission and NSW Rural Fire Service response to Inquiry issues paper), the South East Queensland Fire and Biodiversity Consortium, and the Northern Land Council's Caring for Country project, among others, exemplify such processes.

¹⁰⁴ For example, the New South Wales Nature Conservation Council Bushfire Program (NSW Nature Conservation Council submission) and state and territory agencies' community education programs.

¹⁰⁵ Adams MA 2003, "Fire rules" and issues for resolution by government, industry and the community', Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December.

¹⁰⁶ House of Representatives Standing Committee on Environment and Conservation 1984, *Bushfires and the Australian Environment*, HRSCEC, Canberra, paras 143–5; Adams MA 2003, "Fire rules" and issues for resolution by government, industry and the community', Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December; Institute of Foresters of Australia submission.

guarantee that the goal of the Cooperative Research Centre Program, to foster their continuation beyond the life of a Centre's funding, can be achieved in every case. Access to relevant undergraduate and graduate education, the principal pathway to research training, also remains limited.¹⁰⁷ As Krebs observed, 'a CRC, no matter how well it is done, is not going to solve all these problems ... the [Bushfire] CRC is just one element in a much larger research front that is needed'.¹⁰⁸

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. Further, we consider that the best way of further developing and sustaining Australian research capacity across the spectrum of disciplines relevant to bushfire lies in a long-term integrated strategy, for which existing research groups and educational programs provide a foundation.

The following might be elements of such a strategy:

- capitalising on the activities of current bushfire-related Cooperative Research Centres in both research training and education to develop a cohort of future researchers and a suite of learning resources to support more widespread university teaching relevant to bushfires. The partnerships between researchers and research users that are fostered by the Cooperative Research Centre model (as well as by other forms of alliance) are a critically important foundation for future work
- exploration by governments, and by research funders, providers and users, of strategies to secure a base level of funding to support bushfire research. A range of approaches exist in Australia and internationally, among them industry-specific levies (for example, Australian rural sector research and development corporations and airport security charges) and the establishment of trust funds that support research, such as the Leverhulme Trust in the United Kingdom¹⁰⁹, and Australia's Myer Foundation¹¹⁰
- innovative use of those funds to capitalise on existing institutional investments. Examples are Canada's Research Chairs Program¹¹¹ and co-funded appointments between research institutions such as CSIRO, universities and state research agencies
- 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.

¹⁰⁷ Adams MA 2003, "Fire rules" and issues for resolution by government, industry and the community', Paper presented to Bushfire Research Advisory Group meeting no. 2, 9 December.

¹⁰⁸ Krebs, C in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, p. 230.

¹⁰⁹ The Leverhulme Trust, <<http://www.leverhulme.org.uk>>, viewed 5 March 2004.

¹¹⁰ The Myer Foundation, <<http://www.myerfoundation.org.au>>, viewed 5 March 2004

¹¹¹ Canada Research Chairs Program, <<http://www.chairs.gc.ca>>, viewed 10 March 2004.

Recommendation 5.4

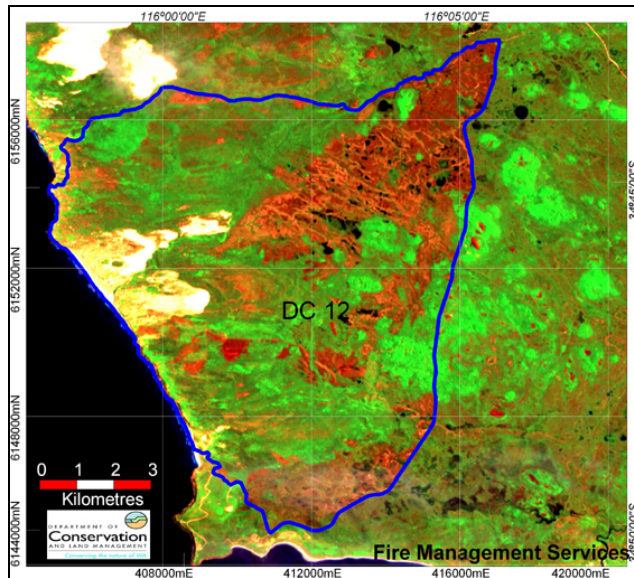
The Inquiry recommends that the Australian Government, in partnership with the states and territories and relevant research organisations, develop a strategy for sustaining bushfire research and capacity building, in the context of a risk-management approach to bushfire mitigation and management.

5.4 Conclusion

The collection and provision of data and information relevant to bushfire mitigation and management are being greatly facilitated by the adoption of all-hazards and whole-of-government approaches by the Australian Government and the state and territory governments. Technological, analytical and communication advances – such as the increasing availability and improving quality of satellite remotely sensed data and its interpretation and communication to diverse audiences – are also very important to bushfire mitigation and management. Although good progress has been made towards nationally consistent, widely available data and information, there remain anomalies and gaps: these need to be redressed.

The level of research investment relevant to bushfire mitigation and management appeared to be diminishing until the establishment of the Natural Heritage Trust and the Cooperative Research Centres whose work is relevant to bushfires. These investments by the Australian Government and the states and territories and their agencies are significant but gaps and urgent priorities remain. 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.

6 Risk modification



Modified Landsat image of the Mt Cooke fire of 10–11 January 2003, showing the variations in fire intensities due to differences in the ages of fuels. The fire was restricted and finally contained in fuels that had been burnt during the last five years

(Image: Dr Li Shu)

There are three main ways of modifying the level of bushfire risk to assets:

- ensuring that built assets are not placed in fire-prone areas and that structures meet standards of construction that reduce their vulnerability
- reducing the frequency of ignitions that result from arson
- managing the landscape so as to minimise the risk of damage to life and assets.

An important feature of the risk-management process is establishing the context—that is, identifying the assets, their locations in the landscape and the particular objectives relating to each asset (see Section 4.2).

In relation to bushfire, the context is changing in two main ways. First, the landscape in which fires burn is being modified by increased urban expansion, increasing rural–residential areas beyond urban fringes, and changing land tenure (for example, from state forest to national park). As a result, the relative proportions and the spatial arrangement of assets in the landscape are changing. Second, climate, which is a major determinant of vegetation and of fire behaviour, is changing. Hence, the frequency of ignitions and the characteristics of fire regimes in particular areas will be altered. Strategies for risk modification will need to adapt in order to take account of these changes.

One of the greatest challenges in bushfire mitigation and management is the development of a shared, agreed understanding about the most suitable and effective form and process of risk modification. For example, different land uses and tenures have different management objectives, so the approaches taken to modifying the risks posed by bushfires will vary. There needs to be a good understanding in the community of the assets and a shared commitment to finding the most appropriate forms of risk modification for each type of asset. The polarised debates about fuel-reduction burning that have followed recent fire

events in south-eastern Australia highlight the fact that there is not widespread understanding of the fact that various ‘assets’ are distributed across our fire-prone landscapes.

6.1 Planning and building in bushfire-prone areas

Many Australians choose to live close to the natural environment and are passionate about the aesthetics of being surrounded by trees and shrubs and the wildlife they attract. Many others are living close to bushland as a result of past settlement patterns, occupations or economic factors, or simply because they moved to live in a newly developed suburb. Whether by design or default, the fact that an increasing number of Australians are living close to the bush places more individuals, assets and communities at risk.

The fire season of 2002–03 is the most recent reminder of the severity of fire and the damage it can cause. Under extreme conditions fire agencies and other response organisations are unable to guarantee that a bushfire will not inflict loss or damage. As discussed in Chapters 3 and 7, they must rely on an informed and prepared community to minimise the adverse effects.

6.1.1 Land use planning

The *Natural Disasters in Australia* report to the Council of Australian Governments recognised the central role of planning and development control in risk management, recommending that a commitment be made to:

more effective statutory State, Territory and Local Government land use planning, development and building control regimes that systematically identify natural hazards and include measures to reduce the risk of damage from these natural hazards.¹

Readiness – also referred to as ‘preparedness’ – has traditionally been understood within fire and emergency management as a mechanism for reducing the effects of fire. This includes urban planning, building protection, response capability, and community attitudes and behaviour, especially for those living close to bushland. The variability in topography, climate and vegetation across Australia requires that land use planning decisions be site-specific.

The Inquiry supports the view, expressed in *Natural Disasters in Australia*, that land use planning that takes into account natural hazard risks is the single most important mitigation measure in preventing future disaster losses in areas of new development.²

The processes of planning and building control in bushfire-prone areas vary between jurisdictions as a result of the states’ and territories’ particular circumstances. The Inquiry sees no benefit in a common national approach, which potentially would preclude jurisdictions from exercising the flexibility needed to account for local variations and established practices.

¹ Matthews K (Chairperson) 2002, *Natural Disasters in Australia: Reforming Mitigation, Relief and Recovery Arrangements*. COAG, Canberra; p. 14.

² *ibid*, p. 17.

The Inquiry does, however, consider that planning and development controls need to be effective, so as to ensure that inappropriate developments do not occur. We therefore support the following recommendations from the *Natural Disasters in Australia* report:

Recommendation 14: that all State and Territory jurisdictions introduce statutory land use planning policies and requirements governing development in areas which are subject to a significant risk of ... bushfire ... within a two-year timescale.

Recommendation 15: that all State and Territory jurisdictions ensure that courts and tribunals dealing with planning and development matters must have regard to policies and requirements relating to natural disaster risk reduction and mitigation.

Recommendation 22: that States and Territories review current planning legislation to ensure that there are no barriers or disincentives to Local Government, acting in the public interest, rezoning land with high natural hazard risks to avoid inappropriate development.³

An example of differing approaches is the degree to which local government is required to incorporate fire agency advice in planning decisions. In all states but one, fire agency input is advisory only, although the influence exerted can be considerable. In New South Wales, under the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002 No. 67*, the Rural Fire Service has a more formal role:

- councils must consult with the Commissioner of the Rural Fire Service to certify that areas identified as bushfire prone are correctly classified
- councils cannot grant approvals for building developments on bushfire prone lands unless satisfied that the proposal conforms to the mandatory specifications set out in *Planning for Bushfire Protection – 2001*, or they have consulted with the Commissioner
- councils are required to refer residential and rural subdivisions and highly vulnerable developments requiring special protection (for example schools and nursing homes) to the Commissioner for authorisation
- the Commissioner may impose mandatory conditions on such development proposals.⁴

As with many other subjects dealt with in this report, the Inquiry focused on the outcomes of the process rather than the detailed procedures that are followed. Strict planning guidelines and building codes that are strongly enforced can at times be unpopular and result in considerable pressure being placed on agencies and governments. The Inquiry considers, however, that such an approach is essential if Australia is to move from the historical position whereby developments were approved without apparent regard to bushfire risk. This point has been made in previous inquiries:

- The 1984 House of Representatives Standing Committee on Environment and Conservation report *Bushfires and the Australian Environment* recommended that

³ *ibid.*, pp. 30-31.

⁴ New South Wales Government submission, p. 29.

the Local Government Ministers Conference review the adequacy of existing land use and land use planning as it relates to bushfire mitigation.

- The report of the of the Joint Select Committee of Inquiry into the 2001–2002 Bushfires in New South Wales led to the changed planning arrangements just summarised and also supported the proposal that councils identify properties in bushfire-prone areas so that purchasers of such property are aware of the risk (see Appendix C).

Finding 6.1

The Inquiry supports the view, expressed in *Natural Disasters in Australia*, that land use planning that takes into account natural hazard risks is the single most important mitigation measure for preventing future disaster losses (including from bushfires) in areas of new development. Planning and development controls must be effective, to ensure that inappropriate developments do not occur.

Another important element of planning and building to reduce bushfire risk that was consistently stressed to the Inquiry is the need for connectivity between the planning profession, planning policy, local government, town planning, the construction industry, land management, hazard abatement, fire response, and community education. Jurisdictions have introduced planning requirements that have varying degrees of integration between state and local governments and industry, and the Inquiry supports this. Comprehensive adoption of such an approach does, however, require significant resourcing by governments.

The professions involved in urban planning and design can play an important role in strengthening these relationships. In particular, they can:

- ensure that land use planning for natural disaster mitigation is incorporated in all tertiary courses on planning
- implement and actively promote best-practice planning, taking into account natural disaster risk-reduction measures.⁵

Recommendation 6.1

The Inquiry endorses the recommendations in the *Natural Disasters in Australia* report relating to disaster mitigation through land use planning and development controls and recommends that the states and territories continue to make their advisory and statutory measures more effective.

6.1.2 Existing developments

Over the decades many developments have been approved in areas of inherent bushfire risk. This legacy continues to present a challenge for fire agencies, local governments and residents. Even though there has been a change in attitudes to planning in fire-prone areas, new planning and building controls can have effect in

⁵ Matthews K, (Chairperson) , *Natural Disasters in Australia: Reforming Mitigation, Relief and Recovery Arrangements*. COAG, Canberra, p. 17.

these situations only when approval for building alterations or land reconfiguration is sought. As noted, in at least one jurisdiction there is a requirement that a contract for the sale of a property in a bushfire-prone area must contain notification that the property is in a bushfire zone.⁶ At present no jurisdictional process has any retrospective effect.

This situation is causing considerable concern to affected landowners, local government and land managers, and it has the potential to have serious conservation consequences in some areas, especially where new conservation reserves abutting existing developments have been declared and where developments have in the past been permitted to occur right up to the boundary of bushland.

This problem can be resolved only by using the principle of shared understanding of the problem and shared responsibility for finding a solution that recognises the need to reduce the risk to the assets. Thus, in these areas an even higher level of community awareness and readiness will be needed compared with well-planned houses and suburbs in the rural-urban interface zone, because the level of risk will typically be greater, and harder to reduce.

6.1.3 Particular challenges for local government

Local government has a primary role in the planning process. It is usually the 'determining authority' for development applications. As awareness of bushfire threats increases and more formal processes of risk management are implemented in bushfire-prone areas, local government is being expected to take on extra roles and responsibilities, which it is not always equipped or resourced to do effectively.

Local government faces particular challenges with the planning procedures that are its responsibility:

- limited availability of experienced and qualified staff for planning, inspections and community support relating to bushfires
- a tension between good-practice planning decisions and commercial pressures for development
- planning decisions by local government frequently being contestable
- the need to resolve the problem of varying resident attitudes to the level of risk and risk-management responses
- significant resourcing often required for the maintenance of public lands in bushfire zones.

Bushfire protection zones⁷, particularly those that form part of intermediate developments and green corridors, require ongoing maintenance, as do access corridors, fuel breaks and stored water supplies that are development

⁶ The Environmental and Assessment Regulation 2000 (NSW) s. 149 Planning Certificate.

⁷ This term is used in Western Australia and Tasmania; 'asset protection zones' is used in New South Wales, 'setbacks from hazardous vegetation' in Queensland, 'protection zones' in Victoria, and 'fire abatement zones' in ACT.

requirements. These maintenance measures become the province of local government once developments are completed and it becomes responsible for the public lands.

Finding 6.2

Adequate resourcing of local government is essential for robust and competent bushfire planning and decision making and for ensuring continuing maintenance of protection zones and adherence to development controls.

6.1.4 Building design

Building design can be a risk-avoidance measure, since standards can be applied to an application for building approval in an identified bushfire-prone area. This concept is embedded in the Building Code of Australia 1996 and Australian Standard AS 3959-1999, *Construction of Buildings in Bushfire Prone Areas*. These provide a national approach that underpins building and living with safety in fire-prone environments.

The Building Code contains provision for constructions that will resist bushfire and therefore reduce the likelihood of property loss. The Australian Building Codes Board has agreed to a strategy to help minimise the consequences of bushfires following the recent fire events in south-eastern Australia.⁸ The Board recognises that bushfire hazards need to be approached in a holistic manner that will facilitate optimum treatment of the risk. It is clear, however, that construction provisions are only part of the solution. A planned review of the Building Code has been delayed, as has the review of the *Construction of Buildings in Bushfire Prone Areas* Standard.

The Inquiry supports the recommendations in the *Natural Disasters in Australia* report that seek to ensure that the Building Code of Australia adequately deals with resistance to natural hazards and that there is compliance with the Code throughout Australia.⁹ This point was also emphasised in the *Nation Charred* report.¹⁰

The Australasian Fire Authorities Council has expressed disappointment at a resistance to incorporate improvements to Australian Standard AS 3959-1999.¹¹ This is leading to inconsistent application across Australia and has forced some jurisdictions to develop local solutions. A further shortcoming of AS 3959-1999 drawn to the attention of the Inquiry is the absence of any requirement or mechanism for ensuring continuing building maintenance.

A nationally consistent approach is desirable, and the Inquiry supports the Australasian Fire Authorities Council's work to develop a position for the

⁸ Australian Building Codes Board, *Strategy on Bushfires*, Media release, March 2003.

⁹ Matthews K (Chairperson) 2002, *Natural Disasters in Australia: reforming mitigation, relief and recovery arrangements*, COAG, Canberra, pp. 30–1.

¹⁰ House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, pp. 273–4.

¹¹ Australasian Fire Authorities Council position paper supplied to the Inquiry.

protection and construction of habitable buildings in bushfire-prone areas.¹² The principal features of such a position that will require support by member agencies are:

- incorporation of building maintenance in AS 3959-1999
- continuing examination by the Bushfire Cooperative Research Centre (through Program D¹³) of the methodologies outcome of the Building Codes Board's review of the existing Code, including AS 3959-1999, to determine its adequacy and ways in which compliance can be better managed
- extending the scope of the Standard to cover existing buildings and those that are not in areas declared bushfire prone.

Recommendation 6.2

The Inquiry recommends that the review of the Building Code of Australia, with particular reference to the Construction of Buildings in Bushfire Prone Areas Standard—to deal with resistance to natural hazards, including bushfires—be completed by the Australian Building Codes Board as a matter of priority.

6.2 Arson

Human activity is the single greatest cause of bushfire ignitions¹⁴, although it is unclear what proportion of this involves arson. While the common understanding of arson relates to lighting fires to destroy or for perverse pleasure, formally there are three recognised forms:

- *arson* – the wilful or malicious burning of property, especially with fraudulent or criminal intent
- *incendiarism* – incendiary action or behaviour
- *pyromania* – an irresistible impulse to start fires.¹⁵

For simplicity, the report uses the term 'arson' to represent all of the above.

Arson is one cause of fire that can be reduced through greater application of resources. The Inquiry found, however, that the focus on arson varies significantly across the states and territories, depending on the perceived size of the problem, community concern and identification of arsonists. Many fires are lit through carelessness – for example, by discarded cigarette butts, farm machinery, slashing and welding – which reflects a too-often casual approach to fire. Dealing with

¹² *ibid.*

¹³ Bushfire Cooperative Research Centre – Program D: Improving the Odds of Saving Houses from Fires, Project, 'Building and Occupant Protection'; see also House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, recommendation 50, p. 274.

¹⁴ Ninety-four per cent of bushfires are caused by people – Webster, J 2002, *The Complete Bushfire Safety Book*, Random House, Sydney, p. 8.

¹⁵ Drawn from ALP Risk Management submission, 10 November 2003.

these forms of ignition is largely a matter of community education and is considered in Chapter 3.

6.2.1 Arson data and research

As with other forms of data collection by fire agencies, statistics on arson for bushfires are neither consistent nor complete. There is thus no national perspective on the extent of the arson problem. New South Wales Police estimates that 25 per cent of bushfires are initiated by arson¹⁶, but other jurisdictions said their estimates were significantly less because fires of unknown cause are sometimes placed in this category.

The Australian Institute of Criminology estimates that the national loss from all arson fire lighting is \$1.35 billion¹⁷, although this figure is not restricted to rural fire ignitions. While this provides some indication of the cost of arson, the Inquiry concluded that Australia is largely unaware of the impact of arson on bushfire ignitions.

Further research is necessary to gain a clearer understanding of the extent of the problem. The research has in fact been ongoing, but it has not been coordinated and in a number of cases not connected to fire and police services in any way. This area of research again highlights the need for national coordination, in order to raise awareness of the research being done and to provide meaningful knowledge to those who need it. The Bushfire Cooperative Research Centre is conducting a research project called Bushfire Arson, which is being led by the Australian Institute of Criminology, and the opportunity exists for greater synchronisation of arson research.

6.2.2 The role of the states and territories

Arson has evolved into an ongoing element of policing and is integral to many state and territory fire prevention programs. The Inquiry considers that benefit would be gained if fire and police agencies:

- provided information to other services when known arsonists travel or move interstate or when there is potential for this to happen
- shared arson research, teaching and practical advice on arson incendiary devices
- collected nationally agreed statistics, perhaps through the Australian Institute of Criminology
- monitored and reported on any incidents of politically motivated arson.

Anti-arson programs operate in a number of jurisdictions, focusing on projects designed to reduce the incidence of juvenile fire setting and specifically observing for bushfire arsonists. The Inquiry was advised that there are good reasons for not treating every juvenile fire setter as an arsonist, forcing them through the criminal

¹⁶ New South Wales Government submission, New South Wales Police.

¹⁷ Australian Institute of Criminology, *Counting the Cost of Crime in Australia*, Technical report, AIC, Canberra, pp. 4-5.

justice system; alternative programs are designed to redirect young fire setters away from illegal activity.

Cooperation between police and fire agencies is generally good in relation to arson, and joint arson investigations occur in most states and territories. Bushfire arson investigation has increased dramatically in the last 10 years and the Inquiry's understanding is that all significant fires are investigated. This assists with data collection and leads to a greater likelihood of prosecution.

Box 6.1 Bushfire arson reduction in Western Australia

An arson-reduction strategy developed by the Western Australia Fire and Emergency Services Authority's Community Safety Division has recorded a dramatic reduction in the incidence of bushfire arson. The strategy involves informing the community of the level of bushfire arson in their area and encouraging the reporting of suspicious behaviour to Crime Stoppers. Doorknock appeals, shopping centre displays and school visits are used to deliver the message. In Forresfield the number of fires reported dropped from 45 to four in the same period in successive years. In Kwinana the number of deliberately lit fires dropped from 123 in December 2001 to 49 in December 2002.

The Inquiry notes the variations in arson-related legislation and criminal charges across jurisdictions. While not seeing a need for specific national legislation, we note the importance of having substantial criminal penalties that can be applied to people found guilty of arson. Bushfire arson must be considered a crime against both society and the environment.

Psychological screening of fire service personnel is an expensive and time-consuming option. Nevertheless, the Inquiry notes that criminal checks of new recruits are already done in most jurisdictions and considers that this should be mandatory in all states and territories. Vigilance by personnel and the local community is probably the most effective way of reducing the incidence of arsonists operating as members of a fire brigade. Although this matter has on occasions created media interest, it was not specifically raised with the Inquiry, nor is it something we consider could be resolved by implementing a national approach.

Finding 6.3

Arson remains a significant risk for bushfire ignitions, and the states and territories must continue to direct resources towards deterring people from engaging in this illegal activity. National information sharing will assist, although a national program is not justified.

6.3 Landscape management for bushfire risk: an overview

Bushfire in the Australian landscape poses a threat to many assets, and an important element of risk reduction is therefore modifying elements of the landscape in such a way as to reduce the probability of a fire starting, slow a fire's spread and limit its intensity such that it might be able to be controlled.

There are several important, linked components of effective landscape management for risk reduction: reducing the amount of fuel available to burn in a bushfire; creating and maintaining appropriate fire trails; and creating and maintaining strategically located firebreaks. Given the vast experience of fire and land management agency staff and the research that has been done, there can be no doubt that reducing the amount of fuel in vegetated parts of a landscape reduces the risks associated with bushfire by altering fire intensity and spread and by facilitating suppression efforts.

As well as threatening community assets, bushfire is also an ecological process that is important in sustaining some biodiversity assets. For example, some plant species require fire to flower, and heated soils and an ash bed are necessary for good regeneration of some eucalypt species. For some ecological communities lack of fire for a long time can have detrimental effects; for others (such as rainforest communities) fire can be a threatening process.

There is confusion about the use of expressions that describe deliberate burning activities. The Inquiry adopted the following terms and definitions:

- *fuel reduction* – any action (for example, hand clearing, grazing and deliberate burning) that has the objective of reducing the amount of fuel
- *fuel-reduction burning* – fires deliberately lit for the purpose of reducing the amount of fuel
- *ecological burning* – fires deliberately lit for the purpose of maintaining ecological processes or biodiversity, rather than for fuel reduction per se; this includes burning to facilitate tree regeneration in native forest systems and burning to control weeds in native rangeland systems
- *Indigenous burning* – fire used by Indigenous Australians for maintaining habitat and food resources and for a range of cultural purposes.

It is important to note that a single planned fire might satisfy several of these objectives. The ideal situation for risk reduction in an ecologically sensitive area is where the fire regime applied to achieve effective fuel reduction also maintains ecological processes and biodiversity.

Finding 6.4

There needs to be a shared understanding and valuing of assets in relation to bushfire mitigation and management. There also needs to be better recognition of the fact that prescribed burning is a complex matter—ecologically and operationally—and that a variety of prescribed fire regimes might be necessary to meet a range of objectives.

6.4 Risk modification for community assets

The principle of reducing the risk posed by bushfires by reducing the amount of fuel available to be burned is well established. Several empirical studies demonstrate the relationship between fuel load and both fire intensity and other features of fire behaviour, such as the rate of spread.¹⁸

Contained within the concept of fuel reduction as a risk-reduction strategy in the landscape are two slightly different but distinct objectives. One is to modify fire behaviour so as to make unplanned bushfire more amenable to suppression, because prior fuel reduction can reduce the rate of spread, the intensity and the likelihood of a forest fire becoming a crown fire. The other is to enable safer and more effective protection of assets when an unplanned fire does reach them.

There are many ways of carrying out fuel reduction, among them deliberate burning, grazing, slashing and thinning. Although grazing, slashing and thinning might be the only options in some areas (such as areas immediately adjacent to houses), fuel-reduction burning is the most common and most efficient method of fuel reduction for larger areas of the landscape.

6.4.1 Fuel-reduction burning

Effectively applied and strategically planned fuel-reduction burning is widely accepted by land management and fire agencies as a very important strategy for reducing the risk of bushfire-induced damage to assets. Considerable work has already been done by fire and land management agencies with a view to assessing the effectiveness of fuel-reduction burning and developing prescribed-burning manuals for achieving safe and effective fuel reduction in different vegetation types and climatic regions.¹⁹

In order to be effective in mitigating the effects of bushfire on assets, fuel-reduction activities need to be strategically located and repeated often enough to keep the fuel load from exceeding a particular threshold level. The Australasian Fire Authorities Council's training manual for prescribed-burning supervisors links the magnitude of fuel reduction that is desired to the objective for a prescribed burn. For example, for an objective of 'protecting adjoining assets from high intensity wildfire', the strategy might be 'reduction of surface fine fuels from an average of 15 t/ha to less than 8 t/ha with absolute minimum scorch, over not less than 70% of the planned area'.²⁰

¹⁸ Cheney, NP, Gould, JS & McCaw, L 1998, 'Project Vesta: research initiative into the effects of fuel structure and fuel load on behaviour of wildfires in dry eucalypt forest', *Proceedings of the 13th Fire and Meteorology Conference*, Lorne, Victoria, pp. 375-8; Gould, JS, Cheney, NP & McCaw, L 2001, 'Project Vesta – research into the effects of fuel structure and fuel load on behaviour of moderate to high-intensity fires in dry eucalypt forest: progress report', *Proceedings of the Australasian Bushfire Conference*, 3-6 July 2001, Christchurch, New Zealand, pp. 13-21.

¹⁹ See, for example, Department of Natural Resources and Environment 2001, *Fire Management Manual 10.1: prescribed burning*, Victorian Government, Melbourne; Sneeuwjagt, R & Peet, GB 1998, *Forest Fire Behaviour Tables for Western Australia*, Department of Conservation and Land Management, Perth.

²⁰ Australasian Fire Authorities Council 2002, *Specialist Training Manual: Prescribed Burning Supervisor. National Fire Module 3.17*, AFAC, Melbourne, pp. 39-40.

In the majority of forest systems fuel build-up is most rapid soon after a fire and reaches a plateau (representing a balance between the decomposition rate and the accumulation rate) many years later. But precise patterns of fuel accumulation vary between climatic regions and between forests types and other vegetation. Fuel reduction every eight years might keep fuel loads below a hazardous level in some vegetation types (for example, Western Australian jarrah forests), whereas fuel reduction every four years might be needed in others (for example, south-eastern Australian open forest in coastal areas²¹). In savanna ecosystems of northern Australia fuel loads reach equilibrium within a few years of fire²² and can support significant bushfires within a year.

There is no point in doing fuel-reduction burning if it is not effective in reducing the risks to assets. So how does a land manager know that a fuel-reduction program has been effective? As emphasised in the report of the inquiry into the 2002–03 Victorian bushfires²³, there are three main components to this question:

- Did the reduction in fuel load and consequent alteration in fire behaviour actually reduce the damage to assets?
- Has the fuel-reduction prescription actually reduced the fuel load to the desired level?
- Did the reduction in fuel load actually alter fire behaviour, as predicted, under the weather conditions prevailing at the time of the fire?

The first component is the one that is of direct relevance to risk management, and it is therefore the measure that should be used to assess the effectiveness of fuel reduction (see Section 6.4.3). This assessment is difficult, though, so there tends to be a focus on the other two components.

There have been relatively few empirical studies of the second component – assessment of the effectiveness of individual fuel-reduction burns in achieving a particular fuel load prescribed in a plan. The information that does exist suggests that fuel-reduction burns sometimes do not achieve the desired objective. For example, post-burn assessments of prescribed burns in the Blue Mountains from 1990 to 1997 found that loads of fine fuels actually increased in 30 per cent of the burns, 40 per cent failed to achieve significant reductions in loads, and only 30 per cent could be rated as effective.²⁴ This study was conducted in a forested landscape with steep terrain, which is very challenging for effective fuel-reduction burning, but it highlights the fact that one prescription for fuel reduction cannot be universally applied: a strategy must be designed to suit local conditions.

²¹ NSW Government submission, p. 47.

²² Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams, RJ 2002, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin.

²³ Esplin B, Gill AM & Enright N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*. State Government of Victoria, Melbourne, paras 11.10–11.12; see also McCormick, W 2002, *Bushfires: is fuel reduction the answer?*, Current Issues Brief no. 8, 2002–03, Parliamentary Library, Canberra.

²⁴ James, SG 1999, 'Evaluation of the effectiveness of prescribed burns: a simple methodology for post-burn assessment of the achievement of fire management objectives', Paper presented to Bushfire '99, Australian Bushfire Conference, Albury.

Assessing the third component – the degree to which a fuel-reduction burning program allows more effective control of unplanned fires – requires accurate measurement and mapping of fuel-reduction activities (and preferably of fuel loads) and accurate mapping of unplanned fires across a landscape, followed by detailed analysis of the behaviour of the unplanned fires against the ‘fuel landscape’. The Inquiry found that detailed information of this nature is not collected or analysed in a systematic way (see Chapter 5), although there are some notable exceptions.²⁵ The Mt Cooke fire near Perth in 2003²⁶ is a clear illustration of an unplanned bushfire burning at high intensity through forest with high fuel loads and at much lower intensity when it reached forest blocks that had been burned for fuel reduction three to seven years before.

Although there are examples of the potential for fuel-reduction burning to modify bushfire behaviour, there are also anecdotes of severe bushfires burning through areas that had been treated by such reduction burning in the recent past. For example, in the 2002–03 Victorian fires the extreme weather conditions drove the fires through areas of recent fuel-reduction burning²⁷, and in the extreme weather conditions during the Christmas 2001 fires on the south coast of New South Wales the Tomerong–Huskisson fire burnt areas of state forest and national park that had been subject to a fuel-reduction burn only three years previously.²⁸ Fire intensity and the rate of spread were almost certainly reduced as the bushfire burned through these areas, but anecdotal evidence such as this shows that fuel reduction offers no guarantee that a bushfire will be prevented or be readily contained, at least in some terrains and vegetation types.

Evidence provided to the Inquiry by Western Australia²⁹ illustrates the potential for a fuel-reduction program across a relatively homogeneous forested landscape to limit unplanned bushfire boundaries, especially when access via fire trails is good. But many landscapes are much more heterogeneous, and many of the forests are more interspersed with settlement. The Inquiry is concerned by the dearth of empirical data on the effects of fuel reduction on bushfire behaviour under severe weather conditions and on the reduction of damage to assets. There is a need for systematic and detailed studies, based on accurate mapping, of the spatial patterns of unplanned bushfires in relation to previous fire histories of the land they burnt through³⁰ – see Chapter 5.

²⁵ See McCarthy, GJ & Tolhurst, K 1998, *Effectiveness of Broadscale Fuel Reduction Burning in Assisting with Wildfire Control in Parks and Forests in Victoria*, Fire Research Report no. 51, Department of Natural Resources and Environment, Melbourne; Tolhurst, KG 1996, ‘Effects of fuel reduction burning on fuel loads in a dry sclerophyll forest’, in *Fire and Biodiversity – the effects and effectiveness of fire management*, Biodiversity Series no. 8, Department of the Environment, Sport and Territories, Canberra; see also Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 11; Underwood, RJ, Sneeuwjagt, RJ & Styles, HG 1985, ‘Fire ecology and management in Western Australian ecosystems’, in JR Ford (ed.) Curtin Institute of Technology, Perth.

²⁶ Field inspection in Western Australia, November 2003.

²⁷ Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 114.

²⁸ NSW Government submission, p. 54.

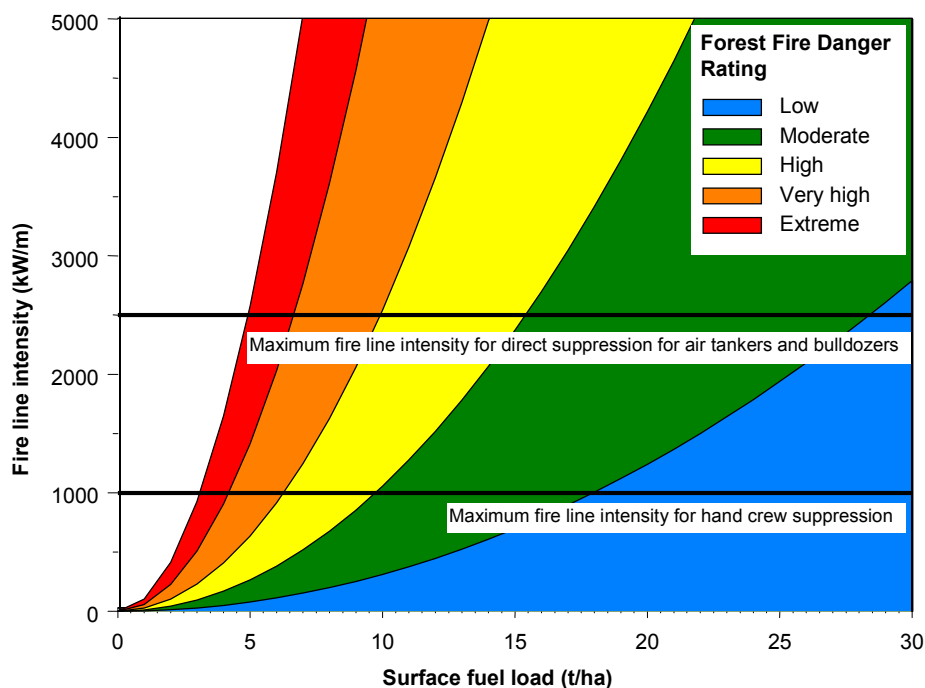
²⁹ COAG Representatives Forum, 17 March 2004, and Western Australian comments on the draft report, 22 March 2004.

³⁰ These concerns were also expressed by Esplin, Gill & Enright (2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 114–15).

Although fire intensity is predicted by fuel loads under most weather conditions, extreme conditions of high temperature, strong, gusty and changeable winds, low relative humidity and steep terrain can make fires uncontrollable when fuel loads are as low as 5 tonnes per hectare (see Figure 6.1).³¹

For the reasons outlined, fuel-reduction burning cannot in itself guarantee protection from uncontrolled bushfire. It can never eliminate the risk, although it is obviously an important contributor to risk reduction.³² The use of planned fire for fuel reduction must be assessed against the other land management objectives – for example, forestry and agricultural production, biodiversity conservation, and protecting water quality – as well as against the extent of risk reduction that it can be expected to achieve.

Figure 6.1 Relationship between fuel load and fire intensity as the Forest Fire Danger Rating changes



Note: In extreme conditions the maximum fire-line intensity at which direct suppression is possible is reached in fuels of less than 5 tonnes per hectare.
Source: CSIRO submission.

³¹ There are several possible reasons for the breakdown in the relationship between intensity and fuel load under extreme weather conditions. First, standard estimates of fuel loads typically include only fine fuels (leaf litter and twigs less than 6 millimetres in diameter); under moderate weather conditions, larger fuels do not ignite readily but they can under extreme conditions. Second, fuel discontinuities slow a fire under cool to moderate conditions but not under extreme, windy conditions.

³² See also McCormick, W 2002, *Bushfires: is fuel reduction the answer?*, Current Issues Brief no. 8, 2002–03, Parliamentary Library, Canberra.

6.4.2 Constraints on achieving planned fuel-reduction burning

Whatever fuel-reduction prescriptions are determined as being appropriate to moderate bushfire behaviour, a number of impediments to implementation are evident³³:

- inadequate funding, skill levels, staffing and equipment
- the difficulty of maintaining adequate levels of suitably skilled personnel as land management agencies become more corporatised and restructure
- changes in the ownership and function of natural and commercial forests in some regions, which have led to a decline in the availability of forestry-trained firefighters
- increased fragmentation of land ownership in some areas – including absentee landowners – which has placed added pressure on the fire agencies to respond to fires in these areas and led to greater expectations of support from volunteer rural fire brigades
- concern on the part of managers to avoid risks of injury and of fire escape and the blame associated with the use of fire for fuel reduction
- greater constraints on the number of days each year that are considered suitable for fuel-reduction burning – for example, in Victoria it was estimated that an average of only 10 days a year are suitable for burning under current prescriptions³⁴
- public pressure to reduce fuel-reduction burning in order to protect air quality in regions where low winds, low temperature and inversion layers occur at times that are most suitable for fuel-reduction burning³⁵
- other detrimental consequences to environmental assets and values that might result from fuel-reduction activities (see Section 6.5).

It is critically important that these impediments be addressed: fuel-reduction burning is a fundamental component of managing bushfire risk. The following are some of the actions that have already been taken:

- measures to compensate for the loss of skilled and experienced personnel – see Chapter 11

³³ For example, House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, p. 81; Gellie, N – Appendix E in House of Representatives Select Committee Report.

³⁴ Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 106.

³⁵ For example, prescribed fuel-reduction burning in the Sydney region for a short period in 1995 produced air pollution levels equivalent to those caused by the 1994 bushfires and resulted in the Environmental Protection Authority instituting a policy of declaring ‘no-burn days’ when weather conditions produce a high risk of air pollution (McCormick, W 2002, *Bushfires: is fuel reduction the answer?*, Current Issues Brief no. 8, 2002–03. Parliamentary Library, Canberra). Note that exemptions for fuel-reduction burning on ‘no-burn’ days can be granted after consultation with the Rural Fire Service.

- recognition that fighting high-intensity, out-of-control bushfires is risky and that fuel-reduction burns, although representing a risk themselves, provide important training opportunities for firefighting – see Chapter 11
- improved forecasting of smoke concentrations – for example, in Western Australia the Department of Conservation and Land Management has worked with the Bureau of Meteorology and the Department of Environmental Protection to develop a smoke management decision process in order to reduce the incidence of excessive smoke haze
- fire agencies and local government taking responsibility for contacting all landowners and informing them of their responsibilities for bushfire risk reduction.

In addition, a recognition that in some regions fire exclusion (or lack of active landscape management using fire) is detrimental to biodiversity conservation is leading to programs to reintroduce fire³⁶, which will have consequent fuel-reduction benefits.

6.4.3 Assessing and reporting on the effectiveness of fuel reduction

The importance of fire agencies and land management agencies reporting on the effectiveness of their activities is discussed in Section 5.1. This principle applies to fuel-reduction activities, and the information reported would form part of the set of indicators of good practice discussed in Chapter 13.

Assessing the effectiveness of fuel reduction is a complex task. The difficulties are substantial and are likely to deter agencies from attempting any form of assessment. The Inquiry considers, however, that it is important for any risk-management action to be evaluated, as a matter of course, in order to assess its effectiveness and so improve the activity.³⁷

The report of the inquiry into the 2002–03 Victorian bushfires noted that evaluating the effectiveness of prescribed burning, even for a single factor such as the protection of built assets, is extremely difficult. It put forward 13 possible ways of approaching this evaluation, concluding that several of them would need to be applied in concert. It discusses in detail each potential effectiveness measure and recommends that further work be done to develop an ‘explicit, routine system of evaluation, analysis and reporting of the effects of prescribed burning’.³⁸

Finding 6.5

There is a need to develop ways of assessing the effectiveness of fuel-reduction programs in terms of the resultant degree of reduction in risk.

³⁶ Meeting with South Australian government agencies, 5 November 2003.

³⁷ The Bushfire Cooperative Research Centre is undertaking some major projects on strategies for management of bushfire risk that will provide managers with the tools to plan fuel reduction to optimise risk management for community and the environment.

³⁸ Esplin B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 108, 115; *‘The Nation Charred’: Inquiry into the Recent Australian Bushfires*, recommended evaluation of fuel management at a national level – Recommendation 13.

Managers are often faced with uncertainty about the effects of particular management regimes in achieving a specified objective for fuel reduction and hence risk reduction. This means that management decisions are being made in the face of incomplete knowledge. The best approach to this situation is to apply an adaptive management approach, which can be defined as follows:

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form – ‘active’ adaptive management – employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.³⁹

Despite the complexities associated with measuring the effectiveness of risk modification through fuel-reduction burning, historically this has been attempted almost exclusively by measuring the gross area burnt each year against area targets. There are many reasons why a gross area target might not be met in a particular year, most commonly the weather not being suitable (either a wet winter or a drought period) and large-area, unplanned fires in the previous year achieving a great deal of fuel reduction themselves. Moreover, the highest priority areas for risk reduction are likely to be the more challenging, urban-bushland interface parts of the landscape – not the large areas of public land in the easiest terrain, where the risk to life and property is much lower. For these reasons, at a state or regional level the area actually treated in fuel-reduction programs in a particular year bears little direct relationship to the real reduction in risk.⁴⁰

Finding 6.6

Comparing the gross area treated annually in fuel-reduction burning—that is, for a whole agency, region or state—with a published target is not a good basis for assessing performance and is likely to be counterproductive.

6.4.4 Summary

There is compelling evidence to show that a reduction in fuel loads in bushland environments will reduce fire intensity and modify fire behaviour. This is the only cost-effective way to achieve fuel reduction in large areas of the landscape.

Fuel-reduction burning has its limitations, in terms of both the desirability and the feasibility of broad-scale burning at a frequency necessary to maintain low fuel loads. The Inquiry found that the ability to achieve effective fuel reduction across large portions of a vegetated landscape varies enormously across Australia and depends on many factors. Moreover, even after fuel-reduction burns have been planned for a particular year, there are many constraints on carrying them out.

In order to be effective in reducing the risks to assets, the frequency of fuel-reduction burning would have to be sufficient to keep fuel loads low, and it would depend on the rate of recovery of fuels. For example, as a result of the rapid build-

³⁹ Canadian Ministry of Forests 2000, <www.for.gov.bc.ca/hfp/amhome/amhome.htm>, viewed 24 March 2004.

⁴⁰ A similar conclusion was expressed by the Victorian Auditor-General in *Fire Prevention and Preparedness*, pp. 52-62.

up of fuels after fire in many ecosystems, it is estimated that some 25 to 50 per cent of fire-prone landscapes in New South Wales would have to be burnt annually to achieve a fuel load of less than 8 tonnes a hectare. This represents 15 million hectares of forest, woodland, shrubland and heathland a year.⁴¹

The magnitude of this task makes it unachievable, even if there were no detrimental consequences for environmental assets (see Section 6.5). There is a need for a more strategic approach, one that accommodates the constraints and establishes priorities. The highest priority must be in zones where fuel reduction (by whatever means) can be most effective in helping to reduce the risk of harm to people, destruction of property and damage to assets. Some ways of achieving this strategic approach to risk reduction are discussed in Section 6.6.

6.5 Risk modification for environmental assets

Australia's National Strategy for Ecologically Sustainable Development identifies the critical need to maintain ecological processes as a fundamental basis for sustainable development. It defines 'ecologically sustainable development' as 'Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.⁴²

The Strategy highlights three principles that are necessary for an understanding sustainable development – intergenerational equity, the precautionary approach, and biodiversity conservation. The objective is to prevent and reverse the adverse impacts of economic and social activities on ecosystems, while continuing to allow sustainable, equitable development of societies.

In the area of bushfire and its effects on ecological processes, there is widespread agreement in the scientific community that our knowledge is far from complete. The response of land managers to this scientific uncertainty is covered in the guiding principle for ecologically sustainable development relating to the precautionary principle:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

There is a wide range of environmental assets for which fire (both planned and unplanned) might pose a risk. There are also, as noted, some assets for which fire is essential. Biodiversity is the environmental asset that is most commonly viewed as needing fire in some cases and as being at risk from inappropriate fire regimes in others.

The Inquiry also classes water and air quality and native forests and rangelands as environmental assets. Sustainable management of native forests and sustainable

⁴¹ New South Wales Government submission, p. 48.

⁴² Council of Australian Governments 1992, *National Strategy for Ecologically Sustainable Development*, >, viewed 29 March 2004, <www.deh.gov.au/esd/national/nsesd/strategy/intro.html.

rangeland grazing both require effective use of fire and avoidance of inappropriate fire regimes. Planned and unplanned fires have an impact on air quality through smoke, and in the longer term bushfires influence carbon budgets and climate change. Similarly, fires in water catchments affect water quality.

Box 6.2 The role of fire in Australian forests

The Institute of Foresters of Australia has developed the following draft policy on the role of fire in Australian forests:

- 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
- that forest managers have a responsibility to minimise adverse impacts on society that may result from uncontrolled forest fires and should allocate adequate resources to manage fire risk in an effective and safe manner
- that 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
- the use of prescribed fire as an effective tool for managing fuel accumulation, maintaining ecosystem processes and achieving silvicultural outcomes in forests and woodlands
- recognition of the importance of effective communication and consultation between forest managers and other stakeholders in relation to planning and implementing fire management activities
- development of inter-agency agreements to address issues of common interest related to forest fire management, including resource sharing, standardisation of training and equipment, and mutual aid during fire emergency situations
- the use of scientifically based decision-support systems to inform forest managers in the context of strategic planning, resource allocation and operational matters related to fire
- the application of performance indicators that provide meaningful information about the effectiveness of fire management in terms of environmental, social and economic outcomes.

Box 6.3 The use of fire in ecosystem management

The Ecological Society of Australia has developed the following position statement on the use of fire in ecosystem management:

The Ecological Society of Australia recognises the need for land managers to use and exclude fire for management purposes. Fire, however, is a complex phenomenon and if employed (or excluded) without adequate knowledge, can threaten the biological productivity, biodiversity and sustainability of ecosystems. For example, biodiversity loss has been associated with both high fire frequency and fire exclusion. Conversely, certain fire regimes are essential for the survival of some native species.

During the past few decades, the use of fire as a management tool has become controversial, with conflicts arising between different land management objectives, especially the maintenance of biodiversity and 'protection' of assets. It is essential therefore that fire management be planned in a much more strategic and integrated way to achieve management objectives and thereby minimise the conflict between conservation and other goals. This can be achieved in part by:

- the use of integrated management plans with ... clearly enunciated objectives
- explicitly resolving conflicts between different objectives at locations where these occur
- identifying fire regimes known or suspected to cause loss of biodiversity and, where possible, avoiding these fire regimes in management practice
- monitoring of specified performance indicators
- incorporation of the results of monitoring into future management action.

6.5.1 Potential bushfire impacts on biodiversity

One part of the overall strategy that gives effect to the objectives of ecologically sustainable development is a national parks system, which has both state and national reserves in a number of categories. This is especially relevant because a significant proportion of the landscape in each state and territory is in the national parks estate: in 2002 it was about 10 per cent of the total area of the continent.⁴³ Fire management that is designed to meet conservation objectives thus needs to be applied over a large part of the landscape (depending on the particular region) and is often interspersed with other land uses.

A system of national parks, no matter how extensive, is insufficient to deliver adequate biodiversity conservation, especially in relation to the role of biodiversity in providing ecosystem services and maintaining ecological processes on land that is used for economic production. Biodiversity conservation needs to be tackled across all land tenures.⁴⁴ Since bushfire is a process that influences the landscape without regard to land tenure, it is important to consider the effects of fire on biodiversity generally, not just within a protected-area system. This situation provides potential for significant conflict between management objectives but also an opportunity for devising complementary management across tenures.

Box 6.4 Biodiversity conservation

The term 'biodiversity' refers to the variety of life on earth, including plants, animals and micro-organisms. Conservation of biodiversity operates at a number of levels – genetic, species, and community and ecosystem. The Australian continent supports a particularly high diversity of organisms and a high level of endemism (organisms that are unique to Australia).

Australia has ratified the Convention on Biological Diversity, and the Australian Government and the states and territories have jointly developed the National Strategy for the Conservation of Australia's Biological Diversity, which entails obligations to regulate or manage relevant processes and activities where a significant adverse impact on biodiversity is occurring.

Bushfire has been an integral part of the environment in many parts of this continent for well over 1 million years, and Indigenous Australians' use of fire has been applied to the landscape in many regions for well over 40 000 years.⁴⁵ This history, combined with some characteristics of plants that allow them to tolerate

⁴³ Northern Territory, 5 per cent; Queensland, 4 per cent; New South Wales, 7 per cent; Australian Capital Territory, 54 per cent; Victoria, 15%; Tasmania, 37 per cent; South Australia, 26 per cent; Western Australia, 11 per cent (includes Indigenous Protected Areas) – Department of the Environment and Heritage 2003, *National CAPAD Summary Statistics – 2002*. <www.deh.gov.au/parks/nrs/capad/2002/report/index.html>, viewed 1 March 2004.

⁴⁴ The National Strategy for the Conservation of Australia's Biological Diversity states, 'Australia's biological diversity and the threats to it extend across tenure and administrative boundaries. At present more than two-thirds of Australia (some 500 million hectares) are managed by private landholders, while about 40 million hectares are within the terrestrial reserve system. The conservation of biological diversity is best achieved in situ and requires integrated and consistent approaches across freehold and leasehold and other Crown lands'.

⁴⁵ See Bradstock, RA, Williams, JE & Gill, AM (eds) 2002, *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK; Abbott, I & Burrows, N (eds) 2003, *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden.

fire and exploit bushfire effects⁴⁶, leads to the commonly heard conclusion that ‘the Australian bush is adapted to fire’. This statement is too simplistic to be useful, a fact widely acknowledged in land management agencies and most fire agencies but not generally understood in the broader community.

All fires that might burn in an area are not equal, and a particular species is likely to respond differently to a high-intensity canopy fire compared with a low-intensity ground fire; further, it is likely to respond differently to a fire in winter or spring compared with one in late summer or autumn, and it is likely to be affected differently if the preceding fire was recent compared with decades ago. These characteristics of fire make up the fire regime. If the fire regime is altered outside a range that is ‘natural’ for the area, detrimental effects are to be expected. The challenges in fire management for biodiversity conservation are, first, that some fire regimes can enhance or sustain biodiversity but others can threaten it and, second, that scientific knowledge is not sufficiently well developed to know what the limits are in all regions.

Inappropriate fire regimes have been recognised as potentially threatening to the conservation of biodiversity. Popular perceptions of what is inappropriate understandably focus on high-intensity fire. High-intensity fire certainly kills plants and animals and changes the ‘look’ of a landscape for years or decades – even centuries in some ecological communities. It is very important, though, not to let first impressions dominate judgment of the ecological consequences of fire.

The time scale of post-fire recovery has to be seen in the context of the life history of the organism rather than the time spans humans are familiar with. Even among the long-lived trees (several hundred years), some species recover rapidly after high-intensity fire because individuals survive and resprout from epicormic buds protected by the bark; recovery thus appears to be almost instantaneous. In some other species – for example, the ‘ash’ group of eucalypts (such as the mountain ash, alpine ash and karri) – adult trees die in a high-intensity fire but stands are replaced by mass germination of seeds that were protected in the canopy and released into the ash bed.⁴⁷ In these situations casual observation gives the false impression of desolation for many years. Since the intensive fires in Kosciuszko National Park in January 2003, seedlings of alpine ash have appeared at high densities in many stands⁴⁸, beneath the stark skeletons of the fire-killed adults, despite concern that this regeneration would not happen.⁴⁹

⁴⁶ For example, buried seeds that are dependent on heat to stimulate germination; dormant buds buried beneath insulating bark in eucalypts; some orchids, and lilies and their relatives, which reproduce only after fire; and seeds that are protected from heat in woody cones and released after fire.

⁴⁷ Florence, RG 1996, *Ecology and Silviculture of Eucalypt Forests*, CSIRO Publishing, Melbourne; House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, p. 58.

⁴⁸ NSW National Parks and Wildlife Service 2003, *Kosciuszko Today – fire special 2003*, NSW Government, Sydney.

⁴⁹ House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, p. 58.

Box 6.5 Inappropriate fire regimes and biodiversity

Inappropriate fire regimes have been recognised as potentially threatening to the conservation of biodiversity.

The National Land and Water Resources Audit noted that changed fire regimes threaten ecosystems across Australia and are one of the principal threats in northern Australia. The national *State of the Environment Report 2001* highlighted the deleterious effects of inappropriate fire regimes on native species, especially in the arid and semi-arid rangelands. *The Action Plan for Birds 2000* estimated that altered fire regimes affect 45 per cent of mainland bird species.

The Australian Government and state and territory governments recently identified 15 national biodiversity 'hot spots' – regions of Australia that are rich in biodiversity but also under immediate threat – as priorities for funding. For 10 of these 15 regions, altered fire regimes and/or threat from bushfires is listed as a key threatening process adversely affecting the biodiversity of the region.

Sources: National Land and Water Resources Audit 2002, *Australian Terrestrial Biodiversity Assessment 2002*, NLWRA, Canberra; Department of the Environment and Heritage 2001, *Australian State of the Environment Report 2001*, DEH, Canberra; Department of the Environment and Heritage 2000, *The Action Plan for Birds 2000*, DEH, Canberra; <www.deh.gov.au/minister/env/2003/mr03oct03a.html>, viewed 5 March 2004.

Similarly, a single high-intensity fire alters animal habitat for some time, temporarily creating conditions more suited to animal species of open environments and excluding species that depend on dense shrub cover. This is part of a natural cycle, with the time-scale depending on the particular species. Recovery of the dense understorey will result in recolonisation by the cover-dependent species that were previously there, as long as they can disperse readily across the landscape from refuges elsewhere. This situation is posing serious problems for conservation in fragmented reserves, especially in relation to fauna that are cover dependent and have low mobility.⁵⁰

Nevertheless, intense bushfires can cause marked changes in plant communities. This is perhaps most obvious when bushfires burn into rainforests and other fire-sensitive communities under severe climatic conditions. In other ecosystems concern has been expressed that high fire intensity in areas of unnaturally high fuel loads resulting from insufficient burning in the landscape can cause marked and long-lasting changes in structure and species composition. However, although it is clear that exceptionally high fuel loads are a strong contributor to high fire intensity and therefore to high mortality rates for plant and animal species, there are few empirical studies of long-term biodiversity effects.

Significant concerns about the threat to biodiversity of inappropriate fire regimes relate to frequency – both too frequent and too rare – and season.⁵¹ Planned fires need to take account of the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* and of similar state and territory legislation, including that dealing with recovery plans for threatened species.

⁵⁰ For example, Burbidge, AH 2003, 'Birds and fire in the Mediterranean climate of south-west Western Australia', in I Abbott & N Burrows (eds) 2003, *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden, pp. 321–47.

⁵¹ 'Ecological consequences of high frequency fires' is explicitly identified as a 'key threatening process' under the NSW *Threatened Species Conservation Act 1995*; the Ecological Society of Australia position statement on the use of fire in ecosystem management states, 'Biodiversity loss has been associated with both high fire frequency and fire exclusion'.

Knowledge about the responses of biota to different fire frequencies is quite limited. There are good empirical data (or at least predictions based on life histories) for effects of fire frequency on plants in some areas⁵², which identify some species that decline as a result of insufficient burning as well as some that decline if burned too frequently. The effects of high-frequency fire on the habitat of cover-dependent fauna have also been the subject of detailed study in south-eastern and north-eastern New South Wales.⁵³ Similarly, medium-term experimental studies at Kapalga in the Northern Territory suggest that fire frequency is a key factor in fire-fauna dynamics, such that some important elements of the fauna favour less frequently burnt habitat.⁵⁴ The best studies are landscape-level studies that are long term: one example involves the Lindsay forest fire regime monitoring sites, which have been maintained since 1970 and show some plant species declining with high fire frequencies and others declining with few fires.⁵⁵

How frequent is too frequent? This is a difficult question to answer. There can be substantial variation from one region to another. For example, among the shrubs in eucalypt forest systems the time to first reproduction appears to be as short as two years in south-western Australian jarrah forests⁵⁶, but studies in the woodlands of the Sydney region indicate a range of about one to over nine years.⁵⁷ If these patterns are general within each region, a fire frequency of every four years might not affect plant diversity in jarrah forest⁵⁸, whereas fire intervals of less than 10 years would be expected to reduce biodiversity in Hawkesbury sandstone woodlands.

⁵² Bradstock, RA, Williams, J & Gill, AM (eds) 2002, *Flammable Australia*, Cambridge University Press, Cambridge UK; Keith, DA 1996, 'Fire-driven extinction of plant populations: a synthesis of theory and review of evidence from Australian vegetation', *Proceedings of the Linnean Society of NSW*, vol. 116, pp. 37-78.

⁵³ Catling, PC, Burt, RJ & Forrester, RI 2000, 'Models of the distribution and abundance of ground-dwelling mammals in the eucalypt forests of north-eastern New South Wales in relation to habitat variables', *Wildlife Research*, vol. 27, pp. 639-54; Catling, PC, Coops, NC & Burt, RJ 2001, 'The distribution and abundance of ground-dwelling mammals in relation to time since wildfire and vegetation structure in south-eastern Australia', *Wildlife Research*, vol. 28, pp. 555-64; Catling, PC 1991, 'Ecological effects of prescribed burning practices on the mammals of south-eastern Australia', in D Lunney (ed.) *Conservation of Australia's Forest Fauna*, Royal Zoological Society of NSW, Sydney, pp. 353-63.

⁵⁴ Andersen, AN, Cook, G & Williams, RJ 2003, *Fire in Tropical Savannas: the Kapalga experiment*, Springer-Verlag, New York.

⁵⁵ Burrows, N & Wardell-Johnson, G 2002, 'Fire and plant interactions in forested ecosystems of south-west Western Australia', in I Abbott & N Burrows (eds) 2003, *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden, pp. 225-68.

⁵⁶ Gill, AM 2002, 'A review of fire regimes of the forested region of south-western Australia with selected examples of their effects on native biota', State of the Environment Technical Paper (Biodiversity), Series 2, Department of the Environment and Heritage, Canberra.

⁵⁷ Keith, DA 1996, 'Fire-driven extinction of plant populations: a synthesis of theory and review of evidence from Australian vegetation', *Proceedings of the Linnean Society of NSW*, vol. 116, pp. 37-78; Benson, D 1985, 'Maturation periods for fire-sensitive shrub species in Hawkesbury sandstone vegetation', *Cunninghamia*, vol. 1, pp. 339-49.

⁵⁸ Note, however, the findings from the Lindsay monitoring study in jarrah forest, which show decline in some species with high fire frequency – Burrows, N & Wardell-Johnson, G 2002, 'Fire and plant interactions in forested ecosystems of south-west Western Australia', in I Abbott & N Burrows (eds) 2003, *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden, pp. 225-68.

Box 6.6 Conservation challenges: variation in fire responses

The fact that there are differences between species, even in a single area, provides significant challenges for biodiversity conservation.

Fire exclusion from areas of inland Queensland and the Cape York peninsula has reduced populations of the golden-shouldered parrot, its preferred breeding habitat of lowland grassland being replaced by *Melaleuca* thickets and woodlands. Conversely, by reducing the food resource (seeds) and habitat, too-frequent fire in grasslands has caused the dramatic decline of the nationally endangered Gouldian finch.⁵⁹ These problems are now being redressed in recovery plans for the two species.

6.5.2 Managing landscapes for biodiversity

Much of the research on fire responses of the biota has been based on small-scale studies of individual species and on inferences drawn from life-history characteristics (for plants) and habitat associations (for animals), rather than on empirical studies of biodiversity at a landscape scale. It is at the landscape scale that the effects of inappropriate fire regimes on biodiversity need to be examined, because it is at this scale that fire management is generally applied.

A range of scientific studies in most jurisdictions have found that continuous application of a single fire regime over a landscape would be detrimental to biodiversity.⁶⁰ The conclusion is that biodiversity would best be protected with a mosaic of fire regimes in the landscape. It is important to define 'mosaic' here because the term is used in two ways. One is to describe a landscape that has patches of vegetation of different ages after fire, even though each patch might be being burnt with the same return time. This is not a mosaic of fire regimes; it is a mosaic of fire ages. A landscape with a mosaic of fire regimes would have some patches that are rarely burned, some more frequently, some in each season, some small, some large, some high intensity, and some cooler.

Scientific studies such as those referred to allow principles to be formulated for guiding the use of fire in land management for biodiversity. In addition, various agencies are using current knowledge (while recognising its limitations) to develop ecological burning guidelines for major vegetation formations in their jurisdictions⁶¹, especially in relation to fire frequency thresholds. Table 6.1 shows one such set of guidelines.

⁵⁹ Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams, D (eds) 2001, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin.

⁶⁰ For example, Abbott, I & Burrows, N (eds) 2003, *Fire in Ecosystems of South-west Western Australia: impacts and management*, Backhuys, Leiden; Andersen, AN, Cook, GD & Williams, RJ (eds) 2003, *Fire in Tropical Savannas: the Kapalga experiment*, Springer-Verlag, New York; Bradstock, RA, Williams, JE & Gill, AM (eds) 2002, *Flammable Australia: fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK.

⁶¹ Kenny, B, Sutherland, E, Tasker, E & Bradstock, RA 2003, *Guidelines for Ecologically Sustainable Fire Management*, NSW Government, Sydney.

Box 6.7 A set of scientific principles to guide fire management for conservation objectives: an example

- Fire should be regarded as an environmental factor that has influenced the nature of landscapes and biodiversity and will continue to do so. It must be an integral part of conservation and land management generally.
- Species vary in their adaptation to and reliance on fire, and communities therefore vary in their fire responses. Knowledge of the temporal and spatial scales of fires in relation to the life histories of organisms is therefore fundamental in guiding the use of fire in natural resource management.
- Following fire, various environmental factors – landform, topography, the life histories of species and climatic events, for example – can cause changes in species composition and the structure of communities. This may obscure the changes that are directly a result of fire.
- Fire management is required for two reasons: to protect and conserve the biota; and to reduce the occurrence of large, damaging uncontrolled bushfires.
- Fire management should be both precautionary and adaptive, considering ecological and protection objectives.
- Diversity in fire regimes promotes biodiversity at the local and landscape scales. At the landscape scale a mosaic representing a range of fire regimes (intervals, seasons, intensities and scales) should sustain the widest diversity of habitats. At the local scale fire regimes need to be based on the biological attributes of the organisms present.
- The scale of mosaics should be based on knowledge of characteristics of the biota, such as dispersal distances and the need for access to particular habitats.
- Avoid applying the same fire regime over large areas for long periods, and avoid treating large areas with extreme regimes, such as very short or very long fire intervals.
- All available knowledge should be used to develop ecologically based fire regimes for a landscape unit or vegetation type – including life histories, the vital attributes of organisms, recorded responses to previous fires, and Indigenous Australians' knowledge.
- Wildfire can damage both biodiversity and community assets, so risk management must be a systematic approach that identifies the assets, identifies the potential consequences of mitigation and management options, and manages fire regimes accordingly.
- Fire management should adapt to changing community expectations and to new knowledge gained through research, monitoring and experience.

Source: Adapted from Burrows, N & Abbott, I 2003, 'Fire in south-west Western Australia: a synthesis of current knowledge, management implications and new research directions', in I Abbott & N Burrows (eds), *Fire in Ecosystems of south-west Western Australia: impacts and management*, Backhuys, Leiden, pp. 437–52; Parks Victoria 1999, *Interim Guidelines and Procedures for Ecological Burning on Public Land in Victoria*, Natural Resources and Environment Victoria, Melbourne.

Table 6.1 Fire interval guidelines to guide ecologically sustainable fire management: an example

Vegetation formation	Minimum interval	Maximum interval	Notes
Rainforest	..	..	Fire should be avoided
Alpine complex	..	..	Fire should be avoided
Estuarine and saline wetland	..	..	Fire should be avoided
Wet sclerophyll forest	25	60	Crown fires should be avoided in the lower end of the interval range
Semi-mesic grassy forest	10	50	Occasional intervals greater than 15 years may be desirable. Crown fires should be avoided in the lower end of the interval range
Swamp sclerophyll forest	7	35	Some intervals greater than 20 years may be desirable.
Sclerophyll grassy woodland	5	40	Minimum interval of 10 years should apply in the Southern Tablelands area. Occasional intervals greater than 15 years may be desirable
Dry sclerophyll shrub-grass forest	5	50	Occasional intervals greater than 25 years may be desirable
Dry sclerophyll shrub forest	7	30	Occasional intervals greater than 25 years may be desirable
Semi-arid woodland	6 ^a	40 ^a	Available data indicate minimum intervals should be at least 5–10 years and maximum intervals approximately 40 years
Arid and semi-arid shrubland	6 ^a	40 ^a	Available data indicate minimum intervals should be at least 5–6 years and maximum intervals approximately 40 years. A minimum of 10–15 years should apply to communities containing <i>Callitris</i> . Fire should be avoided in chenopod shrublands
Heathland	7	30	Occasional intervals greater than 20 years may be desirable
Grassland	2	10 ^a	Occasional intervals greater than 7 years should be included in coastal areas. Available evidence indicates maximum intervals should be approximately 10 years.
Freshwater wetland	6	35	Occasional intervals greater than 30 years may be desirable.

.. Not applicable.

a. Insufficient data to give definite interval.

Note: Guidelines are based on current information and predictions for New South Wales ecosystems.

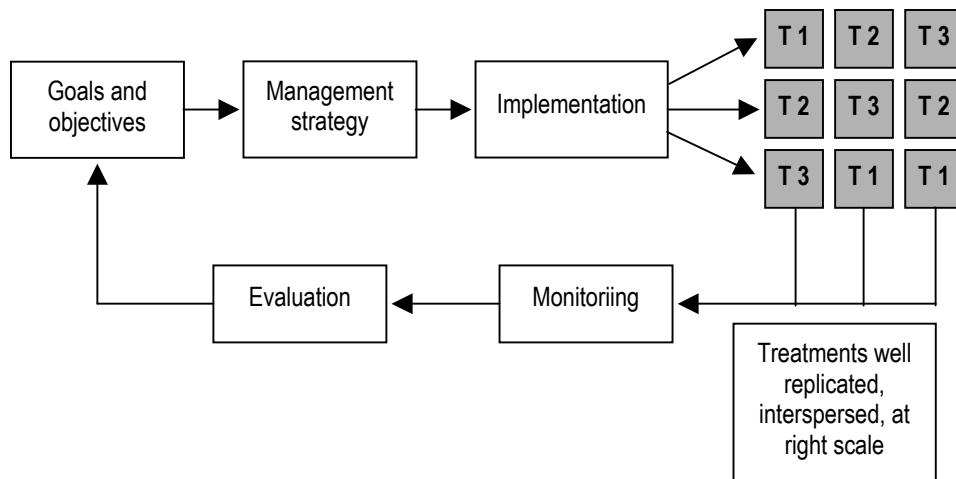
Source: Kenny, B, Sutherland, E, Tasker, E & Bradstock, RA 2003, *Guidelines for Ecologically Sustainable Fire Management*, NSW Government, Sydney, table 3a.

Given the variation in fire responses between species and between regions, these sorts of guidelines will not necessarily be appropriate in other areas, and the effects of fire season and intensity will interact with frequency. It is critically important that the fragile ecological basis for guidelines such as these be acknowledged and that a process be developed for refining the knowledge for each particular location. For example, if appropriate fire regime mosaics can be identified for the biota in an area, there needs to be confirmation that the burning prescription that is applied actually delivers the desired mosaic and then that this does in fact sustain the biodiversity as intended. There are few examples of well-designed and

comprehensive studies that test these ideas: indeed, they are expensive and difficult to conduct (see Chapter 5).

Even before this knowledge is refined, there is a need to apply fire management for ecological objectives – because doing nothing might, in effect, be applying an inappropriate fire regime. This is precisely the situation that requires an adaptive management approach (see also Section 6.4.1) in which procedures for monitoring and analysis are actively incorporated in fire management, as illustrated in Figure 6.2.

Figure 6.2 Elements of an ‘active’ adaptive management program



Source: Whelan RJ 2004, 'Adaptive Management: what does it mean and how can it be used in fire management?', in: Baker, A, Diekman, B & Sparks, M (eds) *Bushfire: managing the risk*. NSW Nature Conservation Council, Sydney, pp. 49–58. See also Andersen, AN, Cook, G & Williams, RJ 2003, *Fire in Tropical Savannas: the Kapalga experiment*. Springer-Verlag, New York, p. 160; Canadian Ministry of Forests 2000, <www.for.gov.bc.ca/hfp/amhome/amhome.htm>, viewed 12 March 2004.

Figure 6.2 shows the ideal situation, which uses experimental manipulation and good experimental design and analysis – a more expensive approach but the only one that can uncover cause-and-effect relationships. The important principles of adaptive management can also be applied to good effect with less investment in experimental design and data collection, although the outcomes will be less informative. Many agencies in several jurisdictions are already developing biodiversity monitoring guidelines to facilitate this level of adaptive management.⁶²

⁶² Gill, AM 2004, 'The wheel of management: biodiversity conservation as restoration', in A Baker, B Diekman & M Sparks (eds), *Bushfire: managing the risk*, NSW Nature Conservation Council, Sydney, pp. 119–23, and sources cited therein.

Finding 6.7

The Inquiry supports the adoption of an adaptive management approach to setting fire regimes that are appropriate for biodiversity conservation. Such an approach should:

- make explicit the biodiversity objectives
- recognise lack of knowledge and clarify questions that need to be answered
- design burning prescriptions that can answer these questions
- devise and fund monitoring and other data-collection activities
- review and communicate results
- use the new knowledge to modify the management prescription.

6.5.3 Impacts of fire on water quality

Bushfires can indirectly increase the rate of erosion in a catchment by reducing the resistance to surface soil movement and by increasing the velocity of the water run-off.⁶³ The magnitude of the effects depends on the extensiveness of the fire, its intensity, the rate of vegetation regeneration, soil properties, topography, geology, and rainfall patterns after the fire.

If the vegetation in the catchment is extensively removed by a fire and heavy rain occurs soon after, there can be serious degradation of water quality. Increased water run-off after a fire will include suspended soil and ash particles and cause increased sediment and turbidity in streams, wetlands and dams.⁶⁴ For example, a study in East Gippsland after the 1983 Ash Wednesday fires compared the export of materials (dissolved and suspended solids, potassium, phosphorus and nitrogen) from three catchments that suffered different degrees of burning, ranging from 7 per cent to greater than 90 per cent.⁶⁵ Export of suspended solids was 10 times greater in the most thoroughly burnt catchment (115 kilograms per square kilometre) compared with the least burnt (10 kilograms per square kilometre). The pattern was similar for nitrogen, but variation in the export of other materials was only slight.

The Christmas 2001 bushfires burnt more than 130 000 hectares of bushland in Sydney Water's catchment areas. The consequence for vegetation in the catchments (also taking account of the creation of containment lines and additional fire trails) was the mobilisation of considerable amounts of sediment. However, mitigation works such as the installation of booms at high-risk locations and the use of wire-mesh barriers to retain sediments, along with continuous monitoring of water

⁶³ Prosser, IP & Williams, L 1998, 'The effect of wildlife on run-off and erosion in native *Eucalyptus* forest', *Hydrological Processes*, vol. 12, pp. 251–65.

⁶⁴ See NSW Government submission; House of Representative Standing Committee on Environment and Conservation 1984, *Bushfires and the Australian Environment*, HRSCEC, Canberra; CSIRO submission.

⁶⁵ Chessman, BC 1986, 'Impact of the 1983 wildfires on river water quality in East Gippsland, Victoria', *Australian Journal of Marine and Freshwater Research*, vol. 37, pp. 399–420; Chapman, G & Daly, H 2004, 'The importance of soil and landscape characteristics and fire impact on water quality in bushfire planning and management strategies', in A Baker, B Diekman & M Sparks (eds), *Bushfire: managing the risk*. NSW Nature Conservation Council, Sydney, pp. 128–35.

quality, reduced the impacts on Sydney's water quality, despite the large extent and high intensity of the fires.⁶⁶

After a fire the yield of water can be reduced because fast-growing regenerating vegetation can have a high water demand. In some forest types it is estimated that reduced water yields can occur for up to 25 years⁶⁷, but there are few studies from which to draw general conclusions.

The Inquiry notes that catchment management agencies in several jurisdictions are exploring ways in which fuel-reduction burning might be used in water catchments to protect water quality by reducing the likelihood and magnitude of large bushfires. Since fuel-reduction burning itself has the potential to affect water quality, it is important to quantify the relative effects of these types of burning over long time spans.

Finding 6.8

More research and monitoring are required in order to understand the effects of fuel-reduction burning and large-scale bushfire events on water quality and quantity in catchment areas.

6.5.4 Fire and air quality

Smoke from bushfires can affect human health through the increase in the quantity of particles, carbon monoxide, air toxics and volatile organic carbons to air sheds, and it can raise ground-level ozone levels.⁶⁸ As noted, concern about air quality is sometimes expressed in debates about fuel-reduction burning. In 1998 all Australian governments agreed to the National Environment Protection (Ambient Air Quality) Measures. This agreement sets a maximum mean atmospheric concentration of 50 micrograms per cubic metre for particles of 10 microns or less in diameter (referred to as PM¹⁰) over a 24-hour period.⁶⁹

The Inquiry received several submissions that discussed the air pollution effects of bushfires – both fuel-reduction burns and unplanned fires – and the potential health effects.⁷⁰ Studies of bushfire and asthma in the 1990s failed to find statistically significant correlations, but a study in Darwin from April to October

⁶⁶ Shanahan, P 2004, 'The challenge of bushfires for Sydney's water supply', in A Baker, B Diekman & M Sparks (eds), *Bushfire: managing the risk*. NSW Nature Conservation Council, Sydney, pp. 79-86.

⁶⁷ Cullen, P 2003, ACT Natural Resources Management Committee 2003, <www.environment.act.gov.au/Files/planningforfirerecovery.doc>, viewed 12 March 2004; see Non-urban Study Steering Committee 2003, *Shaping our Territory*, Australian Capital Territory Government, Canberra, p. 31.

⁶⁸ Department of the Environment and Heritage submission, p. 3.

⁶⁹ National Environment Protection Council 1998. *Ambient Air Quality Standards*, <www.ea.gov.au/atmosphere/airquality/standards.html>, viewed 14 March 2004.

⁷⁰ Submissions from the following: McGill, D, 'Community awareness about the health effects of burning wood in residential areas'; Crossett, G, Advocates for Clean Air; Buckland, D, Advocates for Clean Air; Barraclough, L, Airwatch Australia.

2000 did reveal a relationship.⁷¹ Darwin experiences bushfires throughout the dry season: fuel reduction burning occurs mostly from April to June, and bushfires occur mostly late in the dry season. The study correlated the concentration of respirable particles arising from all bushfires (both planned and unplanned) with attendance at hospital. The PM¹⁰ levels ranged from only 2 to 70, with peak fire activity in September, when the National Environment Protection Measures standard was exceeded on five days. There was a significant increase in asthma presentations to hospital with each 10-microgram per cubic metre increase in PM¹⁰, especially when the level exceeded 40 µg/m³. The study concluded that airborne particulates from bushfires should be regarded as just as injurious to human health as airborne particulates from other sources.⁷²

Major bushfires usually push particulate concentrations well beyond the threshold National Environment Protection Measures level. In the 1994 Sydney bushfires, the peak was 210 µg/m³ (against a background level from non-bushfire sources of 30 µg/m³). During Sydney's Christmas 2001 bushfires, above 150 µg/m³ levels were sustained for 10 days. In Canberra the maximum level on 18 January 2003 was 192 µg/m³.⁷³

In Western Australia a regular program of fuel reduction is undertaken mainly in spring. In response to growing concern about air quality, the Western Australian Government has developed an Air Quality Management Plan.⁷⁴ The Department of Conservation and Land Management is required to manage smoke emissions from fuel reduction in order to minimise the impact on air quality in Perth and other centres. The Department has indicated that as a result of this Plan smoke haze from fuel reduction has decreased significantly during the past decade and the National Environment Protection Measures standards are exceeded only once or twice a year.⁷⁵

The Bushfire Cooperative Research Centre has begun a project entitled Smoke Composition and Impact on Human Health and Ecosystems⁷⁶, which will examine the matter in more detail. Work such as this has the potential to lead to a better understanding of the relative effects on air quality and health of fuel-reduction burning and unplanned bushfires.

⁷¹ See Cooper, CW, Mira, M & Danforth, M 1994, 'Acute exacerbations of asthma and bushfires', *Lancet*, vol. 343, p. 1509; Smith, M, Jalaludin, B & Byles, J 1996, 'Asthma presentations to emergency departments in Western Sydney during the January 1994 bushfires', *International Journal of Epidemiology*, vol. 25, pp. 1227-36; Churches, T & Corbett, S 1991, 'Asthma and air pollution in Sydney', *NSW Public Health Bulletin*, vol. 8, pp. 72-3; Johnston, FH, Kavanagh, AM, Bowman, D & Scott, RK 2002, 'Exposure to bushfire smoke and asthma: an ecological study', *Medical Journal of Australia*, vol. 176, pp. 535-8.

⁷² Johnston, FH, Kavanagh, AM, Bowman, D & Scott, RK 2002, 'Exposure to bushfire smoke and asthma: an ecological study', *Medical Journal of Australia*, vol. 176, pp. 535-8.

⁷³ Department of the Environment and Heritage submission, p. 3.

⁷⁴ Perth Air Quality Management Plan (2002-2030),

<http://aqmpweb.environ.wa.gov.au/air_quality/Air_Quality_Management_Plan>, viewed 16 March 2004.

⁷⁵ Western Australian Department of Conservation and Land Management submission to the House of Representatives Select Committee on the Recent Australian Bushfires, p. 11.

⁷⁶ See Recommendation 15 of the report of the House of Representatives Select Committee on the Recent Australian Bushfires

Finding 6.9

The potential for a reduction in air quality is one of several impediments to achieving necessary levels of fuel-reduction burning. There is a trade-off between tolerating reduced air quality and achieving risk reduction by fuel-reduction burning. Resolution of the question requires both more research and effective dialogue with the community.

6.5.5 Fire and climate change

Bushfire can be both a consequence of altered weather and vegetation patterns associated with climate change and a contributor to climate change through the emission of gases and particles to the atmosphere.

Fires' frequency, intensity and size are expected to increase under climate change as temperatures rise, rainfall variability increases, droughts become more severe and ecosystem dynamics alter, resulting in changed biomass fuel loads and types.⁷⁷ The projected hotter, drier, windier conditions associated with climate change caused by greenhouse warming would extend the period of fuel drying and increase rates of fire spread. Fuel loads could increase as a result of increased growth rates associated with the carbon fertilisation effect, although this may be offset to some extent by increased levels of drought stress.⁷⁸ There could be a reduction in the number of periods suitable for planned fire, and more intense fires could make suppression more difficult.⁷⁹ Between-fire intervals could become shorter, with consequences for ecosystem dynamics and species persistence.⁸⁰

Savanna fires in Australia already make a significant contribution to national greenhouse gas emissions and have impacts outside Australia's borders.⁸¹ The climate change scenarios just described are likely to increase the level of greenhouse gas emissions associated with bushfires.

Depending on future international and Australian arrangements for greenhouse mitigation, there may be economic benefits associated with reducing greenhouse gas emissions associated with fire or in sequestering carbon through vegetation sinks. Realising either of these economic benefits would depend on managing the impacts of bushfires.

In summary, the implications of climate change for bushfires are likely to create substantial economic, social and environmental costs. For these reasons fire and

⁷⁷ Pittock, B (ed.) 2003, *Climate Change: an Australian guide to the science and potential impacts*, Australian Greenhouse Office, Canberra; Cary, G 2002, 'The importance of changing climate for fire regimes in Australia', in RA Bradstock, JE Williams & AM Gill (eds), *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK, pp. 26–46.

⁷⁸ Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams, RJ (eds) 2002, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin.

⁷⁹ CSIRO submission, p. 51.

⁸⁰ Cary, G 2002, 'The importance of changing climate for fire regimes in Australia', in RA Bradstock, JE Williams & AM Gill (eds), *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK, pp. 26–46.

⁸¹ National Greenhouse Gas Inventory Committee 2002, *National Greenhouse Gas Inventory 2000*, Australian Greenhouse Office, Canberra; Kondo, Y, Takegawa, N, Miyazaki, Y, Ko, M, Koike, M, Kita, K et al. 2003, 'Effects of biomass burning and lightning on atmospheric chemistry over Australia and South-east Asia', *International Journal of Wildland Fire*, vol. 12, pp. 271–81.

land management agencies are already exploring measures and arrangements that might mitigate the impacts of bushfires under altered climatic regimes and might capitalise on opportunities that mitigation arrangements present. Because of the significance of northern savanna fires to greenhouse emissions and the potential for landowners to benefit from mitigation arrangements, these options have been most fully explored to date in northern Australia.⁸²

Finding 6.10

Long-term strategic research, planning and investment are necessary if the Australian Government and state and territory governments are to prepare for the changes to bushfire regimes and events that will be caused by climate change.

6.5.6 Fire and forest production

Fire is a fundamentally important ecological process in the Australian environment and the principal agent of successional processes in eucalypt forests.⁸³ For this reason planned fire is commonly used in native, eucalypt-dominated forests that are managed for wood production for the purpose of facilitating eucalypt regeneration and concurrently reducing fuel loads associated with post-logging woody debris. The intensity of this 'regeneration burning' varies with the forest type, and in some forests (such as *Callitris*) fire has to be excluded to allow regeneration.

In the drier (typically mixed-age and -species) forests harvesting is selective, and post-logging woody debris levels are both relatively small and spatially dispersed. Consequently, regeneration fires are of relatively low intensity. In wetter (typically even-aged with few species) forests, harvesting is usually through some form of clear felling⁸⁴, and post-logging woody debris levels are typically relatively high and spatially concentrated. Consequently, regeneration fires are of relatively high intensity.

The Inquiry notes that forest managers now have a much greater awareness of and pay more attention to the impacts of regeneration burning on other values – for example, biodiversity and air quality – than has historically been the case. These impacts are now explicitly addressed by the Ecologically Sustainable Forest

⁸² Russell-Smith, J, Yates, CP, Edwards, A, Allan, GE, Cook, GD, Cooke, P et al. 2003, 'Contemporary fire regimes of northern Australia: change since Aboriginal occupancy, challenges for sustainable management', *International Journal of Wildland Fire*, vol. 12, pp. 283–97; Whitehead, PJ, Bowman, DMJS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25.

⁸³ This section draws from Florence, RG 1996, *Ecology and Silviculture of Eucalypt Forests*, CSIRO Publishing, Melbourne; and chs 10, 12, 13 and 15 in Bradstock, RA, Williams, JE & Gill, AM (eds), *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK.

⁸⁴ The Inquiry notes the trend towards both smaller clear-felling coupe sizes and alternative silvicultural systems in native forests that remain available for wood production and that these changes have implications for the use of regeneration fires.

Management framework adopted by states and territories⁸⁵; relevant matters are discussed elsewhere in this chapter.

6.5.7 Fire and rangeland production

Rangelands are mostly in semi-arid and tropical landscapes. They account for 70 per cent of Australia's continental area, and about 60 per cent of them are devoted to pastoral activity. Rangeland vegetation is influenced particularly by the interaction of grazing, fire regimes, topography and rainfall.⁸⁶

European settlement for pastoralism and the associated displacement of Indigenous Australians brought a marked change in fire regimes in the rangelands. The pastoralists initially viewed fire as a threat to their grass resources and tried to suppress bushfires when they occurred. The consequence is that fire regimes in the rangelands have changed from more frequent small-scale fires to large, episodic bushfires. Higher grazing intensity since European settlement has reduced the amount of fire in semi-arid regions by reducing the amount of grass. In these regions above-average rainfall causing an increase in the grass fuel load is now the primary determinant of bushfire regimes.⁸⁷ In Central Australia above-average rainfall from 1999 to 2002 led to fires burning more than 500 000 square kilometres, with 70 per cent of the Northern Territory's arid zone being burnt between 2000 and 2002; there is concern that this rare situation has led to a loss of biodiversity.⁸⁸ Widespread fires also occurred in Western Australia and the pastoral zone of South Australia during that period.

The season and frequency of fire are the most important components of fire regimes in the rangelands. The changed fire regime resulting from European settlement, in combination with sustained grazing, has resulted in a proliferation of native trees and shrub species in landscapes that were once open, grassy woodlands, which is having significant effects on pastoral production across eastern inland and northern Australia.⁸⁹ The increased woody vegetation can reduce the grass available for livestock, harbour pest animals, and change habitat conditions for native wildlife.

Re-introduction of more suitable fire regimes into rangeland ecosystems can be used to benefit biodiversity. An ecological burning regime can be used to reduce the amount of woody vegetation present in rangeland landscapes and so arrest

⁸⁵ Under the National Forest Policy Statement and as a consequence of the Regional Forest Agreement (or similar) process.

⁸⁶ Noble, JC & Grice, AC 2002, 'Fire regimes in semi-arid and tropical pastoral lands: managing biological diversity and ecosystem function, in RA Bradstock, JE Williams & AM Gill (eds), *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge, p. 375.

⁸⁷ Williams, J 2002, 'Fire regimes and their impacts in the mulga landscapes of central Australia', State of the Environment Technical Paper (Biodiversity) Series 2, Department of the Environment and Heritage, Canberra.

⁸⁸ Allen, GE, Phillips, NR & Hookey, P 2003, 'Learning lessons from an exceptional period of fires in central Australia: 1999 to 2002', Paper presented at International Wildland Fire Conference, Sydney, October.

⁸⁹ Hodgkinson, KC 1991, 'Shrub recruitment response to intensity and season of fire in a semi-arid woodland', *Journal of Applied Ecology*, vol. 28, pp. 60-70.

declines in granivorous bird species.⁹⁰ In combination with chemical and mechanical controls, fire can be effective in controlling exotic weeds such as rubber vine, *Mimosa pigra* and mesquite.⁹¹ In semi-arid and tropical pastoral areas fire can be used to re-introduce the habitat heterogeneity that is important for the survival of endangered species.⁹²

Fire is also an important tool in improving native pasture production in the rangelands. Burning rank grass can improve growth and nutrition. How pasture responds to burning depends, however, on the proportion of annual and perennial species, the frequency and timing of burning, the occurrence of follow-up rain, and management of the total grazing pressure after the fire.

Finding 6.11

There is a potential trade-off between maximising native pasture production by using fire and avoiding biodiversity loss. Too-frequent use of fire, and too much uniformity in fires, can result in loss of biodiversity in a region.

6.6 Land managers' responsibilities

This section might also be called 'Risk reduction as a cooperative effort across the landscape' or 'Combining fuel reduction and environmental protection across the landscape'. The central theme is that areas of land containing different assets, and therefore with very different management objectives, are generally interspersed across the landscape, and unplanned fires can burn out of control across all of them.

The land managers responsible for the greatest areas of native vegetation in the Australian landscape are farmers and graziers, managers of national parks and conservation reserves, managers of unallocated Crown lands, managers of private and public forests (natural and plantation forests), Indigenous communities, mining companies, catchment managers, and local councils. Often-ignored components are home owners in both urban and rural-residential areas: their responsibility for management of their land is particularly important.

6.6.1 The challenge of having many landowners

The mixture of land uses and objectives in a landscape is not static. The report of the inquiry into the 2002–03 Victorian bushfires has a chapter entitled 'The changing Victorian environment', which discusses changing population

⁹⁰ Russell-Smith, J, Craig, R, Gill, AM, Smith, R & Williams, J 2002, 'Australian Fire Regimes: contemporary patterns (April 1998 – March 2000) and changes since European settlement', Australia State of the Environment Second Technical Paper Series (Biodiversity), Department of the Environment and Heritage, Canberra.

⁹¹ Dyer, R, Jacklyn, P, Partridge, I, Russell-Smith, J & Williams, D (eds) 2001, *Savanna Burning: understanding and using fire in northern Australia*, Tropical Savannas Cooperative Research Centre, Darwin.

⁹² Noble, JC & Grice, AC 2002, 'Fire regimes in semi-arid and tropical pastoral lands: managing biological diversity and ecosystem function', in RA Bradstock, JE Williams & AM Gill (eds), *Flammable Australia: the fire regimes and biodiversity of a continent*, Cambridge University Press, Cambridge UK, pp. 373–400.

distributions (reducing in some fire risk areas, such as rural communities, and increasing in others, such as urban fringes), the changing distribution of land uses across the landscape (for example, the size of the national parks estate has increased from 4 to 15 per cent of the state since the early 1970s), changing attitudes to the use of fire and technologies for fire suppression, and changing climate causing an increased bushfire risk.⁹³

Box 6.8 The Southeast Queensland Fire and Biodiversity Consortium

South-east Queensland covers about 6.6 million hectares and contains some of Australia's richest flora and fauna, but the region is becoming fragmented and there are multiple land use pressures. One of the main threats to biodiversity is altered fire regimes.

When local governments acquired land for conservation in the mid-1990s, they inherited the problems associated with implementing fire management practices to suit conservation objectives and limit risks to local residents. In response, the Southeast Queensland Fire and Biodiversity Consortium was formed by local councils. It consists of representatives of the Queensland Rural Fire Service, 11 local councils, the Parks and Wildlife Service, natural resource management agencies, Greening Australia, and universities.

The objective is to gather and disseminate information on fire management across the landscape to support the conservation of the region's biodiversity. The Consortium's first work was to produce a review of current knowledge of fire ecology and identify the areas in which more research was needed. Fire management planning workshops are conducted with landowners and other interested parties. The Consortium has produced ecological guidelines, a property fire management planning kit, a management manual for fuel-reduction and ecological burns, a fire and biodiversity monitoring manual, and guidelines for planning and implementing a council fire management strategy.

The Consortium was initially funded through the Natural Heritage Trust from 2000 to 2002 and managed by Logan City Council.

Source: Watson, P, 'The Southeast Queensland Fire and Biodiversity Consortium: a case study in interagency cooperation and community education', *Bushfire 2001*, pp. 205-11.

These patterns are repeated in other states and territories to varying degrees. The changes all affect in some way risk assessment in relation to bushfire and all add complexity to effective fire mitigation and management. Perhaps the most challenging situations are the increasing complexity of the urban-bushland interface and the change in the land tenure of relatively large tracts of public land, mostly from forestry to national parks. There is a clear need for fire mitigation and management processes to be able to respond to these changes.

The long, convoluted nature of the urban-bushland interface is obvious from any aerial photograph or satellite image, and the length of the urban perimeter is increasing rapidly as major cities expand. For example, in the Ku-ring-gai council area, on the northern fringe of Sydney, there are currently 8000 properties on the urban-bushland interface, spread over an 89-kilometre perimeter.⁹⁴ Many of these properties back onto Ku-ring-gai Chase National Park – an important conservation reserve – forming a convoluted pattern of mostly ridge-top subdivision. This sort of situation is evident in most states and territories; Figure 6.3 shows a similar example on the Gold Coast in Queensland, in which large rural blocks with

⁹³ Esplin B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 16–19.

⁹⁴ Meeting with representatives of North Sydney Region of Councils, 30 October 2003.

dwellings, suburban subdivisions and as-yet-undeveloped rural blocks are interspersed with bushland reserves (large white areas).

Meeting the challenge of designing effective bushfire mitigation and management with this sort of mix of land uses is hindered by the differing attitudes and values the various stakeholders – local communities (urban and rural), graziers, land managers, environmentalists, and so on – hold about the adequacy and impacts of fuel reduction. This question has been debated for many years (especially after each major fire event), but it is more about the appropriateness of the land uses than about the best way of managing fire to achieve the management objectives of each area.

6.6.2 Fuel management zoning

The rural–urban interface and the agriculture – conservation reserve interface are the areas where bushfire poses the greatest risks to lives, property and economic values, although there are other critical areas, such as utilities (especially communications and power) and other types of primary production. In such situations the interface zones must be a high priority for fuel reduction, especially where land management objectives elsewhere in the landscape preclude wide-scale fuel reduction. The most effective way of accommodating these apparently conflicting objectives is by identifying ‘fire management zones’ across the landscape and having clear objectives for each zone.

Fuel management zoning has been adopted in Victoria and recently in New South Wales. In Victoria there are currently five fuel management zones on public land. These flow from the Fire Protection and Fire Operations Plans. In New South Wales the Bushfire Coordinating Committee has identified fuel-reduction zones in association with the Bushfire Risk Plans to cover all of the state. A zoning approach was originally used by the New South Wales National Parks and Wildlife Service to manage fuel reduction in its estate. The Inquiry into the Operational Response to the January 2003 Bushfires in the ACT recommended that the Australian Capital Territory adopt a fuel-reduction zoning system similar to that in Victoria.⁹⁵

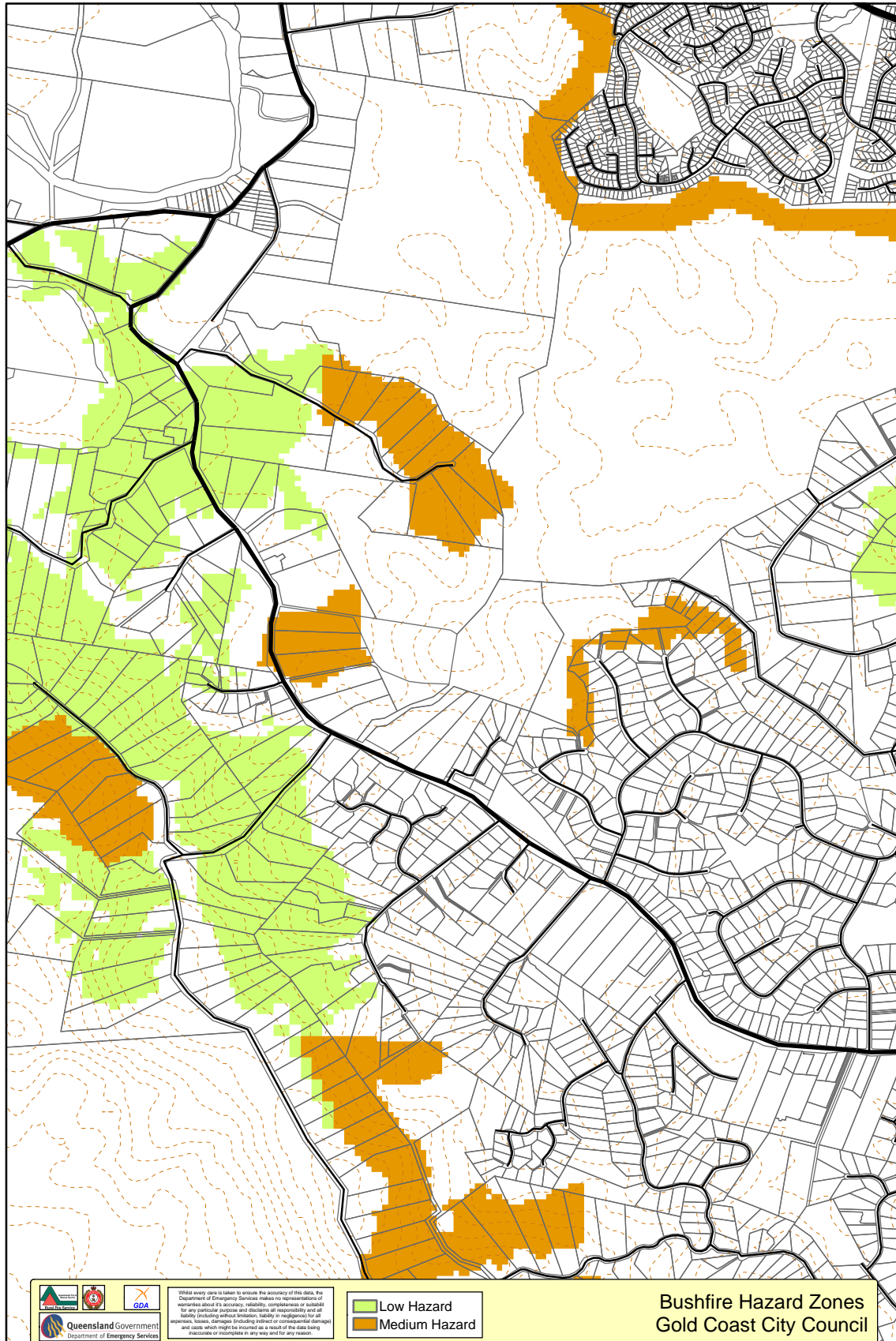
This Council of Australian Governments Inquiry supports the adoption by all states and territories of a system for classifying fuel management zones across the landscape – not solely within individual land tenures.⁹⁶ The zone category would direct the nature and priorities for risk-management action. A zoning approach is emerging in a number of jurisdictions, with the following features:

- *Asset protection zone.* This is typically the rural–urban interface, where regular fuel reduction should be undertaken in the vicinity of specific assets.
- *Strategic fuel management zone.* This aims to provide areas of reduced fuel in strategic areas, to reduce the speed and intensity of bushfires and reduce the potential for spot-fire development.

⁹⁵ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra.

⁹⁶ Supported in recommendation 3 of the report of the House of Representatives Select Committee on the Recent Australian Bushfires.

Figure 6.3 Queensland's Gold Coast: a convoluted urban-bushland interface



- *Land management zone.* The primary purpose here is to meet the objectives of the relevant land manager, which can be planned fire for fuel reduction, biodiversity conservation or forest regeneration.

Once zonings are defined in a region, an effective process is necessary for determining the most suitable forms of fire management and mitigation. For example, assets that are particularly fire sensitive can exist in any of these zones and call for specific risk-management actions; examples are rainforest patches and pine plantations, from which fire should be excluded. Such a process would have the following characteristics:

- identification and acknowledgment of the assets
- collation of information on how fire, and fire mitigation, might affect these assets, incorporating knowledge available at the local level as well as general knowledge
- involvement of all parties with an interest in protection of the assets
- application of a risk-assessment process to the entire landscape (not just a single land tenure), resulting in a fire mitigation and management strategy at the landscape level
- development of actions for specific areas that fit in to the landscape-level strategy.

A potentially effective mechanism for applying appropriate fire mitigation across the landscape, focusing at the small scale on asset protection, is the development of bushfire risk-management plans. To be effective in capturing local knowledge and gaining commitment to the protection of all assets in a complex landscape, these plans should be developed with community input and should cover all private and public land.

All jurisdictions indicated support for this approach in their meetings with the Inquiry, and there are many good examples of multi-agency involvement, integration with the community, and planning across all tenures in a landscape. The process has a large human component, so its effectiveness obviously varies. The Inquiry was informed of some situations in which the characteristics of individual people and the agendas of particular agencies made such committees dysfunctional, despite the strengths inherent in a cooperative planning structure.⁹⁷

Recommendation 6.3

All states and territories should have a zoning approach to the classification of fuel management areas, with clear objectives for each zone. The process should be applied at the landscape scale, and all land managers and the community should be involved.

⁹⁷ NSW Nature Conservation Council meeting with the Inquiry, 2 February 2004.

6.6.3 Landscape-scale management planning

Through the Natural Heritage Trust the Australian Government and state and territory governments are investing in sustainable natural resource management at the landscape scale. Under the new regional component of the Trust, for example, natural resource management plans are being developed, based on 'regions' defined by the states and territories (a combination of catchment regions and local government areas). In most regions of Australia, fire management is central to natural resource management. Some of the natural resource management plans currently being developed and implemented include funding for fire management.

Natural resource management plans are being developed such that they complement bushfire risk-management planning. For example, in South Australia one of the key actions in the Kangaroo Island natural resource management plan is to develop fire management plans to protect biodiversity. In New South Wales, the plans recognise bushfire risk-management plans.

Finding 6.12

Natural resource management regional plans developed under the National Heritage Trust should take bushfire management into account and be consistent with the bushfire risk-management process.

Box 6.9 Natural Heritage Trust support for landscape management and fire

Because fire management plays an important role in achieving conservation and sustainable management objectives, the Natural Heritage Trust has supported many projects related to fire management. The following projects relate to the use of fire in landscape management:

- studies of the impact of fire on biodiversity in the rangelands
- fire management in Indigenous lands in northern and Central Australia
- development of endangered species recovery plans where altered fire regimes are a threatening process
- fire management in northern Australia
- development of a regional fire management strategic framework, including management guidelines, for all regions in the Northern Territory
- habitat restoration for the endangered Gouldian finch, which is threatened by inappropriate fire regimes in northern Australia
- rehabilitation of fire trails and walking tracks following the Australian Alps bushfires of 2003
- fire management workshops with Indigenous owners, pastoralists and ecologists to develop a fire management plan for Anangu Pitjantjatjara land in South Australia
- sustainable fire management of eucalypt woodlands in the central rangelands of Queensland.

Source: Department of the Environment and Heritage submission.

6.7 Indigenous Australians' use of fire

There is widespread acknowledgment that Indigenous Australians' burning over more than 40 000 years has played a central role in shaping the biodiversity of Australia. In recent decades there have been major advances in understanding the ways Indigenous Australians use fire⁹⁸ – to hunt; to promote new grass, which attracts game; to make the country easier to travel through; to clear country of spiritual pollution after death; to create fire breaks for later in the dry season; and for a variety of other reasons.⁹⁹

As noted in the report of the inquiry into the 2002–03 Victorian bushfires¹⁰⁰, it should be recognised that some areas of the continent might not have been subjected to managed fire for reasons of population size and resource availability. Furthermore, an essential element of traditional Indigenous burning is sophisticated and fine-scale application of fire to (and fire exclusion from) the landscape to achieve specific objectives. This approach contributes to the development of considerable variation in fire regimes within a region.¹⁰¹ Thus, Indigenous burning did not produce a single, uniform fire regime across large parts of the landscape.

Despite the transfer of lands back to traditional owners, native title and co-management agreements, traditional use of fire in the landscape has broken down over much of Australia, and the lack of it appears to be having an adverse effect on biodiversity conservation in several parts of the country, especially in the north and in Central Australia.¹⁰²

Resumption of active fire management and training of young Indigenous people is being pursued in several projects (for example, in Kakadu National Park, on Cape York and in parts of Arnhem Land¹⁰³) to ensure maintenance of the cultural and natural values of northern Australia. Northern Land Council projects (such as Caring for Country) support the re-introduction of traditional burning practices on Aboriginal land. Similarly, in Uluru – Kata Tjuṯa National Park traditional Anangu

⁹⁸ For example, Whitehead, P, Bowman, D, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25; Cary, G, Lindenmayer, D & Dovers, S (eds) 2003, *Australia Burning: fire ecology, policy and land management issues*, CSIRO Publishing, Melbourne, part V; Baker, R, Davies, J & Young, E (eds) 2001, *Working on Country*, Oxford University Press, Melbourne.

⁹⁹ Yibarbuk, D 1998, cited in Bowman, D, Cooke, P & Yibarbuk, D 2003, *Traditional and Non-traditional Viewpoints: Arnhem Land fire stories*, Tropical Savannas Cooperative Research Centre, < savanna.ntu.edu.au/information/ar/aboriginal_fire_management>, viewed 21 March 2004.

¹⁰⁰ Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 117–23.

¹⁰¹ Hill, R 2003, 'Frameworks to support indigenous managers: the key to fire futures', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and land management issues*, CSIRO Publishing, Melbourne, pp. 175–86; Liddle, L 2003, 'Fire in a jointly managed landscape – fire at Uluru – Kata Tjuṯa National Park', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and land management issues*, CSIRO Publishing, Melbourne, pp. 187–97.

¹⁰² Whitehead, P, Bowman, D, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25.

¹⁰³ Whitehead, P, Bowman, D, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25; Cape York project, <www.balkanu.com.au/projects/landresearch/firemanage.htm>, viewed 19 March 2004.

burning practices are engaged in together with the promotion of scientific knowledge.¹⁰⁴ The depopulation of Aboriginal people in significant areas (for example, the western Arnhem Land plateau) is a major obstacle to the re-introduction of traditional burning.

Initiatives such as these have the potential to ameliorate problem fire regimes over a large part of the continent and, in doing so, help resolve a number of other nationally significant concerns – notably greenhouse gas emissions and the wellbeing of Indigenous communities.

The loss and fragmentation of Indigenous knowledge in much of southern Australia mean that attempts to reintroduce Indigenous burning practices in these areas should be seen initially as experimental¹⁰⁵, rather than as a formula for best-practice fire mitigation and management – especially because the post-European settlement landscape is very different. Nevertheless, there are many potential lessons to be learnt from the way Indigenous Australians use fire.¹⁰⁶

Recommendation 6.4

The Inquiry recommends that fire agencies, land managers and researchers continue to work in partnership with Indigenous Australians to explore how traditional burning practices and regimes can be integrated with modern practices and technologies and so enhance bushfire mitigation and management in current Australian landscapes.

Box 6.10 Fire management in Western Arnhem Land

Western Arnhem Land, in the Northern Territory, is predominantly Indigenous land and an area of high natural and cultural values, including the highest level of biodiversity in the Territory. This remote environment, adjacent to and including endemic sandstone country, is under threat from contemporary fire regimes, among them frequent late-season fires. In 1997–98 a project was first funded to develop a long-term coordination approach to fire management in the region.

The project involves the documentation and implementation of traditional burning practices, applying a variety of fire management techniques, and the mapping of fires, vegetation and culturally sensitive areas. Partners in the project are Indigenous groups and the Jawoyn and Bawinjanja Associations, the Tropical Savannas Cooperative Research Centre, the Bushfire Council, Parks Australia, Northern Territory agencies, local tourism and mining interests, and pastoralists.

The project is leading to a reduction in late-season, intensive fires and their corresponding adverse impacts on fire-sensitive plants (including in the adjacent Kakadu National Park) and a reduction in greenhouse gas emissions. Traditional Indigenous burning practices have been re-introduced, with the accompanying cultural and natural environment benefits. The project was funded from the Natural Heritage Trust's Bushcare Program.

Source: Natural Heritage Trust, Northern Territory, *Fire Management of Western Arnhem Land*, Case study, <www.nht.gov.au/nht1/programs/bushcare/ntproj4.html>, viewed 19 March 2004.

¹⁰⁴ Department of the Environment and Heritage submission to the House of Representative Select Committee of Inquiry into the Recent Australia Bushfires, p. 11.

¹⁰⁵ Esplin, B, Gill, AM & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 12.

¹⁰⁶ See Cary, G, Lindenmayer, D & Dovers, S (eds), *Australia Burning: fire ecology, policy and land management issues*, CSIRO Publishing, Melbourne, chs 25–31.

7 Readiness



The interactive community education display vehicle that travels New South Wales attending local shows and events and conducting school education programs

(Photo: NSW Rural Fire Service)

Readiness is the third of the 5Rs. Many people think readiness applies only to fire agencies, but the Inquiry's view of readiness is more holistic, including communities as well. Readiness is everything that can be done before a bushfire event.

7.1 Community education, information and action

A comprehensive program of community education and public information is needed in all areas that are subject to the risk of bushfire. This education and information should focus on awareness of the nature and risk of bushfires, measures for preparing and protecting lives, property and the environment, and the timely provision of operational and safety information to the public in the event of a bushfire.

7.1.1 Relationship to overall bushfire mitigation and management

Community education and public information are central to several of the fundamental elements of bushfire mitigation and management that are discussed elsewhere in this report:

- *Australians' understanding of and attitude to bushfires.* Community education programs have a vital role – complementary to that of the school system – in communicating knowledge and information about bushfires. Such programs maintain people's awareness and the flow of information and support and increase individual and community readiness. See Chapter 3.
- *Risk modification.* Greater community understanding of and involvement in aspects of bushfire mitigation and management, such as risk awareness, prevention activity, capacity building and arson detection, increase community preparedness and decrease the impacts of bushfires. See Chapter 6.

- *Stay or go.* Individuals and communities at risk from a bushfire need sufficient information to allow them to choose between evacuating early or finalising their preparations for defending their well-prepared property. See Chapter 8.
- *Operational response.* Bushfire alert systems need to give communities clear and timely warning of the approach of a bushfire. The provision of operational information to the public is a central role of incident control centres. An informed public can add significantly to the protection of property during a bushfire while lessening the workload of, and risk to, fire, police and emergency services in the conduct of last-minute evacuations. See Chapter 8.
- *Recovery.* Inclusion of a structured public information strategy is a very important aspect of bushfire response and recovery plans. Direct community involvement is a vital element of recovery following a bushfire that has had major community consequences. See Chapter 9.

Although in the last decade or so fire agencies in Australia have sought to deal with each of these aspects of community education and public information, the events of the 2002–03 fire season brought into sharp focus the continuing challenges that need to be met.

7.1.2 Community engagement and public information programs

The background to community engagement for bushfire mitigation and management is discussed in Chapter 3. The Inquiry notes the substantial efforts of fire agencies in the development of community education and information programs. We also note the widespread belief among fire agencies and researchers that there is a need to build on these programs to engender a wider sense of shared responsibility in the community and consequent behavioural change to increase individual and community readiness.¹

Successful programs are based on the specific community's needs and style, and they work in with other important community objectives. This means engaging with each community and understanding what is unique about it. What needs to be avoided is lecturing the community. Programs for increasing interaction, improving preparedness and raising awareness must be flexible, adapting to suit the characteristics of the community and to empower them to act on their own behalf and share responsibility.

The following types of programs are operating in the states and territories.

Community information programs

States and territories have printed material and documents available on the internet, setting out preparation and response measures that need to be taken to safeguard people and property from bushfire.² The *Bushfire Information Booklet* distributed to all residents of the Australian Capital Territory is an example of such

¹ For example, Rohrmann, B 2003, 'Bushfire preparedness of residents: insights from socio-psychological research', in G Cary, D Lindenmayer & C Dovers, *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne, ch. 14.

² For example, the Tasmania Fire Service material, <www.fire.tas.gov.au/firesafetyandyou>, viewed 4 March 2004.

a comprehensive document³; its distribution was supported by an extensive print and television advertising campaign. That public information program is an example of what can be done in response to a major fire disaster. The challenge is to maintain a similar priority of effort in subsequent years, when there is likely to be less community interest and, often, less funding available.

Community engagement programs

Among the community engagement programs introduced and maintained by fire agencies are FireWise in New South Wales⁴ and the Australian Capital Territory⁵, Community Fireguard and Bushfire Blitz in Victoria⁶ and South Australia⁷, and the work of the Bushfire Ready Action Groups in Western Australia.⁸ Programs of this kind typically involve street or community meetings during which local bushfire hazards are identified and information on bushfire behaviour and personal and property protection is provided. If possible, local community organisations are involved. These groups receive information and guidance, but they have no organised fire-suppression role beyond their own property. They are not provided with protective clothing or basic fire equipment.

Volunteer fire brigades

Membership of volunteer rural fire brigades is a major way in which community members contribute to bushfire mitigation and management. On the basis of information collected by the Productivity Commission, the Inquiry estimates that there were some 180 000 volunteers in bushfire brigades across Australia in 2002–03.⁹ Without the contribution of these volunteers, bushfire response in Australia of the current scale would be financially prohibitive – and probably unachievable in practical terms. Support for volunteers and upholding brigade membership is discussed in Chapter 12.

Community-based fire units

In rural-urban interface areas in New South Wales, and more recently in the Australian Capital Territory, groups of residents under the sponsorship of fire agencies have formed community fire units. These groups, based on streets or small suburbs, are trained by the fire services and provided with protective clothing and a trailer or fixed cabinet containing basic firefighting equipment. The role of such groups is essentially to defend homes against ember attack, in support of and under the control of organised fire services, and to be involved in local bushfire-related community education and mitigation activities.

The report of the Victorian Inquiry recommended that the Country Fire Authority provide technical advice to Victorian community fireguard groups so that they can

³ ACT Government 2003, *Bushfire Information Booklet*, ACT Government Publishing Services, Canberra.

⁴ New South Wales Government submission, Rural Fire Service, p. 20.

⁵ <www.esb.act.gov.au>, viewed 4 March 2004.

⁶ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 132.

⁷ South Australian Government submission, December 2003, p. 9.

⁸ Bushfire Ready Action Group 2003, *Street Coordinators' Kit*, Fire and Emergency Services Authority of Western Australia, Community Safety Division, Perth.

⁹ Productivity Commission 2004, *Report on Government Services, Part D, Emergency Management*, Productivity Commission, Canberra, p. 8.14.

purchase equipment and protective clothing to respond to fires on their own land.¹⁰

The Inquiry supports the advice of the Tasmania Fire Service that the operation of these community fire units in fire suppression needs to be carefully managed to ensure that members of these groups are not encouraged to participate in bushfire situations that exceed their training, equipment and overall capabilities. New South Wales Fire Brigades has developed strict procedures, supervisory processes, and training for its community fire units, and in the last eight years has had no experience of volunteers acting beyond their capabilities or brief.

Finding 7.1

The community information and engagement programs conducted by the states and territories are generally comprehensive. Their effectiveness depends on community uptake and commitment. Community surveying needs to be done regularly to ensure that programs retain their relevance and are being delivered in ways that maximise community participation and understanding.

7.1.3 Research

The Inquiry notes and supports the research, by both CSIRO¹¹ and the Bushfire Cooperative Research Centre¹², into how community attitudes towards acceptance of bushfire and bushfire management strategies are formed and how community education and information programs might be further improved. Programs focused on bushfire risk and preparedness are also benefiting from coordination and a greater degree of consistency with programs dealing with other natural hazards.

Social and psychological research can make a contribution, not only to improving communications programs but also in the development of programs to promote community resilience. This is of particular importance at times of prolonged high bushfire risk (as occurred during the campaign fires of 2002–03) and during the recovery from major natural disasters. This is discussed further in Chapter 5.

7.1.4 Provision of operational information to the public

Chapter 8 discusses the provision of timely and comprehensive operational information to the public as a key responsibility of all incident management teams. This information should cover the status of the fire in question, the response measures being taken, a realistic assessment of areas potentially at risk, and preparations that members of the public can make.

Failure to provide consistent operational information in good time was one of the primary concerns expressed to the McLeod inquiry.¹³ Although the operational

¹⁰ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne.

¹¹ Gail Kelly, CSIRO Sustainable Ecosystems, Discussion with Inquiry 15 January 2004.

¹² Cottrell, A 2004, 'Understanding community needs, perceptions and attitudes', Research project, Bushfire Cooperative Research Centre, viewed 3 March 2004, <www.bushfirecrc.com>.

¹³ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, p. 177.

pressures in such situations are extreme, provision of information to enable the public to make informed decisions is essential for the protection of life and property. This is another part of the philosophy of shared responsibility discussed in Chapter 3.

7.1.5 The role of the media

The electronic and print media have an important role in informing the community about bushfire mitigation and management in preparation for each bushfire season and in providing up-to-date information during bushfire events. As demonstrated during the 2003 fires, the role of radio, in particular, is crucial, especially when power fails and television and world wide web services are unattainable.

At the national level, the Australian Broadcasting Commission has an agreement with Emergency Management Australia. Under this agreement, EMA regards the ABC as its primary mechanism for the dissemination of information to the Australian public during major disasters and emergencies where human life or critical infrastructure is at threat. The ABC itself is identified as an element of that critical infrastructure.¹⁴

Separate agreements exist between the ABC and agencies in Victoria and South Australia. These agreements are not exclusive, and emergency information will still be provided to other radio and television channels. Elsewhere, while formal agreements do not exist this does not necessarily mean that the ABC is unprepared to respond. In Tasmania, for example, a 'clear understanding' exists that the ABC is the main provider of extensive community service announcements and coverage when a fire event occurs.¹⁵

ABC Radio in the Australian Capital Territory, the southern areas of New South Wales and eastern Victoria often provided almost continuous coverage at the height of the 2002–03 fires. In these circumstances radio is the fastest and most flexible medium available to fire and police agencies and has the widest coverage. The contribution of ABC Radio has been consistently praised and the resources of its 66 stations nationwide provide services – particularly outside normal working hours – that commercial stations generally cannot emulate.

It is for this reason that the Inquiry supports the continuing development of agreements and arrangements with the ABC. We also encourage fire agencies to establish relationships with commercial radio stations, in order to provide the widest possible delivery of emergency messages to the public.

We note and support the Victorian inquiry into the 2002–03 bushfires recommendation that the Australian Communications Authority review commercial and community radio codes of conduct to ensure that they provide the necessary guidance to and explain the obligations of radio stations during emergencies and in relation to emergency warnings.¹⁶ We understand that draft

¹⁴ Document provided to the Inquiry, *ABC Emergency Relationships and Agreements*, February 2004.

¹⁵ *ibid.*

¹⁶ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 137.

revised codes for commercial radio have been issued for public comment as part of that review.¹⁷ We support the adoption of the revised code.

Recommendation 7.1

The Inquiry recommends that each state and territory formalise non-exclusive agreements with the Australian Broadcasting Commission as the official emergency broadcaster, providing an assured standing arrangement. Similar protocols with commercial networks and local media should also be established.

The Inquiry notes that most states and territories provide media training in fire ground safety and awareness, with the aim of contributing to the safety of media personnel on the fire ground and accurate presentation of operational fire information.

One unresolved matter highlighted in the Victorian inquiry concerns the need to coordinate the provision of operational bushfire information through the media when a bushfire event involves agencies from more than one jurisdiction.¹⁸ Arrangements need to be formalised to ensure that media information about such things as fire bans, road closures and the progress of the fire is consistent.

7.1.6 Other communication channels

The media are not the only means whereby fire authorities can communicate with the public, both during a fire event and more generally. Other channels that are of great value during major fires are call centres and the world wide web, both of which were used very successfully during the Canberra fires. Public meetings and briefings are another form of communication used very successfully during the Victorian fires. This latter approach is discussed further in the report into the Victorian fires.¹⁹

Community awareness and education programs should be developed for general and specific audiences and be accessible via the internet, school curricula and fire service volunteers trained as education facilitators, as well as through a range of promotional activities.

Box 7.1 Canberra Connect < www.canberraconnect.act.gov.au >

Canberra Connect is the Australian Capital Territory Government's information portal, providing multi-channel information systems where information can be obtained in person at shopfronts, through a phone call or via the world wide web. The ACT Emergency Services Bureau has made arrangements with Canberra Connect to act as a call centre during major fire events and other emergencies. This allowed the Bureau to provide fire information to Canberra Connect, so that it became a non-stop information source that was additional to the provision of information through the media.

¹⁷ Commercial Radio Australia Ltd 2004, *Review of Commercial Radio Codes of Practice*, Explanatory note, Sydney, p. 27.

¹⁸ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 214.

¹⁹ *ibid.*, ch. 23.

7.2 Operational communications

Effective operational communications are an important element of rural firefighting. They are vital for delivering information promptly, having a direct impact on firefighter and community safety as well as on operational performance. Shortcomings in communications systems have been a recurrent theme in past coronial inquests and independent inquiries.

7.2.1 History

After Cyclone Tracey had devastated Darwin in 1974, it became apparent that Australia needed dedicated radio frequencies to ensure interoperability for police and emergency services. Sixty-four channels were allocated for this function and were managed by police forces. Over time, however, the purpose of this police ‘block’ of 64 channels was lost and the channels’ availability for emergency services was not maintained. The first opportunity for emergency service interoperability vanished.

In 1991, in an effort to improve productivity and reduce spectrum congestion, the states and territories began reviewing their spectrum use and converting from single-channel radios – which are inefficient in their use of spectrum – to multi-channel radios. Some jurisdictions chose to operate these new systems in the very high frequency (30–300 megahertz) band; others chose the ultra high frequency (300–3000 megahertz) band. These decisions restricted opportunities for interoperability.

7.2.2 Interoperability

‘Communications interoperability’ refers to the ability of two or more agencies to communicate effectively. Interoperability within states and territories is a jurisdictional matter, with governments commonly seeking to resolve the challenge through ‘whole-of-government’ radio systems.

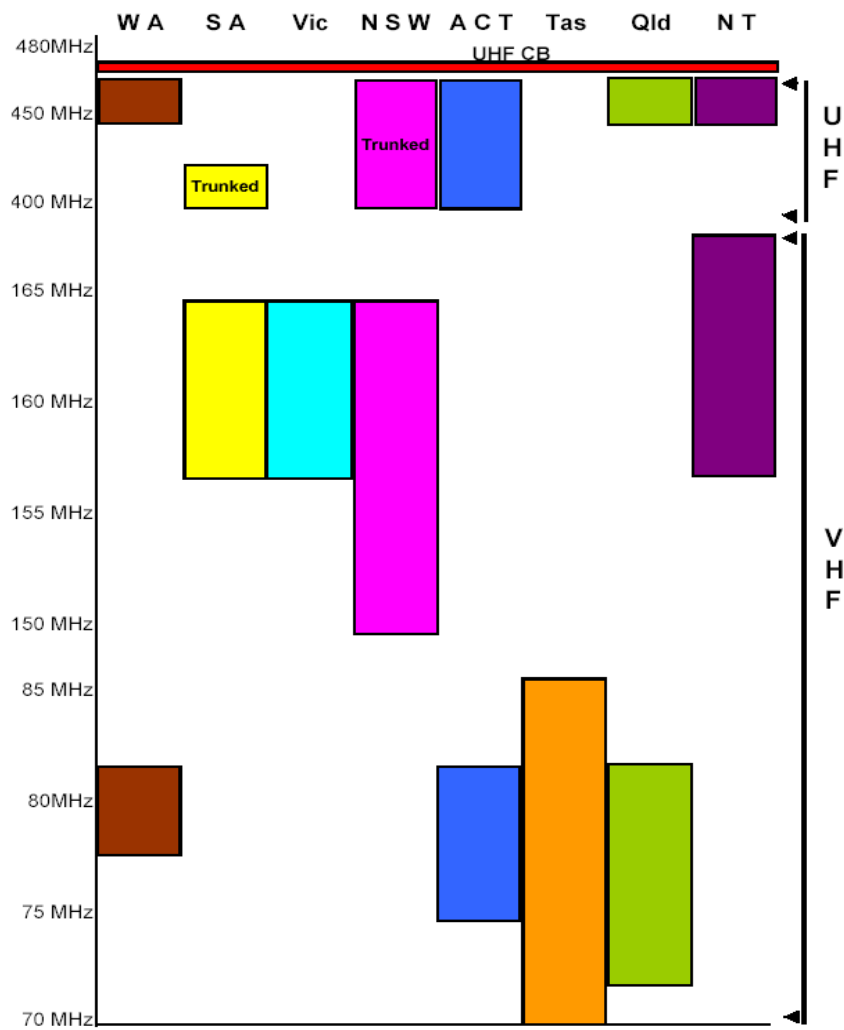
For cross-border operations and when firefighters deploy with their equipment for operations in other jurisdictions, there would be considerable benefit if the operational communications systems were compatible. This is not the case. The various states and territories generally do not operate the same bushfire operational communications systems. This is the cause of considerable frustration at the local level and is a general impediment to state and territory and national decision making. Nevertheless, resolving the problem is complex for a number of reasons.

Operational fire agency communications are the responsibility of the states and territories. The systems are expensive, have long lead-times for acquisition and implementation, need extensive infrastructure, and tend to have a nominal ‘life’ of 15 years. Each state and territory manages equipment procurement under its own rules and processes. In addition, the ages of existing systems differ. For example, the Australian Capital Territory is currently procuring a system at a time when other jurisdictions are not making a similar purchase. Compatibility concerns with New South Wales are delaying the process.

Factors such as these have led to uncoordinated use of specific frequencies across jurisdictions and between agencies. While New South Wales, Victoria and South Australia have moved to a whole-of-government approach, in practice the 'whole-of-government' generally means 'most-of-government', and the exceptions might further reduce opportunities for compatibility.

Figure 7.1 that has been prepared by the Inquiry shows the existing allocation of radio frequency bands to Australian rural fire services.

Figure 7.1 Fire agencies' radio frequency bands



Note: VHF is very high frequency (30–300 megahertz); UHF is ultra high frequency (300–3000 megahertz).

7.2.3 The future

The Australian Communications Authority is the spectrum regulator and coordinates frequency allocations on behalf of all jurisdictions, in accordance with the *Radiocommunications Act 1992*. The Inquiry discussed the question of interoperability with the Authority, attempting to identify how existing problems might be resolved. Two initiatives became apparent.

The first entails commitment and political will. Two committees have recently considered the need for interoperability across emergency services. In 2001 New South Wales, Victoria and South Australia, as well as the Department of Defence, the Australian Customs Service, the Australian Federal Police and Emergency Management Australia, approached the Communications Authority, seeking interoperability between emergency services. Subsequently, the Inter-governmental Spectrum Harmonisation Committee, involving all jurisdictions, endorsed the idea of a common technology platform to achieve interoperability in emergency services communication.

This goal is now being pursued through the National Coordination Committee for Government Radio Communications, which has gained high-level support and is developing a strategic plan for attaining interoperability across Australian emergency services. Although there is no specific time frame, the commitment to a common strategic goal is encouraging. The progress thus far partly answers the call for achievement of a national goal, as expressed in the independent 'Report on communication issues' commissioned by the House of Representatives Select Committee on the Recent Australian Bushfires.²⁰

The second initiative concerns technological developments. In parallel with this government approach are technological improvements. Although currently only at the conceptual stage, a 'software-defined radio', also referred to as an 'adaptive radio', is receiving increasing support. This technology involves a computer-driven radio that effectively searches available spectrum in order to achieve interoperability.

7.2.4 Local alternatives and consequences

On the fire ground, practitioners make the existing arrangements work. For cross-border situations, the Inquiry was advised that Victorian and South Australian rural fire services have purchased the radios used by each service to ensure interoperability.²¹ Fire appliances along the border have an additional radio installed. In the Australian Capital Territory during the 2002–03 fires, interstate taskforces operated their existing communications systems back to a control centre, where information could then be exchanged with ACT firefighters. This provided a measure of operability and there was some exchange of personnel and vehicles to further facilitate liaison, together with face-to-face meetings and the occasional exchange of hand-held radios.

An alternative is the use of ultra high frequency citizen-band radios. These radios are used extensively by rural landholders, many of whom are rural fire brigade members. It is an open system that can be accessed by anyone with the necessary, commercially available, equipment. Although favoured by many property holders during local bushfire events, CB radio is not supported by fire agencies for fire-ground command communication because of a lack of guaranteed access, limited coverage, and uncontrolled use of the band. Fire agency communications need to have sufficient coverage and capacity and assured accessibility to provide command and control communication.

²⁰ Parry, B 2003, 'Report on communication issues', in House of Representatives Select Committee on the Recent Australian Bushfires, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, app. F.

²¹ Across Border Joint Working Party submission.

Introduction of more sophisticated operational communication systems has had some unintended consequences. A number of past and current operational communication systems could be 'monitored' by members of the public, which provided a degree of reassurance for spouses and partners of firefighters deployed locally. The systems were also an important source of information for members of the community wanting immediate local information about a fire. The more sophisticated radio systems now being introduced generally deny public access. This particularly applies to whole-of-government systems, which includes the police.

7.2.5 Conclusion

A clear goal of establishing a single national emergency management communications approach is required in the short to medium term. Natural disasters and other emergency events increasingly require a multi-agency response, and interoperability will be a continuing requirement. Committees have been established to facilitate a common approach; subsequent implementation of their decisions will produce a longer term, strategic outcome.

Finding 7.2

The Inquiry supports the efforts of the National Coordination Committee for Government Radio Communications in seeking to develop a national strategic plan to enable interoperability of emergency service radio communication across Australia.

7.3 Surge capacity

As part of Australia's national bushfire readiness planning, there needs to be a structured and practised ability to call on additional capacity to meet the demands and consequences of major and prolonged bushfire events. This additional capacity includes response elements such as firefighters, tankers and aircraft; police and other emergency services; public information; health and community recovery services, and is just infrastructure services including, roads, telecommunications, water and gas.

For government agencies and government-owned companies planning can proceed with some certainty and exercises can be conducted to practise requirements. For community organisations and commercial enterprises there needs to be a sound understanding of expectations and limitations.

While well-balanced communities have an inherent potential to respond to emergencies, major natural disasters such as large bushfires can quickly exhaust local resources and regional, jurisdictional and eventually national capabilities need to be engaged.

Australia is fortunate that these resources are generally made available. The Inquiry received positive comment regarding the provision of additional support during the 2002-03 bushfire emergencies. In addition, bilateral arrangements between jurisdictions operated effectively facilitating the movement of resources across borders. Some concern was expressed that the community service obligations of all infrastructure providers should include a requirement that the

maintenance and restoration of supply during and after emergencies will be a priority.

Finding 7.3

Emergency services' readiness for and response to bushfires is reliant not only on the movement and concentration of firefighting resources but also on the assured availability of recovery services and infrastructure support such as telecommunications. Community service obligations of suppliers should include this requirement.

8 Response



Volunteers and staff from various states and agencies formed incident management teams to manage fires in Kosciuszko National Park in 2003.

(Photo: NSW National Parks and Wildlife Service)

Most aspects of operational response are the responsibility of state and territory fire authorities. Generally, they are not matters that require national policy. The matters discussed in this chapter do, however, have implications for national capability, and failure to deal with them will limit the efficiency and effectiveness of the national bushfire response effort.

8.1 Operational response

The reports of previous bushfire inquiries and submissions to this Inquiry raised several concerns and themes that are relevant to the efficiency and effectiveness of bushfire management nationally.

8.1.1 National coordination

Rural firefighting in Australia has a history of developing ‘from the bottom up’, and much of its efficiency and effectiveness derive from this approach. Each state and territory has established control and coordination arrangements (see Chapter 10 and Appendix E), obviating the need for a national centre. Further, interstate requests and deployments currently occur on a bilateral basis, with facilitation when necessary by the Australasian Fire Authorities Council.¹ The existing coordination arrangements at the state and territory and national levels are sufficient and cater for an all-hazards approach. The Inquiry sees no advantage in developing a national coordination centre and, although similar centres operate in some other bushfire-prone countries, it sees no need for such a facility in Australia in the foreseeable future.

Finding 8.1

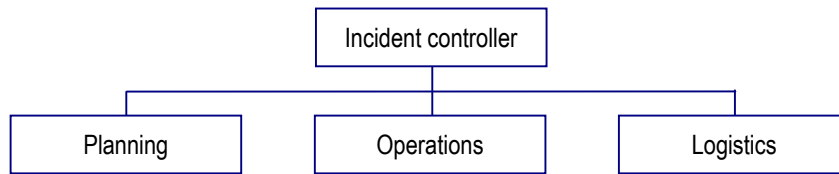
The current all-hazards control and coordination arrangements at the national and state and territory levels are adequate for the operational management of bushfires in Australia.

¹ Australasian Fire Authorities Council Guidelines – ‘Mutual aid and resource sharing’, August 2003; ‘Interim Interstate/International Incident Support Plan’, December 2002 – AFAC, Melbourne.

The fundamentals of the system

The Australian Inter-service Incident Management System, or AIIMS, Incident Control System was developed in Australia during the mid-1980s; it is based on the US National Inter-Agency Incident Management System. The Australian System has been progressively implemented since the late-1980s, and the formation of the Australasian Fire Authorities Council in 1993 provided a significant impetus for its wider adoption. Through consultative committees, the Council leads the development of details of the System and much of the related training material.² All Australian fire authorities are now committed to managing fire incidents within the AIIMS framework.

At its simplest, the Incident Control System divides incident management into four distinct roles:



This structure provides for the incident controller to hold overall responsibility for managing the incident in question. An incident might initially involve only one fire appliance and crew, with the crew leader taking on all four roles. As the incident develops in size or complexity the size of the management team adjusts accordingly, but the management functions remain as shown.³

The AIIMS Incident Control System is a tool for incident management and highlights the reality that managing large incidents is complex and difficult. Large rural fires become complex, fast-changing incidents because of the number of resources (fire appliances, aircraft, communications, media, firefighters and support personnel) that must be managed, together with a mobile group of local residents. Often such fires are rapidly developing and unpredictable, further adding to the complexity. A degree of confusion has often been considered the norm. Effective management of such large and rapidly developing incidents remains one of the greatest challenges for fire authorities and calls for a structured focus and allocation of sufficient resources if authorities' performance and outcomes are to improve.

Finding 8.2

Effective management of large rural fire incidents remains one of the greatest challenges for fire authorities. If bushfire management performance and outcomes are to improve, the necessary focus and resources must be directed to this end. The AIIMS Incident Control System offers the means to achieve that.

² Australasian Fire Authorities Council submission, p. 9.

³ *ibid.*, p. 3.

Review of and enhancements to the system

The Australasian Fire Authorities Council recently concluded a review of the AIIMS Incident Control System, to improve the development of training methodologies and performance on the fire ground.⁴ The review aimed to understand how agencies currently applied the System and what improvements should be incorporated to improve its practicality and uptake. The review was also informed by comments made in various coroners' reports and independent inquiries into major bushfires – see Appendix C.

The Inquiry into Operational Response to the January 2003 Bushfires in the ACT found that the application of the System had been modified, leading to incident controllers not being able to manage the entire response, while the higher level headquarters focused too much on the management of detailed information.⁵ The report on Victorian fires found that the System had not been fully implemented in operational areas of the Country Fire Authority, while incident control centres, although needing to be safe and practicable in terms of available infrastructure, should be located closer to the fire area.⁶

The Australasian Fire Authorities Council considers the Incident Control System to be the basic building block for the establishment of effective standing protocols for liaison and coordination within and across agencies. Through greater understanding and a common language and approach to emergency management, the System also facilitates emergency management arrangements at the state and territory and national levels.

The Council's review revealed that the core of the Incident Control System is meeting the needs of agencies that use it – predominantly fire and land management agencies. There has been a marked improvement in the management of incidents, particularly of more complex incidents of larger size and involving more than one authority.

In addition to commonality of approach, use of the System has led to greater cooperation between using authorities, through pre-planning, joint exercises and agreement on specific details of operational procedures. Nevertheless, although there is now broader acceptance of the core System compared with 10 years ago, the complexities of rural fire management are still not fully understood by some fire managers and fire authorities.

Police and other emergency services that do not use the system are able to mesh their protocols with those of fire authorities through the AIIMS framework. Nevertheless, the Inquiry sees merit in the Australian Emergency Management Committee considering whether there is scope to accommodate changes that could lead to more widespread adoption of the framework for all emergency incidents in all jurisdictions.

This Inquiry is of the view that a wider examination of implementation of the System in the management of other large-scale disasters, and indeed all hazards,

⁴ *ibid.*, p. 9.

⁵ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, pp. 121–8.

⁶ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 187–8.

would be worthwhile. This matter was not dealt with *Natural Disasters in Australia*, in the recent report to the Council of Australian Governments.

As the Victorian Inquiry noted, following the events of 11 September 2001 the United States Government directed that the response and emergency management plans of all agencies include an appropriate multi-agency incident management system.⁷ The Inquiry further noted that on 1 March 2004 the US Office of Homeland Security approved the adoption of a new National Incident Management System (NIMS) for all types of hazards and emergencies. That system includes an Incident Control System that is almost identical to the proven AIIMS model. The Australasian Fire Authorities Council supports the adoption of a single national incident control system where fire and emergency services are likely to be 'first responders'.⁸

Analysing the 2002–03 bushfire events in Australia offers an opportunity to consider the adoption of a single emergency management system in this country and what could be done to change the situation. The re-affirmation of the Incident Control System as the single emergency management system in the US suggests that AIIMS is a good platform for an Australian system.

Recommendation 8.1

The Inquiry recommends that implementation of a single Incident Control System for the management of multi-agency emergency incidents be further examined by the Australian Emergency Management Committee, with a view to developing one nationally agreed system.

The Incident Control System in the international context

Australian agencies assisted the United States during fire emergencies in 2000⁹ and 2002. Faced with the challenge of long-running fire seasons, US authorities took the step of seeking international assistance from Australian and New Zealand fire authorities. The key requirement was for trained incident management team personnel.

In both of those years, a contingent of qualified incident management team members transferred to the United States for six to eight weeks. In 2003 a number of US staff assisted in Australia in reciprocal exchanges. The benefit of using compatible incident management systems was clearly evident and, although there were differences in small plant, tools, vegetation and terminology, it is significant that the underlying system principles were sufficiently alike to allow almost immediate injection of visiting incident management team members. Their participation was effective, with minimal need for pre-deployment briefing and education.

Similarly, the successful integration of interstate resources, across Australia, is now seen as the norm rather than the exception. There are many good examples of

⁷ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 189.

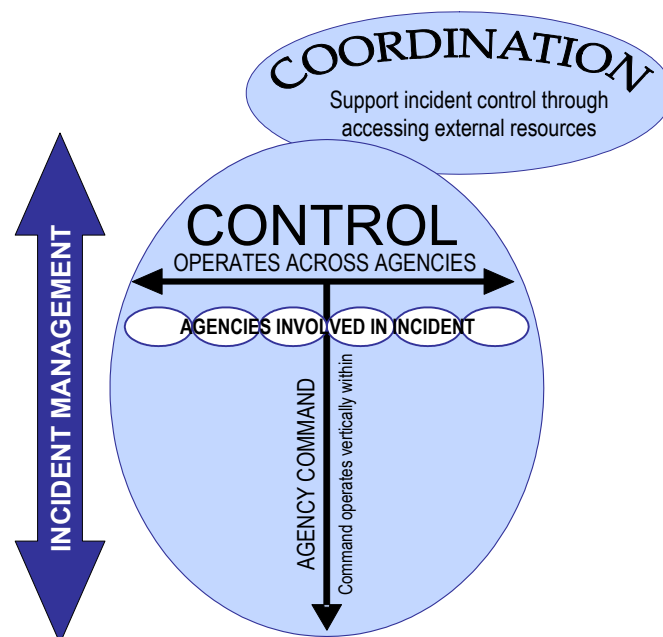
⁸ Australasian Fire Authorities Council submission.

⁹ Sneeuwjagt, R 2000, *Review of the Australia – New Zealand Fire Fighting Deployment to the United States*.

effective integration of interstate agencies with New South Wales agencies during assistance efforts the 2001–02 and 2002–03 fire seasons.

Globally, fire managers have increasingly accepted the value of a common system of management. At an international fire conference in Sydney in October 2003 – the 3rd International Wildland Fire Conference – a summit concluded that in many countries there are multiple agencies with responsibility for rural and forest fires. It further concluded that the lack of a robust, clearly defined management system is often found to be a barrier to effective fire management in developing countries. The summit strongly endorsed the concept of a common incident control system to apply in all countries that wished to participate in assistance exchange programs in future, as either providers or receivers of assistance.¹⁰

Figure 8.1 The relationship between the functions of command, control and coordination, as facilitated through the AIIMS framework



Source: Australasian Fire Authorities Council 2004, *The Australian Inter-service Incident Management System*, 3rd edn, Version 1, draft.

Improving the System

The Australasian Fire Authorities Council's review of the AIIMS Incident Control System identified some potential improvements that would require authorities to develop revised standard operating procedures and training materials in areas such as aircraft operations and fire-ground safety. These improvements are currently being incorporated in a revised Incident Control System manual; they include a role for a 'safety adviser' and discuss the requirement to take account of community needs and the integration of 'local knowledge'.

The Inquiry strongly endorses these changes. We received considerable comment, directly and through previous inquiries, about a perceived lack of use of local knowledge. This is discussed more fully in Section 8.1.3; suffice to say here that, as

¹⁰ International Wildland Fire Summit 2003, *Summit Communique*, 8 October, p. 3

reported in *A Nation Charred*¹¹ and the Victorian report on the 2002–2003 Fires¹², many rural landowners and volunteer firefighters consider that using the AIIMS Incident Control System stalls decision making and discourages the input of local knowledge.

The Inquiry acknowledges the significant benefits afforded by the Incident Control System, but it is also of the view that authorities have failed to adequately ‘sell’ the values of this management and control framework to agency firefighters and local landholders. The following exemplifies much current opinion: ‘We have moved from the days when volunteers went out and got the job done to a point where a bureaucracy sits on the side of the road and wonders what to do next’.¹³

Adjusting the System so that it better accommodates the use of local knowledge, as well as safety responsibilities, should change current perceptions.

An important observation needs to be made in connection with local knowledge. Although the inclusion of such knowledge in the Incident Control System for bushfire operations is critical, managing large fires is complex and demanding and has consistently been underestimated by many involved. People with vital local knowledge might not always be best placed or have the required competencies to manage large incidents. This can lead to local firefighters feeling they have been excluded from decision making or have been ‘taken over’ by fire managers brought in from elsewhere. This need not be the case if tact and awareness are displayed. The training provided to military personnel to develop operational management competencies is instructive in highlighting the effort required to effectively manage ground and air operations on a large, complex fire ground. Local firefighters might not have the opportunity to gain such skills and experience.

Recommendation 8.2

The Inquiry recommends that the AIIMS Incident Control System be adjusted so that it adequately allows for the identification and integration of local knowledge during firefighting operations.

Delayed initial attack

The Inquiry is also aware of a perception that implementation of the AIIMS Incident Control System can reduce the speed and effectiveness of the initial attack on bushfires. Although we did not investigate individual incidents, we did form the view, having reviewed other inquiry reports, that delays in initial attack during the 2002–03 fire season were more a result of existing response plans dictating specific actions rather than implementation of the System. We saw no evidence to suggest that use of the System slowed the initial response to bushfires.

¹¹ House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, pp. 143–8.

¹² Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 194–6.

¹³ Western Australian Farmers Federation (Inc.) submission, November 2003.

Informing others

Another matter requiring emphasis in reviewing the AIIMS framework concerns the role of informing those outside the fire agency. This includes keeping government and other authorities (such as those involved in state and territory disaster arrangements) up to date – as well as the public. This function must be viewed as a core role. It cannot be seen as a duty additional to ‘fighting the fire’. Nor can it be assumed that adequate information is reaching the public. Every effort must be made to facilitate the prompt provision of advice: this calls for the establishment of long-term, effective relations with the media and government information services. This is discussed in Chapter 7.

Recommendation 8.3

The Inquiry recommends that a central function of the AIIMS Incident Control System be the flow of adequate and appropriate information to threatened communities, government, police and other emergency services authorities. The incident controller should have overall responsibility for this.

National benefit

The Inquiry is satisfied that the recommendations from the Australasian Fire Authorities Council review of the AIIMS Incident Control System – once implemented in all states and territories and consistently applied – will provide fire authorities with the optimum available management structure for bushfire operations. Authorities should avoid making local adjustments, which have proven problematic¹⁴ and limit the application and flexibility of the System during interstate deployments.

Recommendation 8.4

The Inquiry recommends that all Australian fire authorities adopt and continue to use the AIIMS Incident Control System in accordance with Australasian Fire Authorities Council guidance and policies.

8.1.2 Best use of local knowledge

The Inquiry takes ‘local knowledge’ to mean both knowledge of the local environment and knowledge of previous fire events. Use of local knowledge is essential during planning and in order to capture detail often not recorded on spatial information sources. How this local knowledge is acquired can vary. It can be provided by a member of local government, a long-term resident, or anyone with detailed knowledge of the area. It does not require the direct involvement of a local firefighter. Local fire knowledge, however, is more specific and generally should be provided by a local firefighter or landowner.

It is essential that during bushfire response fire authorities acknowledge and use both forms of local knowledge, accommodating this function within the AIIMS

¹⁴ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, pp. 121–8.

framework. Failure to do so erodes the credibility of fire authorities and the framework and reduces the effectiveness of the response.

Efforts have been made to ensure that local knowledge is received and used; an example is the direction by the Bush Fire Coordinating Committee of New South Wales that, 'Under a section. 44 appointment, the Incident Controller will form an IMT [incident management team]. The IMT must include a person who has local knowledge of the area and can assist the IMT in effecting fire activities'.¹⁵

This is not the only way in which local knowledge should be valued. Local knowledge should be collected on an ongoing, long-term basis and be included in fire management and response plans, with individuals being identified as suitable sources of local knowledge well before a fire event occurs.

Finding 8.3

Failure to acknowledge and use local knowledge erodes the credibility of fire agencies and the AIIMS Incident Control System, ultimately reducing the effectiveness of the national bushfire-response effort.

8.1.3 Decision making within a safety framework

In the last 10 years rural fire brigades have increasingly focused on the safety of firefighters. Although safety has always been a high priority, recent coronial inquests and changes to legislation in some jurisdictions have further highlighted its importance. Responsibility has been passed to controllers at all levels, and a strong 'safety first' culture exists in all rural fire agencies. This is to be commended. In addition, jurisdictions are considering appointing safety advisers and introducing further technical improvements to reduce the risk of personal injury.

While no fire agency expects firefighters to engage in activities that are unsafe, the expectations of members of the public – resulting from their lack of understanding – are less clear. Everyone on the fire ground has a responsibility for safety and for maintaining individual awareness of unsafe activities. Firefighting will always be risky, but training, protective measures and comprehensive forms of operational support reduce the risk.

It became apparent to the Inquiry that there is a need for greater mentoring of people in the field. We were advised of the reduced field experience of many fire managers, particularly in land management agencies. Mentoring for less experienced firefighters (including fire managers) is critical, particularly when balancing the requirements of safety with attaining operational objectives. Well qualified but inexperienced firefighters cannot be expected to make effective operational decisions on the fire ground without receiving through sound mentoring and the opportunity to seek further guidance. Fire agencies should make greater efforts to offer and support mentoring on the fire ground: the alternative could be inappropriate decision making by fire managers, including taking no action at all.

¹⁵ New South Wales Bushfire Coordinating Committee Policy, January 1999.

Finding 8.4

The Inquiry commends the ‘safety first’ approach adopted by fire agencies. This approach does, however, highlight the need for effective mentoring to complement formal training. It is not sufficient to rely on technical qualifications and competencies alone.

8.1.4 A common national alert system

The states and territories do not use consistent phraseology and intensity indicators when advising the public about potential and current bushfire events. In isolation, this variation appears of little consequence, but when it is reflected against an increasingly mobile Australian population the need for greater consistency is clear. Particularly during the summer months, at the height of the bushfire season, many Australians move from cities to coastal and rural locations where bushfire threats are high. This often involves crossing state or territory borders.

The inconsistency in fire warnings is in contrast to the national cyclone warnings developed by the Bureau of Meteorology, which apply across the Northern Territory, Queensland and Western Australia. In the Inquiry’s view, consistently formatted bushfire warnings should be used throughout Australia. These should apply in two circumstances:

- when providing fire ban advice as a result of predicted fire weather
- when advising local communities of the level of threat posed by a current bushfire.

The provision of fire ban advice is already well structured across jurisdictions, even though some of the terminology is inconsistent. The Inquiry considers it would take little effort by state and territory fire authorities – possibly through the Australasian Fire Authorities Council in collaboration with the Bureau of Meteorology – to standardise fire ban information provided to the public.

Development of a consistent ‘current bushfire threat’ warning is more problematic but in the Inquiry’s view more pressing since this warning is generally portrayed less consistently. The *Natural Disasters in Australia* report to the Council of Australian Governments considered the question of a national warning system and made a number of recommendations in that regard.¹⁶ These included:

- obligations to media to broadcast warnings
- development of best-practice guidelines for local area warnings
- that warning systems be regularly reviewed.

In addition to those recommendations, and while not limiting any future deliberations, the Inquiry considers that such a warning system should include the following:

¹⁶ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, pp. 31–2.

- a consistent warning signal at the beginning of the advice when lives are at risk or there is a major threat to property
- the location, size and intensity of the bushfire threat
- the expected movement of the fire front and identification of threatened communities or properties
- advice on appropriate action by residents or community members under threat.

Box 8.1 The Standard Emergency Warning Signal

The Standard Emergency Warning Signal was devised by the Australian Acoustic Laboratories on behalf of the Bureau of Meteorology in the 1990s. It is now 'controlled' by Emergency Management Australia and is the authorised natural disaster warning signal. Because of its infrequent use in southern Australia, however, television and radio stations often have difficulty locating the Signal when they need to play it and the public is largely unaware of its significance. Reluctance to use the Signal when local communities are threatened by bushfire has led to the Signal being virtually ineffective as a national warning measure. The Inquiry considers that regular use of the Signal during periods of bushfire threat is warranted and should be adopted.

The Inquiry notes the Communicating Risk to Communities and Others project of the Bushfire Cooperative Research Centre. It considers this project should be afforded the highest possible priority.

Recommendation 8.5

The Inquiry endorses the recommendations on warning systems in the report *Natural Disasters in Australia*. In addition, it recommends as follows:

- that all fire ban advice and subsequent 'bushfire threat warnings' related to specific fires be conveyed consistently in all states and territories, including the use of the Standard Emergency Warning Signal when lives or property are threatened
- that the final structure of the warnings be based on the findings of the Bushfire Cooperative Research Centre's project Communicating Risk to Communities and Others.

Access to property and water

The question of access to property and water is essentially an operational planning matter reliant on effective policies and preparation at the local and state and territory levels. Despite being the subject of heated debate, it does not warrant national strategy consideration. The Inquiry noted, however, consistent comments in submissions and other inquiries relating to track access and water supply signage and use.

Effective and efficient fire suppression requires agreed standards and sound information about access to public and private land and water supplies. Fire trails and tracks are an essential element of fire mitigation, and inadequate, unmarked or poorly maintained access severely hinders firefighting (especially during the early stages of response) and represents a major safety concern. The Inquiry was made

aware of impediments such as poor track markings, discontinuous tracks at property boundaries, and tracks in public land that are poorly maintained or overgrown. Bushfires begin as small fires. If they can be reached quickly they can be extinguished in all but the most extreme conditions. A lack of track access inhibits this.

Similarly, the placement and maintenance of water access is an important aspect of planning that, poorly considered, will hinder bushfire-suppression efforts. Identifying static water supplies such as swimming pools and dams in rural-urban interface areas is relatively straightforward and has been dealt with in some, but not all, jurisdictions. Policies on the replacement of water used for firefighting should also be examined by all the states and territories. Again, these considerations need to be reflected in bushfire management plans.

There are sometimes good reasons for limiting track access in wilderness areas, with complexities associated with fire access and the provision of more tracks potentially leading to greater public access and feral animal incursions. Water accessibility can also encourage animal pests and affect biodiversity values. These are land management questions and are for the states and territories to manage and resolve.

Nevertheless, simple measures, such as consistent fire trail and water access marking signs, have the potential to be effective nationally and would provide invaluable assistance to visiting fire crews. The Inquiry expects that, through the Australasian Fire Authorities Council, fire agencies would be in a position to agree on these measures and potentially confirm them as common standard.

Finding 8.5

Fire access trails and water access are important, practical components of bushfire mitigation and management that are often inadequately considered. Consistent national markings adopted by all states and territories would benefit bushfire response, particularly for out-of-area fire crews.

8.1.5 Defence support

The Australian Defence Force has traditionally provided effective support during times of national disaster; examples are the aftermath of Cyclone Tracy in Darwin in 1974, during the Ash Wednesday fires in 1983, after the hail storms in Sydney in 1999, and during the 2003 fires in the Australian Capital Territory and Victoria. In numerous other events Defence resources have also been deployed to provide assistance. This has led to an expectation that the Defence Force, and Defence more generally, will be able to provide assistance to civil communities affected by natural disasters.

To its credit, the Defence Force has responded well when called on and has been keen to provide assistance where possible. It is very conscious that it is part of the Australian community and that it has an obligation to help the community, at the local and national levels, wherever possible. Defence has significant human and equipment resources, many 'combat ready' and deployable, making it well suited to responding to disasters. Defence Force personnel are trained and prepared to operate under difficult circumstances, in conditions that many members of the community would find uncomfortable.

Existing limitations

There are, however, limits to the assistance Defence can provide in response to major bushfires:

- Defence Force personnel are generally not trained in the competencies required for bushfire-fighting operations, nor do they practise those skills. As discussed elsewhere in this report, the introduction of national fire competencies – largely in response to safety concerns – requires that all personnel on a fire ground be qualified in basic fire competencies. This poses an immediate limitation on Defence Force personnel becoming directly engaged in firefighting operations.
- The Defence Force – in particular the Australian Army – has moved a large number of its personnel to northern Australia, thus reducing the number in southern and eastern Australia. Of those personnel remaining in the south, many are directly engaged in standby security operations, which means they are unavailable for other tasks, or are undergoing training.
- Further, fewer Defence Force personnel are engaged in non-combat roles. The Defence Force and the Department of Defence, like other Australian Government agencies, have focused on their core activities and have ‘contracted out’ many support functions that previously were undertaken by service people. There are, for example, fewer drivers, cooks, firefighters and land managers, since many of these functions are now performed by contractors. The result is a diminished ability to provide the level of Defence support previously deployed in response to natural disasters such as bushfires, particularly in southern Australia.

Public perceptions and expectations

Public perceptions and expectations of the scale and availability of Defence assistance do not reflect the limitations just discussed. A number of submissions to the Inquiry called for greater Defence Force involvement in bushfire fighting, in the belief that large numbers of Defence Force personnel were readily available and that significant numbers of vehicles, equipment and aircraft could be used to provide material benefit.

Perceptions of this nature are reinforced by the media focus on Defence Force involvement as a ‘pseudo indicator’ that an event has reached disaster proportions. The end result is that in the public domain there can be confusion about what Defence resources might be available and when they can be used.

Emergency Management Australia and the state and territory emergency management and fire agencies have a good understanding of both the nature of possible Defence assistance and the limits to that assistance. Over time, public expectations might be changed by focusing on the ‘supporting role’ Defence plays in major bushfires, while emphasising the well-developed ‘combat’ capabilities of fire agencies. Misconceptions might also be reduced if a simple brochure or pamphlet that clearly explains Defence’s policy and practical limitations were produced and made available to local government and authorities that do not often seek Defence support. While Defence expressed to the Inquiry concern about

it being portrayed as having limited bushfire-fighting capabilities¹⁷, we consider it is better to clarify expectations, rather than be criticised for not providing adequate emergency support.

Defence assistance to the civil community

The policy on Defence assistance to the civil community is set out in Defence Instruction (General) Operations 05-1, 'Defence Assistance to the Civil Community – Policy and Procedures'. The instruction makes it clear that such assistance should be regarded as the exception rather than the rule.¹⁸ Australian Government resources (including Defence assistance) can be made available if the state or territory authority lacks the necessary resources or skills or is unable to react with sufficient speed.¹⁹ Defence assistance that has the potential to be of benefit during bushfires includes appropriately trained personnel, vehicles (transport vehicles, fuel and water tankers, and heavy plant), aircraft and ground support, stores, supplies, accommodation and facilities.

Defence counter-disaster and emergency assistance comes within three categories²⁰:

- *Category 1.* This is emergency assistance provided by local commanders or Defence administrators from within their own resources for a specific task in localised emergency situations when immediate action is necessary to save human life, alleviate suffering, prevent extensive loss of animal life, or prevent widespread property damage. The assistance is generally short term – less than 24 hours.
- *Category 2.* This category covers emergency assistance beyond that provided under Category 1, in a more extensive or continuing disaster.
- *Category 3.* This is assistance associated with recovery from a civil emergency or disaster; it is not directly related to saving life or property. Assistance provided can include temporary bridging, shelter and power supplies, and the restoration of roads.

The provision of Category 1 assistance is a matter for local Defence commanders, while requests for Category 2 and 3 assistance are coordinated through Emergency Management Australia, which deals directly with Headquarters Australian Theatre. The Parliamentary Secretary to the Minister for Defence is the approving authority for such assistance.

Support in the 2002–03 fire season

The support provided by Defence during the 2002–03 fire season was substantial and included provision of base logistic resources such as catering, accommodation and stores preparation. Defence Force personnel (regular and reserve), Australian public servants and contractors provided various types of assistance – aircraft operations and ground support, fuel and water tankers, bulldozers and graders, field engineers, transport, liaison and operational planning support.

¹⁷ Australian Government response to draft report, 23 March 2004, Attachment B.

¹⁸ Defence Instruction (General) Operations 05-1, p. 1.

¹⁹ *ibid.*, p. 3.

²⁰ *ibid.*, p. 5 and Annex E.

Risk

The Inquiry has some concerns about the use of Defence Force aircraft for water bombing. Although Defence Force air crews have considerable overall skills and are very committed, they should not be placed in high-risk situations such as aerial water-bombing operations without the appropriate training. We do not doubt the technical competence, ability and intent of the crews involved. Defence advised us that crews and resources would not be tasked on activities unless appropriately qualified and would not continue to participate in an activity that was deemed dangerous.²¹ In our view, Defence should critically examine bushfire-firefighting tasks to ensure that personnel are appropriately trained.

Future support

Defence's provision of assistance, both locally and through Emergency Management Australia, in support of bushfire fighting is well practised and understood by all the relevant agencies. The support provided could, however, be made more effective if there were closer liaison between the requesting agency and local Defence Force commanders.

Support for fire mapping

Another important area where Defence has provided considerable assistance to bushfire fighting is its role in the establishment of the Sentinel Fire Mapping website.²² Following the 2001–02 bushfires in New South Wales and the Australian Capital Territory, the Defence Imagery and Geospatial Organisation initiated work on the development of a system for detecting and monitoring bushfires by using earth-observing satellite technology and web-based mapping. Sentinel is now managed by CSIRO Land and Water, in collaboration with the Defence Imagery and Geospatial Organisation and Geoscience Australia. The overall question of the provision of information systems and data to support bushfire mitigation and management is dealt with in Chapter 5.

Fire management and unexploded ordnance on Defence land

Defence advised the Inquiry that it acknowledged the Australian community's 'aspirations and expectations' in relation to the responsibility to manage the 'broad and diverse natural and cultural environmental resources over which it has management responsibility'.²³ It said it was very conscious of the numerous activities that occur on the Defence estate and potentially threaten environmental values, including causing bushfires as a result of military training, live-firing and vehicle manoeuvres. Defence's approach is to develop site-specific land management plans, with particular reference to fire management: 'Currently, all major training areas and facilities are covered by environmental management plans that incorporate fire management strategies and fire management implementation plans'.²⁴ Bushfire response on Defence training areas has generally been contracted out to the fire agency in the jurisdiction concerned.

²¹ Australian Government response to draft report, 23 March 2004, Attachment B.

²² <www.sentinel.csiro.au>, viewed 31 March 2004.

²³ Comment attached to the Department of Defence submission, 4 December 2003, p. 3.

²⁴ *ibid.*

One matter that was raised in discussions with the Inquiry by Western Australian fire and land management agencies relates to the risk to firefighters of unexploded ordnance during fire suppression on former Defence land.

There is a Commonwealth Policy on the Management of Land Affected by Unexploded Ordnance.²⁵ The Policy states that the Commonwealth is not considered liable for the continuing effects of unexploded ordnance contamination of lands where the Commonwealth has never had, or has disposed of, a legal interest.²⁶ Defence does have staff whose task it is to render safe unexploded ordnance and makes those people available on request. The Policy also states that, in particular cases, the Commonwealth may contribute to reducing the level of contamination, subject to the resolution of issues relating to the extent of the intended reduction, cost sharing and legal liabilities.²⁷ These are complex matters that are best addressed through direct consultations between the Defence Corporate Services and Infrastructure Group and the jurisdiction in question.

The impression gained by the Inquiry was that, putting aside Defence policy, more could be done locally to ensure that firefighters were aware of potential risks and, when required, could gain assistance from Defence in relation to unexploded ordnance. Locally, this is an emotive issue and, in the view of the Inquiry, Defence would do well not to rely simply on policy solutions.

Finding 8.6

- Defence has the capacity to provide valuable assistance in support of bushfire fighting, but it has a limited number of personnel with the necessary training to engage in direct firefighting operations. This is not always well understood by the public and should be better explained by Defence.
- The operating arrangements for Defence assistance to the civil community are effective, as is the coordination of that assistance at the local Defence command level and through Emergency Management Australia for larger scale or longer duration events.
- Defence support during the 2002–03 fire season was in all cases effective and well received.
- Matters relating to the possible presence of unexploded ordnance on former Defence land are emotive locally and require direct consultations between the Department of Defence and the fire agency concerned.

8.2 Aerial operations

Aircraft have been used in support of fire operations for many decades, especially in Canada, the United States and the Mediterranean region, where large fleets of aircraft are on standby during the fire season. The supply of firefighting aircraft is a major industry, with companies building and modifying aircraft specifically for firefighting operations.

In Australia aircraft have for many years been used for observation and monitoring of rural fires, and more recently they have been used for aerial

²⁵ Dated 19 May 1999.

²⁶ *ibid.*, p. 4.

²⁷ *ibid.*

bombing operations. In comparison with the United States, Canada and France, however, the scale of operations and the size of aircraft used have been small. Some larger capacity helicopters have been leased in recent years, but Australian aerial firefighting operations have generally tended to use agricultural aircraft and rotary-wing aircraft with either slung buckets or internal water tanks.

8.2.1 Aircraft use in firefighting operations: an overview

Aircraft can be used in a number of ways:

- for observation and reconnaissance – including detection of new fires, observation of fires, and mapping of fire boundaries using manual and global positioning systems and production of line scans of fire fronts using FLIR (forward-looking infra red) and other sensors
- for transporting crews and equipment to remote sites
- for aerial ignition through the dropping of incendiary devices into areas chosen for prescribed burning as part of pre-season bushfire mitigation or for back-burning operations during fires
- as a communications relay platform
- for suppression and water-bombing operations.

In all applications the use of aircraft depends on flying conditions: operations can be restricted or halted by factors such as smoke, dust and extreme weather.

Aerial bombing is the dropping of suppressant by aircraft. There are three types of suppressant:

- water – dropped directly onto the flames of the fire
- firefighting foam – used to expand the water bulk through bubbles and to help the water remain on vegetation, rather than immediately running off. Foam is also dropped onto the flames or at the edge of the fire
- retardant mix – a red phosphate that is dropped to form a fire break to slow a fire's spread or reduce its intensity, thus avoiding defoliation, back-burning or a mineral earth break. This is an expensive option and requires purpose-built equipment to mix the retardant slurry.

The use of aircraft for suppression and water-bombing operations is the most problematic application in terms of assessing effectiveness and value for money. The aircraft must be capable of readily collecting and dumping water. With helicopters, water is either scooped up by bucket or pumped through snorkels from water sources; fixed-wing aircraft require a suitable airfield with a water supply. In both instances the distance involved and the time taken to reload water tanks or buckets is of critical importance to the overall bushfire-fighting response. More sophisticated water-bombing aircraft have a suite of options for how the water is dumped – in what pattern and using a percentage of the load. This capability increases the effectiveness of the aircraft.

Airborne coordination is essential in the interests of safety in the air and on the ground. New South Wales, Victoria, South Australia and Western Australia use air attack supervisors to manage this risk and maximise the effectiveness of the aerial assets. Communication must also be maintained with ground crews, for constant awareness of their location and the ground attack plan.

Aircraft alone rarely put out fires. In nearly all situations there is a need for ground crews to play an important role in extinguishing the fire, including blacking out and ensuring that re-ignition does not occur. Air crew must be fully aware of where firefighters are on the ground, to avoid dumping of tonnes of water on them, which is dangerous in its own right and can lead to branches falling and structures collapsing.

Pilots' experience, competencies and training are also important. Although aircraft accidents during aerial bombing have been relatively few in Australia, the potential for pilot error during these high-risk, fluid operations – often undertaken in very difficult flying conditions – should not be underestimated.

Whether to use water, foam or retardant depends on the purpose of the bombing and the outcome sought. In environmentally sensitive areas chemical retardants generally may not be used because of their residual impact.

8.2.2 Effective use of aircraft for bushfire response

Media reports on the role of aircraft in bushfire response have given rise to unrealistic community expectations about the effectiveness of aerial operations. This is a matter of concern to bushfire authorities since aircraft are only one of a number of tools used for fire suppression. In its submission to the Inquiry, CSIRO commented:

Small to medium helicopters are no more effective in suppressing fires than crews with hand tools. Helicopters have the advantage that they can be deployed rapidly to fires while they are small but they have the disadvantage that the attack is not systematic or continuous. Even when multiple helicopters were used, the intermittent nature of their attack meant that sections of the fire that had been partially extinguished by the drops re-lit or burnt around the area of dampened fuel.

Helicopters are most effective when supporting ground crews who can work in a continuous manner to systematically surround fire. Helicopters can be used to reduce the intensity of the fire but more importantly they can detect and immediately suppress spot fires as soon as they occur beyond the fire line.²⁸

These comments are supported by the experience of fire agencies.²⁹ New South Wales argued that water bombing is not effective when the fire intensity reaches a threshold level about equivalent to the level that well-equipped firefighters can effectively knock down – that is, a flame height of about 3 metres.³⁰

These observations reinforced to the Inquiry the benefit of the early deployment of aircraft for aerial bombing – as soon as a fire has been detected – and a coordinated

²⁸ CSIRO submission, p. 63.

²⁹ New South Wales Rural Fire Service and Fire Brigades submission, p. 22.

³⁰ *ibid.*, p. 23.

effort with ground crews, to concentrate effort on the fire and ensure that what has been suppressed by aerial bombing is extinguished by ground crews.

8.2.3 A scientific basis for assessing effectiveness

Australia's approach to aerial operations in support of firefighting has generally lacked sufficient scientific evaluation. The effectiveness of water bombing and using other retardants was the subject of CSIRO's Project Aquarius in 1986. The Inquiry supports the Bushfire Cooperative Research Centre in giving priority to an evaluation of the cost-effectiveness and efficiency of aerial suppression techniques, particularly in conjunction with ground-based resources.

The intention of the Centre's research is to review current aerial and ground suppression tactics used in Australia, Canada and the United States. After a pilot study to assess Australian and overseas best practice in suppression, researchers will gather frontline wildfire data over three summers. The Project also includes an analysis of the effectiveness and optimum uses of aerial firefighting. The findings will include an assessment of the costs and benefits of suppression options and the provision of guidelines for optimising the use of aircraft and ground resources from an operational perspective.³¹ It is intended that the results of the Project will directly influence the work of the National Aerial Firefighting Centre and be factored into future arrangements.

The Inquiry received advice that Australia should increase the frequency of use and the size of aircraft for aerial bombing operations, particularly for deployment in high-risk areas such as the rural-urban interface. The Inquiry did not form a view about what should be the future magnitude of aerial support: it considers this cannot properly be determined until the Cooperative Research Centre has completed its research. In the interim, the Inquiry considers that the 2003-04 level of aerial support should be sustained.

Finding 8.7

The Inquiry encourages the Bushfire Cooperative Research Centre to place considerable emphasis on the aerial suppression elements of its firefighting technology project, being conscious of the three years planned to achieve a result. Early publication of results from the study will be an important contribution to the future work of the National Aerial Firefighting Centre. The appropriate extent of aerial support for bushfire fighting cannot properly be determined until the Bushfire Cooperative Research Centre has completed its research.

Finding 8.8

The Inquiry supports the approach taken in Victorian performance agreements, whereby aerial providers receive a proportion of the contract price dependent on satisfactory performance in such areas as safety, load performance, availability and communications. The Inquiry encourages the Bushfire Cooperative Research Centre to review this approach as part of its research.

³¹ Bushfire Cooperative Research Centre, research on firefighting technology project summary, December 2003.

8.2.4 Use of air support during the 2002–03 fire season

Overall, Australia lacks a common approach to the application of aerial support for operational firefighting. South Australia and Western Australia have aircraft, positioned in a designated zone, that deploy automatically on the sighting of smoke or the reporting of a fire to provide early intervention. The advantage of this type of approach in high-risk areas is that optimum use can be made of the aircraft at the optimum time – during a fire’s development.

Other approaches rely on aircraft being requested by incident controllers as part of the response to a developing fire. This method maintains a coordinated approach to the use of these high-value assets, but the benefit of the earliest possible intervention and aerial bombing may be lost. This is of particular relevance in critical areas such as the rural–urban interface and broad-acre forests.

Where major fires require aircraft deployments over long distances the value of a rapid initial response is lost, but aircraft can assist by water bombing to maintain a control perimeter, by extinguishing fires spotting outside a control perimeter, and by protecting infrastructure in the path of the fire.

When a fire is intense, uncontrolled and moving rapidly, however, aerial bombing has little, if any, effect. This is the time when uncoordinated use of aircraft can become a major problem, with aircraft operators flying and bombing the fire without specific objectives. The overall benefit to the firefighters on the ground in these circumstances is marginal. Such an approach can result in a period of high aircraft use at high cost but with little firefighting benefit. According to CSIRO:

To achieve efficient aerial suppression of wildland fires, optimum conditions on the performance of the air tankers, drop pattern (ie. footprint of the retardant drop) and retardant coverage are required for specific fuel and fire situations.³²

Such observations highlight to the Inquiry the need for better coordinated and planned use of aerial assets. We consider that after major aerial bombing there is a need for critical examination of the strategies used and learning from past experience. Such an assessment has already been made by the Victorian Inquiry into the 2002–03 Victorian bushfires³³, while the New South Wales Rural Fire Service is the major sponsor of the Bushfire Cooperative Research Centre project just referred to.³⁴

In summary, the Inquiry was advised that the most effective use of aerial bombing is during the early stages of fire development – in establishing and maintaining control lines and for the protection of assets in the path of a fire. In both cases it is of little benefit if it is not part of a coordinated effort with firefighters on the ground to achieve specific objectives. There appears to be general agreement on this in the fire industry, but the public often does not understand these limitations, and some aircraft operators may promote the use of aircraft regardless of effect or outcome. This self-promotion – together with the prominence in the media of large

³² CSIRO submission, pp. 63–4.

³³ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 22.

³⁴ New South Wales Rural Fire Service and Fire Brigades submission, p. 23.

heli-tankers – hinders rational explanation and use of aerial assets and clouds the question of cost-effectiveness.

Throughout Australia the use of aircraft is coordinated at the highest level, generally through a state-level coordination centre. The Inquiry supports this approach. In Victoria aircraft used by the Department of Sustainability and Environment and the Country Fire Authority are coordinated from a single State Aircraft Unit; in New South Wales aircraft used by the Rural Fire Service and the National Parks and Wildlife Service are coordinated through the State Aviation Desk. In the other states and territories aircraft are generally coordinated in a similar fashion, with a combination of agency staff operating from one facility, although arrangements may not be as formally established as they are in Victoria and New South Wales.

Table 8.1 details aircraft availability during the 2002–03 fire season; funding was entirely a matter for each state and territory.

Overall, the 2002–03 fire season, and to a lesser degree the 2001–02 season, saw unprecedented use of aerial operations. This was particularly the case with the campaign fires in New South Wales and Victoria; at the height of the 2002–03 operations in New South Wales, 103 aircraft were deployed on a single day.

Finding 8.9

The Inquiry considers that aerial fire suppression makes an important contribution to bushfire-suppression operations. We support the approach that the most effective use of aerial bombing is during the early stages of fire development, to establish and maintain control lines and to protect assets in the path of a fire. The effectiveness of aerial bombing on more intense fires is questionable. All aerial operations are reliant on a coordinated approach with the firefighters on the ground.

8.2.5 The National Aerial Firefighting Strategy

Following the bushfires in New South Wales in January 2002, the Deputy Prime Minister wrote to all states and territories, offering the Commonwealth's assistance to 'co-ordinate the development of a joint proposal amongst the States and Territories on cost effective options for improving Australia's aerial firefighting capacity'.³⁵

The Australasian Fire Authorities Council prepared a proposal to establish a National Aerial Firefighting Strategy³⁶, involving contributions by both the Australian Government and the states and territories. In September 2002 the Australian Government announced it would provide \$5.5 million to meet half the leasing and positioning costs of three heli-tankers for the 2002–03 fire season. This funding was provided in recognition of the expected severity of that season.³⁷

³⁵ Australasian Fire Authorities Council submission, p. 103.

³⁶ *ibid.*, p. 103.

³⁷ Includes GST: Department of Transport and Regional Services 2003, 'National Aerial Firefighting Strategy', *Annual Report 2002–03*, <<http://www.dotars.gov.au/dept/annrpt/0203/3-3-2-26.htm>>, viewed 12 February 2004.

Table 8.1 Aircraft availability, by jurisdiction, 2002–03 fire season

Jurisdiction	Available aircraft summary
Northern Territory	There is no base-load requirement for aviation support for fire management
Queensland	DPI Forestry makes moderate use of ad hoc chartered light and medium helicopters principally for aerial ignition and also for reconnaissance and fire bombing. Aircraft are mainly sourced from the Government's Aviation Wing.
New South Wales	3 medium water-bombing helicopters 3 fixed-wing water bombers 1 fixed-wing line scan aircraft Agencies also use a large fleet of 'call when needed' aircraft comprising: <ul style="list-style-type: none"> • light helicopters • medium water-bombing helicopters, a number of which are 'restricted category aircraft' that are not cleared by the Civil Aviation Safety Authority to carry fire crews • light and medium fixed-wing water bombers • fixed-wing reconnaissance aircraft
Australian Capital Territory	1 light helicopter 1 medium helicopter (primary mission medical) Extended attack resourcing varies from 2 to 6 light helicopters depending on availability
Victoria	1 high-volume water-bombing helicopter 5 light to medium water-bombing helicopters 6 light helicopters 10 fixed-wing water bombers 20 fixed-wing reconnaissance aircraft 1 line scan aircraft
Tasmania	1 light helicopter 6 fixed-wing aircraft for reconnaissance
South Australia	3 fixed-wing water bombers 1 fixed-wing transport aircraft 1 fixed-wing air attack supervisor's platform Shared access to State Rescue Helicopter
Western Australia	6 fixed-wing water bombers 2 light helicopters

Source: Australasian Fire Authorities Council submission, 'Australian base load aerial firefighting', pp. 130–5.

In January 2003 the Prime Minister announced an additional \$2.1 million in Commonwealth funding to meet half the leasing and positioning costs of two extra Erickson air crane heli-tankers during that fire season. He also announced funding of \$550 000 to assist Western Australia and South Australia with costs for medium fixed-wing firefighting aircraft. In total, the Australian Government spent \$8.1 million in support of aerial firefighting operations in 2002–03. The states and territories spent more than \$110 million during the same period.³⁸

The result of the Australasian Fire Authorities Council proposal was that a National Aerial Firefighting Strategy was developed in Australia for the first time. The Strategy provides for each state and territory to continue funding aircraft support for its own jurisdiction. The aircraft are referred to as the 'base load' – that

³⁸ *ibid.*

is, those aircraft each state and territory considers it will need for use in its jurisdiction.

In addition, for the 2003–04 fire season the Strategy calls for further aerial firefighting resources to be provided to New South Wales, Victoria, Tasmania, South Australia, Western Australia and the Australian Capital Territory, at a cost of \$14.8 million, with \$5.5 million of this being funded by the Australian Government. Queensland and the Northern Territory will receive service from these arrangements on an as-required basis.³⁹ The National Aerial Firefighting Centre has been established to manage these arrangements.

8.2.6 The National Aerial Firefighting Centre

The National Aerial Firefighting Centre is a public company incorporated in Victoria on 30 July 2003 for the purpose of coordinating and managing the acquisition, deployment and logistical support of a national aerial firefighting fleet. The Centre has been established along the lines of the Canadian Inter-agency Forest Fire Centre, which has proved a successful national coordinating agency. The board of directors of the Australian Centre has representatives of all jurisdictions but the Northern Territory, which does not participate in the initiative. The board supervises the operations of the company, including the positioning of aircraft.

Through their participation in the National Aerial Firefighting Centre, the states and the Australian Capital Territory are establishing, maintaining and using the national aerial firefighting fleet. They are keen to see that, through these arrangements, longer term (three to five years) contracts are let with industry and more innovative equipment and aerial firefighting solutions are attracted to Australia. It is intended that the combined buying power and greater cooperation will deliver efficiencies in procurement, ensuring that Australia is served as well as possible in the management of bushfires.

The Centre intends to develop measures to improve the Australian aviation industry's capacity to provide safe and effective aerial firefighting services. It also aims to work with the aviation industry to develop aerial firefighting technology, helping the industry equip itself with aircraft that will meet firefighting agencies' requirements into the future. An expert working group consisting of fire agency representatives has been formed to pursue technology implementation, standardisation and common operating procedures and protocols.

Development of the National Aerial Firefighting Centre has allowed for flexibility in moving resources between the states and territories – as evidenced on 14 February 2004, when an air crane from New South Wales was deployed to South Australia because of the extreme weather conditions there. Table 8.2 shows aircraft availability for the 2003–04 fire season as a result of the formation of the National Aerial Firefighting Centre.

³⁹ Australasian Fire Authorities Council submission, 'National Aerial Firefighting Strategy', p. 103.

Table 8.2 National Aerial Firefighting Centre: aircraft availability, 2003–04 fire season

Jurisdiction	Aircraft type	Capacity (litres)	Crew transport (number)	Minimum period (weeks)
Queensland	As required	..	..	Negotiated
New South Wales	Air crane	9500	0	12
	Bell 214B	2700–2950	14	12
	Bell 214B	2700–2950	14	12
Australian Capital Territory	Bell 214B	2700	14	6
Victoria	Air crane	9500	0	12
	M18	4600	0	12
	Bell 214B	2700	14	12
Tasmania	Bell 205A	1400	14	6
South Australia	Bell 214B	2200	14	12
Western Australia	AS 350	1200	6	12
	AS 350	1200	6	12

.. Not applicable.

Note: The Northern Territory does not participate in the Centre.

Source: Australasian Fire Authorities Council submission, 'National Aerial Firefighting for 2003/2004', p. 108.

Fixed-wing aircraft are already used extensively in the base-load fleets of state and territory agencies, being resourced entirely by the jurisdiction concerned. The National Aerial Firefighting Centre is focusing on the provision of complementary resources for employment in rural-urban interface areas, where potential losses are greatest. Because of this focus, and the ability to use on-site ground water (reducing turnaround times), the Centre has chosen helicopters. This does not reflect an overall preference for rotary- over fixed-wing resources: it is a consequence of the fact that jurisdictions already operate significant numbers of fixed-wing aircraft, and additional rotary-wing resources were seen as providing the optimal mix and flexibility for aerial support.

Although it might be argued that the Australian Government has achieved the required outcome with the establishment of the National Aerial Firefighting Centre, this structure is in its infancy and, in the view of the Inquiry, further involvement by the Australian Government is necessary until the Bushfire Cooperative Research Centre can provide definitive evidence of the effectiveness of aerial support.

In particular, a commitment for the next three years, until the Cooperative Research Centre's advice is available, would provide assurance for the existing arrangements and also bring efficiencies in seeking a three-year, rather than one-year, future contract. The timing of such an announcement is important: if it is delayed until later in the year – even until the time of the budget – the opportunity to consider Australian Government involvement during current negotiations will be lost. A prompt commitment will achieve savings through centralised leasing and administrative costs, together with further savings as part of a three-year tender process.

Aerial operations have an important role in firefighting: they offer considerable flexibility and, at optimum times, can be very beneficial to the firefighting effort. But they are expensive and high risk. Fixed- and rotary-wing aircraft are valuable in specific situations, and deployments using both types of aircraft provide the greatest capability and flexibility. Maintaining a national fleet that can be deployed according to assessed risk is an efficient use of an expensive asset.

Recommendation 8.6

The Inquiry recommends that the Australian Government maintain leadership of and support for the National Aerial Firefighting Centre for a further three years, until the Bushfire Cooperative Research Centre has finalised its research into the effectiveness of aerial suppression operations.

8.2.7 A National Aviation Training Program

The use of aircraft in fire management is a high-cost, high-risk activity requiring skilled operators, effective ground coordination, and competent air attack supervisors and support crew. This is why the personnel involved undergo rigorous training in their area of speciality.

Victoria has developed recognised expertise that is used by a number of jurisdictions but otherwise each jurisdiction does its own training. Complementing the formation of the National Aerial Firefighting Centre, the Australasian Fire Authorities Council established the Aviation Training Resources Kits Working Group in August 2003 to develop and implement a national approach to training in aviation skills.

This cooperative approach is an effective model for other bushfire training development nationally; it means that training packages are developed on a priority basis to a common standard, allocating responsibilities to specific jurisdictions and authorities. The approach will allow for sharing of resources and reduced duplication of effort, thus helping with implementation of a national training effort that complies with the requirements of Australian Quality Training Framework.

8.3 The decision to go early or stay and defend

The question of allowing people to decide whether to go when confronted by a major bushfire threat or to stay with their home or property continues to give rise to contention in the community and among fire and police agencies.⁴⁰ This section reviews the policy and sets out to clarify misconceptions.

The Inquiry has chosen to refer to this section as ‘go early or stay and defend’ as a result of advice from the states and territories. The commonly used phrase ‘stay or go’ does not adequately capture the requirement that if you choose to stay you might be required to actively defend your property.

⁴⁰ See, McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, pp. 73–4; House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra, pp. 268–70; Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 129–30.

8.3.1 Current policy

The national approach to evacuation as a response to emergencies is set out in the Australian Emergency Manuals series.⁴¹ Manual 1 – *Evacuation Planning* – provides guidelines to assist in the development of evacuation plans in accordance with accepted emergency management principles and the legislative requirements of the states and territories.⁴²

The more specific approach to evacuation during bushfires is dealt with in the Australasian Fire Authorities Council position paper *Community Safety and Evacuation during Bushfires*.⁴³ The approach set out in the position paper was presented by the Council to a meeting of Australian police commissioners held in Canberra in October 2001. With the exception of Queensland, the police commissioners accepted the approach.

In its comments on the Inquiry's draft report Queensland indicated that it found the debate about 'stay or go' unhelpful. It asserted that the critical concern is to have 'consistent approaches to creating, assessing and aiding an informed and prepared community, prior to bushfire'.⁴⁴ That may be so, but the Inquiry considers that an established policy position is required to enable fire, police and emergency services personnel – as well as the community – to plan their actions should a bushfire eventuate. For this reason, the Inquiry proceeds to examine the current national policy.

In summary, the Australasian Fire Authorities approach is based on the concept 'that houses protect people and people protect houses' and that communities at risk of bushfires should be allowed and encouraged to take responsibility for their own safety.⁴⁵ People whose properties are well prepared and defensible, who are themselves fit and mentally prepared for the stress of firefighting, and who take shelter in their homes while the fire front is passing have an excellent chance of surviving the fire and saving their home.⁴⁶

8.3.2 Key requirements

Successful implementation of a 'go early or stay and defend' policy depends on the property where people may choose to remain during the passage of a bushfire being defensible.

The decision to stay

The property where people choose to remain during the passage of a bushfire must be defensible. This means, for example, ensuring that there is sufficient defensible space proportional to the threat⁴⁷, that the area around buildings is

⁴¹ Emergency Management Australia 1998, Australian Emergency Manuals series, part III, vol. 2, Manual 1: *Evacuation Planning*, Commonwealth of Australia, Canberra.

⁴² *ibid.*, ch. 1.

⁴³ Australasian Fire Authorities Council 2001, *Community Safety and Evacuation during Bushfires*, AFAC, Melbourne.

⁴⁴ Queensland Government response to the draft report.

⁴⁵ *ibid.*, p. 2.

⁴⁶ ACT Government 2003, *Bushfire Information Booklet*, ACT Government Publishing Services, Canberra, pp. 4–5.

⁴⁷ Planning and design are discussed in detail in Chapter 7.

essentially free of combustible material, that the buildings have been suitably prepared, and that there is the necessary basic firefighting equipment.

The fire risk posed by urban gardens was highlighted in the Canberra fires of January 2003. Water restrictions because of the drought had led to many gardens being parched. This promoted subsequent ember attack when the firestorm reached Canberra suburbs.

Some of these conditions might not be easily met, particularly in rural–urban interface areas where previous planning decisions did not take full account of bushfire risk or where property design is poor or building maintenance inadequate. Although each set of circumstances needs to be assessed on its merits, it is questionable whether residents in such situations should have the option of remaining with their properties in the face of a major bushfire. To do so is to endanger both the people themselves and the fire, police and emergency services personnel who might need to come to their aid. The Inquiry is aware that in Victoria a person claiming a pecuniary interest in a property or goods or valuables within that property cannot be made to leave.⁴⁸

Finding 8.10

A decision on the application of the ‘go early or stay and defend’ policy in circumstances where particular properties are not defensible is one for individual states and territories.

The other important consideration is that people who choose to remain with their properties must have suitable clothing and equipment and be well prepared, physically and mentally, for the impact of the passage of the fire front:

Even well prepared residents have left their homes at inappropriate times because they did not realise the emotional impact that a neighbourhood on fire would have on them. Furthermore, most residents and even those responsible for conveying the safety advice have not experienced the windiness, noise, darkness, ember storms and heat of a major fire at first hand, let alone experienced a suburban disaster. Preparedness is important.⁴⁹

Meeting this condition requires continuing, focused community education and information. This very important subject is discussed in detail in Chapter 9. A survey conducted by the Victorian Auditor-General in high–fire risk areas of Gippsland and the Dandenongs found that 27 per cent of respondents would be prepared to stay and defend their homes during a bushfire; a further 25 per cent would prepare their home but leave when a bushfire threatened.⁵⁰

The decision to go

Deciding to go rather than stay and defend is also a valid response to a bushfire threat. People with young children, the elderly, people with disabilities, people who do not feel able to deal with the fire event, and people whose properties are not defensible should leave. The critical question is when.

⁴⁸ Section 31(4) of the Victorian *Country Fire Authority Act 1958*.

⁴⁹ Gill, AM 2004, ‘The landscape or bushfire problem: an overview’, in preparation.

⁵⁰ Cameron, JW (Victorian Auditor-General) 2003, *Fire Prevention and Preparedness*, Auditor-General’s Office, Melbourne, p. 78.

Early evacuation is vital, and fire agencies' provision of clear, timely and consistent advice to affected communities is essential so that residents can make an informed, considered decision (see Chapter 9). Delays and inconsistencies in the provision of such advice were a major criticism in relation to the immediate response to the onset of the Canberra fires of 18 January 2003.⁵¹

The evidence available to the Inquiry is consistent: evacuations during the approach of a bushfire are unsafe and greatly increase the risk of death or injury for both residents and fire, police and emergency services personnel.⁵² Research into the fatalities arising from the Ash Wednesday fires in Victoria in 1983 and similar events elsewhere shows that many civilian deaths occurred when residents left late or were caught outside their homes.⁵³ People who leave late face a range of dangerous conditions – rapidly moving fires, falling trees, wind and fire noise, flying material, poor visibility because of smoke, and radiant heat⁵⁴ – along with an increased likelihood of vehicle accidents.

Whether residents leave or not, advice on pets and stock needs to be provided to the public early. The Inquiry found that most state and territories provide information on appropriate actions for the removal of horses and sheltering of farm stock, as well as household pets.

A related and equally important factor is the education and training of fire, police and emergency services personnel who might be present during a fire emergency. These personnel are subject to the same dangers and pressures as members of the general public. Making informed decisions in such circumstances is difficult but critical. This was evident during the 2003 Canberra fires⁵⁵, and similar observations have been made by others.⁵⁶

⁵¹ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, pp. 73–4.

⁵² Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 129.

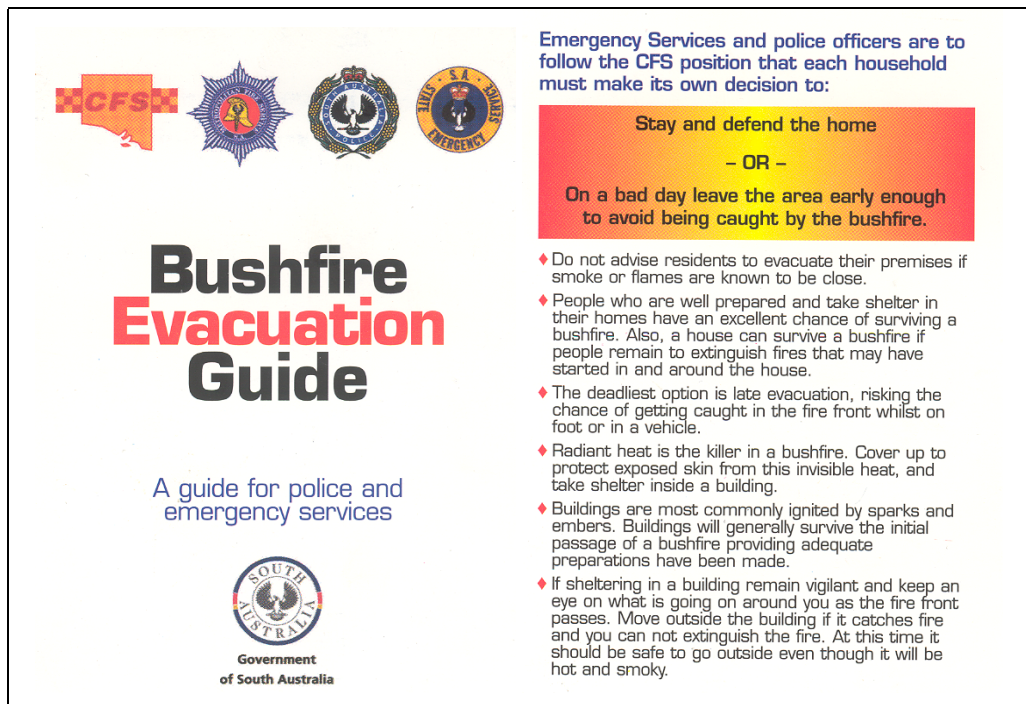
⁵³ Braun, K 2002, 'Bushfire threat to homeowners', Proceedings of conference on *Fire in Ecosystems of South-west Western Australia: impacts and management*, vol. 2, *Community Perspectives about Fire*, Department of Conservation and Land Management, Perth, pp. 64, 68.

⁵⁴ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 129.

⁵⁵ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, pp. 73–4.

⁵⁶ For example, Braun, K 2002, 'Bushfire threat to homeowners', Proceedings of conference on *Fire in Ecosystems of South-west Western Australia: impacts and management*, vol. 2, *Community Perspectives about Fire*, Department of Conservation and Land Management, Perth, p. 70.

Figure 8.2 The South Australian *Bushfire Evacuation Guide*



8.3.3 Some misconceptions

Most members of the public obtain their information about bushfires and responding to them from media reports, which, quite naturally, tend to focus more on the dramatic than the evidentiary. This can result in misconceptions that are both persistent and dangerous.

In terms of the application of a go or stay and defend policy, the most important misconception is that houses explode in fires and that this is a reason why residents should be evacuated in the face of an approaching bushfire front. CSIRO research carried out after the Ash Wednesday fires of 1983 clearly demonstrated that houses do not explode as a result of the radiant heat of a passing fire front. Houses have been seen to explode, but not at the time of the passage of the fire front: a well-developed house fire precedes such an explosion.⁵⁷ This information should be included in the training of fire, police and emergency services personnel and the media.

Another important consideration is to ensure that the material on fire readiness that is prepared for the public is tested with them beforehand, to avoid any misconceptions that might not be apparent to the members of fire or other emergency services. For example, residents in areas at risk of bushfires are advised to fill containers, including baths, with water as part of their preparations. This advice is aimed at ensuring that sufficient water sources are available to put out spot fires. Such advice could give rise to a misconception that a water-filled bath could be a place of refuge in the event of a fire. The reverse is, of course, the case.

⁵⁷ Ramsay, GC, McArthur, NA & Dowling, VP 1985, *A Survey of House Survival in the 16 February 1983 Bushfires*, CSIRO, Canberra.

8.3.4 Shared responsibility

The Australasian Fire Authorities Council⁵⁸ and others have commented that in many rural–urban interface areas the community has become dependent on fire services for bushfire protection. Such an approach is not sustainable. The number of houses likely to be threatened by a major fire will probably exceed the number of available fire appliances. Residents of such areas need to contribute to the protection of their properties through actions that, as a minimum, include the sort of preparations just outlined and, ideally, through participation in community-based activities such as FireWise and Community Fireguard groups or similar programs, depending on the state or territory. Local government has a further responsibility for local public land and the reinforcement of these policy positions.

8.3.5 Review of the go early or stay and defend policy

Under its Community Self-sufficiency for Fire Safety program the Bushfire Cooperative Research Centre is evaluating the current go early or stay and defend approach, reviewing current practices in the context of their legal, organisational and emergency planning implications across Australia. As part of this study, the Centre will develop plans for the further definition and implementation of a preferred approach for people and property protection.

Recommendation 8.7

The Inquiry recommends as follows:

- that the approach that gives residents the option of leaving when confronted by a major bushfire threat or making an informed decision to stay and defend their home or property be adopted as a common national policy
- that implementation of a ‘go early or stay and defend’ policy must be fully integrated, with effective community education programs to improve preparedness and support timely and informed decision making.

Provision of training for fire, police and emergency services personnel in the application of the go early or stay and defend policy is essential if this approach is to be applied safely—with particular emphasis on minimising evacuations at the height of fire events. This should be supported by formal agreements between the relevant authorities.

⁵⁸ Australasian Fire Authorities Council submission, p. 8.

9 Recovery



A young Australian Red Cross worker with a Canberra resident evacuated to Narrabunda College on 18 January 2003

(Photo: Courtesy Emergency Management Australia)

Disaster recovery is the coordinated process of supporting disaster-affected communities in the reconstruction of physical infrastructure and the restoration of economic, physical and emotional wellbeing.¹

Recovery planning and implementation constitute the final aspect of the risk-management framework for bushfires set out in Chapter 5. Recovery from major bushfires is little different from recovery from any other natural disaster and thus should be considered, wherever possible, from an all-hazards perspective. The main difference in relation to bushfires is the need, in many instances, to respond to environmental impacts – see Section 9.3.

This chapter discusses the elements of recovery and the lessons learnt from the recent major bushfires – including those identified in the reports on the major bushfires in the Australian Capital Territory² and Victoria³ in 2002–03, while noting that similar challenges are encountered in other states and territories. These challenges and lessons are considered within the comprehensive nationally agreed framework for recovery provided in the *Australian Emergency Manual – disaster recovery* published by Emergency Management Australia⁴, the *Natural Disasters in Australia* report to the Council of Australian Governments⁵, and the current review of community support and recovery arrangements being prepared for the Community Services Ministers Advisory Council.⁶

¹ Cited in Matthews, K (Chairperson) 2002, *Natural Disasters In Australia – reforming mitigation, relief and recovery arrangements*, COAG, Canberra, p. 36.

² Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra.

³ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 24.

⁴ Emergency Management Australia, 1996, *Australian Emergency Manual – disaster recovery*, EMA, Canberra.

⁵ Matthews, K (Chairperson) 2002, *Natural Disasters In Australia – reforming mitigation, relief and recovery arrangements*, COAG, Canberra.

⁶ Community Services Ministers Advisory Council, Disaster Recovery Sub-Committee 2003, *Review of Community Support and Recovery Arrangements*, Discussion paper, Melbourne.

9.1 Recovery in a risk-management framework

Successful recovery from a major bushfire or other natural disaster requires the effective integration of recovery into each of the other aspects of the 5Rs risk-management framework:

- *Research, information and analysis.* Aspects of bushfire recovery are the subject of continuing research by the Bushfire Cooperative Research Centre and others⁷; community support and recovery arrangements for natural disasters more generally are currently the subject of the review by the Disaster Recovery Sub-Committee of the Community Services Ministers Advisory Council.⁸ The Inquiry supports the early completion of this review.
- *Risk modification.* Recovery is part of consequence reduction. The approach adopted needs to take account of both the immediate and the longer term impacts of the disaster, including psycho-social, economic, infrastructure and environmental factors.⁹ Having recovery structures and processes developed in advance of potential disasters lessens the impacts when disasters do occur.
- *Readiness.* Identifying and training recovery personnel, conducting exercises, and predetermining important elements such as the location and organisation of evacuation centres is critical for the successful conduct of recovery operations. Recovery training in the Australian Capital Territory in November 2002 contributed greatly to the success of the initial recovery response to the Canberra fire disaster of 18 January 2003.¹⁰
- *Response.* Depending on the scale of the event, a coordinated recovery response needs to begin when the fire event or other natural hazard is imminent. Among the actions that need to be taken here are provision of public information on recovery arrangements, opening evacuation centres, initiating health emergency plans, and placing utilities such as electricity, water and telecommunications on standby. The recovery arrangements must be fully integrated into overall emergency management planning and response.

9.2 Recovery principles

Natural Disasters in Australia identifies the following principles of disaster recovery, which were originally developed by the Disaster Recovery Sub-Committee of the Community Services Ministers Advisory Council:

- Management arrangements recognise that recovery from disaster is a complex, dynamic and protracted process.
- Agreed plans and management arrangements are well understood by the community and disaster management agencies.

⁷ See Appendix F.

⁸ Department of Family and Community Services submission, 30 January 2004, p. 2.

⁹ Department of Family and Community Services submission, 30 January 2004, p. 3.

¹⁰ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra, p. 193.

- Recovery agencies are properly integrated into disaster management arrangements.
- Community service and reconstruction agencies are involved in decision making.
- Recovery services are delivered with the active participation of the affected community.
- Recovery managers are involved from initial briefings onwards.
- Recovery services are provided in a timely, fair, equitable and flexible manner.
- Recovery personnel are supported by training programs and exercises.¹¹

These principles provide the basis for recovery in the Australian context and are as relevant to major bushfire events as to other natural disasters.

9.3 Environmental aspects of bushfire recovery

The principal area where bushfire recovery can differ from the response to other natural disasters is in the potential extent and severity of the environmental consequences of a major fire. Other disasters can also give rise to consequences such as hazardous waste and vermin¹² and can damage vegetation and landscapes, but high-intensity bushfires can require a number of environmental responses:

- restoration of damaged ecosystems (such as peat bogs) that will otherwise not recover
- removal and control of weed infestations after fires
- control of erosion arising from damage to vegetation and from fire trails and fire breaks established during firefighting operations
- managing impacts on water quality
- restoration of the landscape, especially areas close to populated areas and other sites of significance as part of the restoration of community spirit.

These environmental recovery measures illustrate that disaster recovery in general, and bushfire recovery in particular, is much more than a community services and infrastructure response.

¹¹ Matthews, K (Chairperson) 2002, *Natural Disasters In Australia – reforming mitigation, relief and recovery arrangements*, COAG, Canberra, p. 36.

¹² Emergency Management Australia, 1996, *Australian Emergency Manual – disaster recovery*, EMA, Canberra, pp. 10.14, 10.15.

9.4 Lessons learnt

As demonstrated by the scope of the *Australian Emergency Manual – disaster recovery*, bushfire recovery involves a complex set of interrelated factors and actions. The nature and extent of this complexity is the first lesson the Inquiry learnt from its consideration of bushfire recovery.

9.4.1 Engaging all relevant areas

Much of the available material on disaster recovery is directed primarily towards human service and community considerations, and disaster recovery coordinators in all or most of the states and territories are located in community or family services agencies. While the other aspects of recovery are covered in the relevant manuals¹³, the Inquiry considers it essential that recovery planning adopt a whole-of-government and whole-of-community approach. This is of particular importance in the response to large-scale and high-impact bushfire events. This concern is reflected in the *Natural Disasters in Australia* report.¹⁴

9.4.2 Establishment of special recovery arrangements

Major bushfire events such as occurred in the Australian Capital Territory and Victoria in January 2003 require the establishment of special whole-of-government recovery mechanisms; the ACT Bushfire Recovery Taskforce and the Victorian Ministerial Taskforce on Bushfire Recovery are examples. The Inquiry considers that such arrangements are very beneficial; it notes, too, that there is a need to ensure an effective transition back to normal management and service provision arrangements at a suitable point after the disaster. The longer term aspects of recovery – particularly ongoing support for affected families and individuals – need to be maintained through normal community services.

9.4.3 Access to services: navigating the maze

One area of contention identified during the Inquiry was the question of whether recovery services are best provided through special structures such as one-stop shops (for example, the ACT Recovery Centre) or through linking affected people to existing services.¹⁵ These differing approaches might be more apparent than real and might be more a product of the relative scale of the event and the size and geography of the area affected.

While one-stop-shop recovery centres were established in a number of Victorian towns¹⁶, the continuation of such an approach is more feasible where the fire impact is more concentrated, as it was in Canberra. In the latter case, it might be possible to provide some special centralised services, such as counselling and building advice. In all other regards, however, the approach to service provision should be the same, with services being provided by the usual agency or

¹³ *ibid.*, chs 10 and 11.

¹⁴ Matthews, K (Chairperson) 2002, *Natural Disasters In Australia – reforming mitigation, relief and recovery arrangements*, COAG, Canberra, pp. 38–9.

¹⁵ Victorian Government comments on the draft report, 22 March 2004.

¹⁶ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 216.

community organisation. Agency resources might need to be augmented, so that the agencies can respond to the increased demand: for this reason, capacity planning should be included in recovery planning.

An important innovation in the delivery of recovery services has been the adoption of a case management approach, which was used extensively in the ACT Bushfire recovery¹⁷ and to a lesser, but still useful, extent in Victoria.¹⁸ The value of such an approach is that it enables affected people to more successfully engage with the range of government and non-government organisations providing various forms of assistance and advice. As well as dealing with the trauma of the event, many affected people have no experience of dealing with community service organisations. Care is also needed to ensure that case managers link clients to services, rather than trying to resolve problems themselves.

When recovery centres and other special arrangements are established, particular attention needs to be given to the sensitivity of the subsequent re-integration of clients with the services provided by the ongoing community support organisations.

9.4.4 Public information

Comprehensive public information programs are vital to success in community recovery. Clear information needs to be provided throughout the recovery, by all available means – electronic and print media, public meetings, internet and call centres, direct mail, and through community organisations. Messages must be reiterated in a variety of ways, to ensure that those affected both hear them and have an opportunity to understand them.

9.4.5 Investing early

One of the lessons learnt from the bushfire recovery in the Australian Capital Territory concerns the benefits to be gained in terms of community confidence through providing sufficient resources so that emerging problems can be resolved early and some early signs of recovery can be achieved. Prompt organisation of the clearance of destroyed properties is an example of an early achievement that met both public health and safety and community confidence objectives.

9.4.6 Building community capacity and beneficial legacies

Perhaps the most important lesson from the recovery activity associated with the recent major bushfires is the central importance of maintaining a high degree of community involvement in the recovery. In Victoria this approach entailed the establishment of on-the-ground community recovery committees¹⁹; in the ACT the community was engaged through the provision of overall guidance to the Bushfire

¹⁷ Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra, pp. 32-3.

¹⁸ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, pp. 222–3.

¹⁹ Victorian Government comments on the draft report, 22 March 2004.

Recovery Taskforce (by the Community and Expert Reference Group²⁰) and through a number of specific community engagement programs.²¹ In both instances there was an understanding that communities recover faster and better if they are fully involved in the development and implementation of recovery programs.²²

Overall, the aim of a recovery program should be to ensure that affected communities emerge from the event as stronger, more cohesive communities.

9.5 Updating current recovery practice

The Inquiry notes that the *Natural Disasters in Australia* report proposed the modernisation and enhancement of the Natural Disaster Relief and Recovery Arrangements.²³ The Inquiry supports this proposal. As noted, we also support the current review of community support and recovery arrangements being undertaken for the Community Services Ministers Advisory Council. The recovery lessons described in this chapter should be reflected in that review.

Recommendation 9.1

The Inquiry recommends that the *Australian Emergency Manual—disaster recovery* be updated as a matter of priority by Emergency Management Australia, in consultation with the states and territories, the Australian Local Government Association, the Department of Transport and Regional Services and the Department of Family and Community Services, to incorporate:

- the lessons learnt from the recovery programs undertaken in relation to the recent major bushfires
- the outcomes of by the Community Services Ministers Advisory Council's review of community support and recovery arrangements.

9.6 Insurance

When considering natural disasters such as bushfire within a risk-management framework, one important element is insurance. Once actions are completed to reduce, avoid where possible, and modify the remaining risk, insurance provides a further level of security. The Victorian report referred to insurance as 'a necessary option for protecting assets and living in a rural landscape. An appropriate level of insurance coverage is a sound preparedness measure and should be encouraged'.²⁴ For people who live in bushfire-prone areas, adequate private and public insurance is an important element of the risk-management framework.

²⁰ Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra, pp. 35–7.

²¹ *ibid.*, pp. 57–74.

²² Victorian Government comments on the draft report, 22 March 2004.

²³ Matthews, K (Chairperson) 2002, *Natural Disasters In Australia – reforming mitigation, relief and recovery arrangements*, COAG, Canberra, pp. 41–6.

²⁴ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 138.

The main concerns the Inquiry identified in relation to insurance are the level of insurance cover, the performance of the insurance industry in response to disasters, taxation, and community information and incentives.

9.6.1 Insurance cover

The insurance industry cites significant levels of non-insurance and under-insurance, with about one quarter of households being without building or contents insurance and 70 per cent of tenants and 15 per cent of owner-occupiers having no contents insurance. Some doubts were expressed to the Inquiry about the accuracy of these figures. For example, only six of the 488 houses destroyed in the ACT in January 2003 did not have building insurance.²⁵ Data from the Canberra fire did, however, highlight the problem of under-insurance²⁶: the Insurance Council of Australia suggested that, nationally, about 30 per cent of buildings are under-insured in terms of their replacement value.²⁷

The ACT experience in 2003 highlighted the need for property owners and occupiers to pay much closer attention to the adequacy of the dollar value and coverage of their buildings and contents insurance policies.²⁸ For example, building cover based on the value of a mortgage over the property, or simply updated for annual movements in the consumer price index, often will not pay for the replacement of a destroyed property or keep pace with movements in building costs. The Inquiry considers that the insurance industry has an obligation to improve its advice to policy holders in this regard.

Finding 9.1

The insurance industry should provide improved and more consistent advice to policy holders on how to ensure that their level of insurance cover for buildings and contents meets the full replacement cost.

9.6.2 Insurance industry performance

The performance of the insurance industry during the 2002–03 fire season was variable. Activation of the Insurance Disaster Response Organisation in response to the Canberra fire proved very effective in providing a prompt and coordinated response linked to overall recovery arrangements.²⁹

Policy holders did, however, encounter a considerable number of difficulties, which suggests that some changes to insurance industry policies and practices are

²⁵ Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra, p. 98.

²⁶ *ibid.*, p. 99.

²⁷ Insurance Council of Australia submission, pp. 24–5.

²⁸ Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra, pp. 274–9.

²⁹ Insurance Council of Australia submission, p. 3.

required. These matters are set out in detail in the report of the Bushfire Recovery Taskforce³⁰ and are simply summarised here.

The insurance industry seeks to provide prompt settlement of claims, and this approach is generally welcomed by policy holders. Nevertheless, insurance companies need to exercise care in dealing with people who might be traumatised. These people might not be in a good position to consider the adequacy of a loss assessment offer. The Inquiry supports the proposal that there be a cooling-off period, to allow for consideration and perhaps subsequent review of such offers. Some loss assessors lacked the necessary sensitivity and patience, and there were complaints about the level of information provided to policy holders. Application of the term 'replacement value' and settlement offers being made for less than the sum insured where particular areas of dispute. Under-insurance was another problem, as discussed.

In many cases the performance of insurance companies in response to the Canberra bushfire disaster was sympathetic and flexible; in other cases it could have been improved.³¹ The Inquiry is aware of the self-regulating code of practice developed by the Insurance Council of Australia³²: this code should be reviewed so as to incorporate the lessons learnt from the 2002–03 bushfires.

Recommendation 9.2

The Inquiry recommends that the Insurance Council of Australia be asked to review the industry's code of practice in response to the lessons learnt from the claims arising from the 2002–03 bushfires.

9.6.3 Taxing insurance

The Insurance Council of Australia's submission focused in particular on the question of the taxes imposed on insurance premiums.³³ Although the Inquiry considers that comments by the insurance industry might appear self-serving, from the perspective of risk management and encouraging the community to be better insured the taxing of insurance is counter-productive. The Insurance Council highlighted the 'cascading' effect of taxes on insurance premiums: a \$100 premium in country Victoria costs the purchaser \$178, with \$78 of this being stamp duties, fire levies and GST.³⁴ A contributing factor in the overall level of such taxes is the compounding, or 'tax-on-tax', effect, whereby taxes and levies contribute to the base on which a subsequent tax is levied.³⁵

The Australian Government and the state and territory governments impose taxes on insurance, and all governments could take action to reduce the cost of insurance and encourage Australians to be better prepared for natural disasters, including

³⁰ Hollway, S 2003, *The Report of the Bushfire Recovery Taskforce – Australian Capital Territory*, ACT Government, Canberra, pp. 98–9, 274–9.

³¹ *ibid.*, pp. 274–9.

³² Insurance Council of Australia *Code of Practice*, <www.ice.com.au/codepractice>, viewed 16 February 2004.

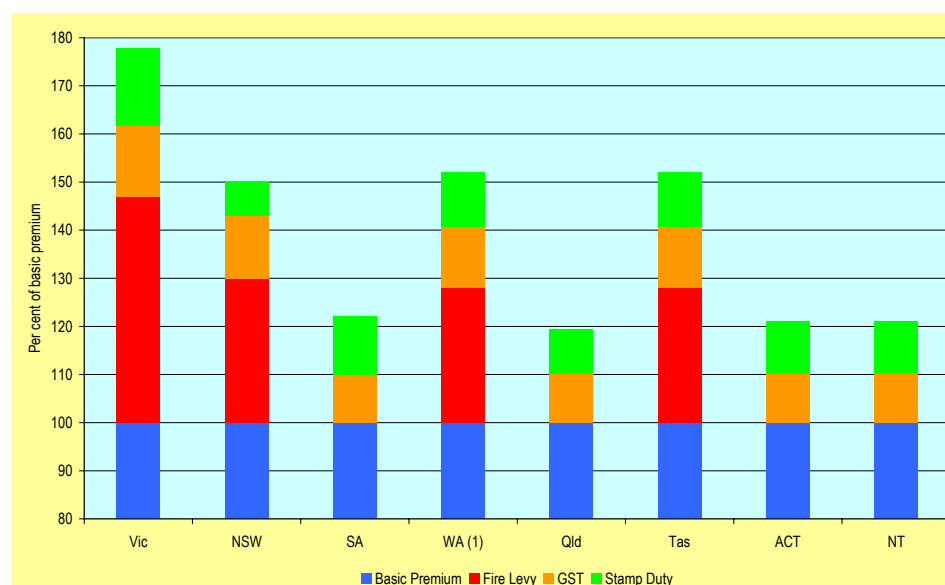
³³ Insurance Council of Australia submission.

³⁴ *ibid.*, pp. 14–15.

³⁵ *ibid.*, p. 11.

bushfire. Previous reviews³⁶ have recommended that levies be removed or adjusted or that insurance premiums be treated as a tax deduction. The Inquiry notes that the Victorian Government recently reviewed the funding of emergency services, including levies on insurance, but chose not to alter the current arrangements. New South Wales is conducting a similar review. The impact in other states, while not as dramatic, is also considerable, as Figure 9.1 shows, using the impact on country-area business insurance premiums as an example.

Figure 9.1 Indirect taxes and charges on country-area business insurance premiums



Source: Insurance Council of Australia submission.

9.6.4 Community information and incentives

The Inquiry discussed with the Insurance Council of Australia the opportunity – currently lost – to encourage property owners in bushfire-prone areas to modify risks around their property. The Council advised the Inquiry that, although measures to increase security (such as alarms and deadlocks) are rewarded with reduced premiums, this does not occur for bushfire measures because the overall loss from bushfire is low relative to overall losses from house fires and does not warrant the reduction. The Inquiry notes that historically such incentives have existed; an example is the State Government Insurance Office in South Australia in 1984. More importantly, the Inquiry considers that providing this incentive – however small it might be – would be beneficial in promoting risk-modification action in bushfire-prone areas and represents an opportunity for the insurance industry to participate in community awareness. This approach was also recommended in the report of the Victorian inquiry.³⁷

³⁶ HIIH Royal Commission 2003, *The Failure of HIIH Insurance*, vol. 1, *A Corporate Collapse and its Lessons*, Commonwealth of Australia, Canberra; House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra.

³⁷ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, p. 138.

Finding 9.2

An opportunity exists for the insurance industry to engage in community bushfire awareness through offering a premium reduction for property owners who have taken bushfire preparedness measures. This may have only a limited impact, but any raising of community awareness is beneficial.

9.6.5 Conclusion

An examination of insurance highlights the need for governments at every level to encourage property owners living in bushfire-prone areas to take out insurance. Existing taxation applications are a disincentive and need to be reviewed. Although insurance companies responded quickly as a result of the bushfires in 2002–03, their subsequent actions were not always faultless, and a consistent code of practice for responding to natural disasters is warranted.

Part Four
Governance and organisations

10 Governance and coordination

State and Territory governments are responsible for instituting regulatory arrangements for the protection of life, property and the environment, and have the primary responsibility for delivering emergency services, including fire and ambulance services, directly to the community. Commonwealth, State and Territory governments are also jointly responsible for developing building fire safety codes, undertaking fire related research, formulating policies and providing advice on fire safety.¹

When major bushfires affect communities and landscapes they progressively engage all levels of government. They do not recognise local government boundaries or interstate borders, nor do they distinguish between public or private land. As the size and impact of bushfires increase, so does the involvement of local and state and territory governments and the Australian Government. The efficiency and effectiveness of bushfire mitigation and management are determined by how well the three levels of government interact and the ways in which responsibilities are upheld and authority is used. This chapter clarifies those responsibilities and summarises the existing arrangements; it also proposes some changes in the areas of coordination and policy development.

10.1 The Australian Government

10.1.1 Natural disaster management

The Australian Government's role in natural disaster management is described in a number of documents, among them the *Commonwealth Emergency Management Policy Statement*², the Productivity Commission's *Report on Government Services*³, and *Natural Disasters in Australia* report to the Council of Australian Governments.⁴ The *Natural Disasters in Australia* report describes the Australian Government's role in relation to natural disaster management thus:

- to provide national leadership in collaborative action across all levels of government in disaster research, information management and mitigation policy and practice
- to reduce the risks and costs of disasters to the nation
- to mobilise resources when state and territory disaster response resources are insufficient
- to provide national support for disaster relief and community recovery.⁵

¹ Productivity Commission 2004, *Report on Government Services 2003*, vol. 1, Productivity Commission, Melbourne, p. 8.3.

² *Commonwealth Emergency Management Policy Statement*, viewed 21 March 2004, <www.ema.gov.au/emaInternet.nsf>.

³ Productivity Commission 2004, *Report on Government Services 2003*, vol. 1, Productivity Commission, Melbourne, p. 8.3.

⁴ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, p. 21.

⁵ *ibid.*

Several specific roles identified in that report are relevant to bushfire mitigation and management:

- undertaking natural disaster research of national significance
- identifying national priorities for natural disaster mitigation, in collaboration with other levels of government
- providing support for disaster risk assessment and mitigation measures, in conjunction with the states and territories and local governments
- providing information services, such as meteorological, hydrological, geophysical and other data, that support warnings and disaster management.

10.1.2 The environment

The Department of the Environment and Heritage is responsible for matters of national and international environment and heritage significance, as listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Four environment and heritage objectives are relevant to implementation of fire mitigation and management measures:

- protecting matters of national environmental significance
- reversing the decline in Australia's native vegetation and biodiversity
- reversing the decline in water quality
- improving air quality.⁶

The Inquiry evaluated environmental governance responsibilities in relation to bushfire mitigation and management only for the purpose of identifying the following national strategies, policies and standards:

- the National Strategy for the Conservation of Australia's Biological Diversity
- the National Framework for the Management and Monitoring of Australia's Native Vegetation
- the National Water Quality Management Strategy
- the National Environment Protection (Ambient Air Quality) Measure standards
- the National Objectives and Targets for Biodiversity Conservation 2001-2005
- the Natural Heritage Trust
- the National Land and Water Resources Audit
- the National Strategy for Ecologically Sustainable Development

⁶ Australian Government Department of the Environment and Heritage submission, p. 1.

- the National Greenhouse Strategy
- the National Forest Policy Statement.

These are important considerations, although they relate more to program implementation than to aspects of governance, as discussed in this chapter, and therefore are not explored further here.

10.1.3 Proposed additional roles for the Australian Government

As discussed elsewhere in this report, the Inquiry considers that the Australian Government can make some further specific contributions to the improvement of bushfire mitigation and management. The proposed contributions are based on the existing Commonwealth Emergency Management Policy⁷, which includes the following:

- While recognising that constitutional responsibility for protection of the lives and property of Australian citizens lies predominantly with the states and territories, the Australian Government accepts that it has a broad responsibility to support the states and territories in developing emergency management capabilities.
- In the development of Australian Government capabilities, the principles of an all-hazards, comprehensive, all-agencies approach and the concept of a prepared community will be upheld.
- The Australian Government will support state and territory measures to facilitate the recovery of communities and will provide financial assistance to the states and territories and to individuals to assist in the recovery from disasters under arrangements that will be determined from time to time.
- The Australian Government will continue to provide support to the states and territories in the development of emergency preparedness and mitigation activities. In particular, it will facilitate education, training, research, public awareness, information collection and dissemination activities, and specialised warning and monitoring services for meteorological and geological hazards, as appropriate.
- The Australian Government will encourage and facilitate further standardisation of emergency management procedures and equipment.

On this basis the Inquiry proposes that specific Australian Government assistance for bushfire mitigation and management include the following:

- the development and provision of nationally consistent and regionally relevant education programs about bushfires for all Australians
- support for volunteering as a contribution to local and national social capital

⁷ *Commonwealth Emergency Management Policy Statement*, viewed 21 March 2004, <www.ema.gov.au/emaInternet.nsf>.

- national standards and programs for the professional development of bushfire fighters
- consideration of taxation rebates for emergency service volunteers
- the long-term allocation of radio spectrum to enhance national interoperability
- facilitating the collection and sharing of climatic, spatial and ecological bushfire-related data
- nationally consistent fire signage and emergency warning.

10.1.4 Financial contributions

The Inquiry notes that at present the Australian Government makes a financial contribution to bushfire mitigation and management through the natural disaster relief arrangements, the Bureau of Meteorology, Emergency Management Australia, and Defence Force and other assistance provided in response to bushfire emergencies. It has also provided financial assistance through the National Aerial Firefighting Strategy, the Bushfire Cooperative Research Centre, the Natural Heritage Trust (for natural resource management) and natural disaster mitigation programs.

10.2 State and territory governments

Comprehensive and integrated emergency management and landscape management are based on a holistic approach involving the Australian Government, the state and territory governments, and local government. Constitutional responsibility for the protection of lives, property and the environment in Australia is predominantly the domain of the states and territories.

The *Natural Disasters in Australia* report⁸ describes the state and territory responsibilities as follows:

- developing, implementing and ensuring compliance with comprehensive disaster mitigation policies and strategies in all relevant areas of government activity, including land use planning, infrastructure provision and building standards compliance
- strengthening partnerships with and encouraging and supporting local governments and remote and Indigenous communities in undertaking disaster risk assessments and mitigation measures
- ensuring the provision of appropriate disaster awareness and education programs and warning systems
- ensuring that the community and emergency management agencies are prepared for and able to respond to natural disasters and other emergencies

⁸ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, p. 20.

- maintaining adequate levels of well-equipped and trained career and volunteer disaster response personnel
- ensuring that appropriate disaster relief and recovery measures are available
- ensuring that post-disaster assessment and analysis are undertaken.

10.3 Local governments

The Productivity Commission's *Report on Government Services 2003* notes that 'Local Governments in most States and Territories are involved to varying degrees in emergency management'.⁹ The *Natural Disasters in Australia* report summarised the local government role from an all-hazards perspective:

Where Local Government powers exist, Local Governments also have responsibilities, in partnership with States and Territories, to contribute to the safety and well being of their communities, which means they have an important role participating in local natural disaster management.¹⁰

In most circumstances, the principal roles and responsibilities of local governments are as follows:

- ensuring that all requisite local disaster planning and preparedness measures are undertaken
- ensuring that there is an adequate local disaster response capability, including local volunteer resources
- taking cost-effective measures to mitigate the effects of natural disasters on local communities, including routinely conducting disaster risk assessments
- systematically taking proper account of risk assessments in land use planning to reduce hazards
- building public education and awareness and ensuring that local disaster warnings are provided
- ensuring that local resources and arrangements exist to provide disaster relief and recovery services to communities
- representing community interests in disaster management to other levels of government and contributing to decision-making processes
- participating in post-disaster assessment and analysis.

The Inquiry identified a number of important local government responsibilities in relation to bushfire mitigation and management:

- hazard identification and management

⁹ Productivity Commission 2004, *Report on Government Services 2003*, vol. 1, Productivity Commission, Melbourne, p. 8.4.

¹⁰ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, p. 20.

- planning controls to limit development in high-risk areas
- supervision of building standards in bushfire-prone areas
- facilitating local fire-prevention committees and community awareness and policing non-adherence to prevention measures
- encouraging and supporting volunteers
- coordinating local recovery
- in Western Australia only – responsibility for bushfire operational response.

Although the understanding just outlined is generally accepted by local government, application of these principles varies according to perceived local bushfire hazard, state- and territory-specific policies, and individual councils' capacity to comply.

Parts of some states and territories lie outside local government boundaries. Since the introduction of the emergency services levy in South Australia local government no longer has responsibility for funding emergency services. In the Northern Territory local governments do not have land use planning powers. In the Northern Territory and Western Australia the majority of Indigenous communities have a modified form of local government, with no income from rates; in these communities, significantly greater levels of responsibility for decision making and funding relating to community safety and welfare are accorded the state and territory governments and the Australian Government through various agencies.¹¹

10.4 Policy development and coordination

10.4.1 Coordination of the contributions of Australian Government agencies

A number of Australian Government agencies are involved in or have an interest in bushfire mitigation and management and related matters:

- Emergency Management Australia – coordinating Australian Government emergency assistance to the states and territories in the event of a major natural, technological or civil defence disaster when state and territory resources are inadequate, exhausted or unavailable
- the Department of Transport and Regional Services – the National Aerial Firefighting Strategy and natural disaster relief and mitigation programs
- the Department of Defence – assistance to the civil community
- the Department of the Environment and Heritage – the Natural Heritage Trust, matters of national environmental and heritage significance under the *Environment Protection and Biodiversity Act 1999*, and national and international

¹¹ *ibid.*, p. 20.

agreements in relation to biodiversity, native vegetation, air quality and water quality

- the Department of Agriculture, Fisheries and Forestry – forestry
- the Department of Family and Community Services – disaster recovery
- the Department of Education, Science and Training – CSIRO
- the Bureau of Meteorology – climate and weather services
- Geoscience Australia – spatial data.

Although the Inquiry considers the coordination of Australian Government operational assistance through Emergency Management Australia and the implementation of specific assistance programs through the Department of Transport and Regional Services are effective, a more coordinated approach to the full range of Australian Government involvement in bushfire mitigation and management would be beneficial. Information management, research and mitigation are just as important as response and recovery. This applies equally to bushfires and to other natural disasters.

A senior executive-level committee chaired by the Department of the Prime Minister and Cabinet – with representation from the departments and agencies just listed and with secretariat services provided by Emergency Management Australia – would ensure that there is informed, coordinated development of bushfire-related policy throughout the Australian Government. Such a committee would also provide comprehensive advice to bodies such as the augmented Police Ministers Council and the Australian Emergency Management Committee. The committee's role could be further developed to encompass coordination in connection with policy development for other types of natural disaster.

Early establishment of this Australian Government senior executive-level committee could offer an efficient and effective means of coordinating implementation of the recommendations of this Inquiry.

Recommendation 10.1

The Inquiry recommends that the Australian Government formalise the coordination of the development of policy on bushfire mitigation and management across Australian Government departments and agencies and the provision of advice to the Australian Emergency Management Committee and the augmented Australasian Police Ministers' Council.

10.4.2 A ministerial council?

An additional ministerial council with overall responsibility for bushfire mitigation and management would improve national coordination in this area. The Inquiry is aware, however, of both the breadth of matters that would need to be dealt with and the Council of Australian Governments' general aim to consolidate, rather than expand, the number of ministerial councils. For these reasons, the Inquiry did not pursue this option.

The Council of Australian Governments currently maintains the following ministerial councils that have an interest in bushfire mitigation and management:

- the augmented Australasian Police Ministers Council – dealing with emergency services
- the Primary Industries Ministerial Council – dealing with forestry
- the Natural Resource Management Ministerial Council – dealing with the Natural Heritage Trust and other natural resource management and environmental fire matters
- the Regional Development Ministerial Council – dealing with local government and planning
- the Health and Community Services Ministerial Council – dealing with community aspects of recovery.

Coordination of these ministerial councils is problematic and further highlights the need for the Australian Government to have a consistent and informed view at senior executive level.

As a separate but complementary initiative, the Australasian Fire Authorities Council – representing as it does rural and urban fire agencies and land management authorities – is well placed to provide advice and industry expertise on bushfire mitigation and management to the various ministerial councils. The Inquiry understands that similar arrangements operate in the health area, where representative bodies provide industry-specific advice to government.

Finding 10.1

A single ministerial council overseeing bushfire mitigation and management is not practical because of varying considerations that must be taken into account by the different jurisdictions and government departments and agencies.

10.4.3 The Australian Emergency Management Committee

The perception that generated a call for a ministerial council was an underlying concern that agencies responsible for bushfire mitigation and management are not well represented through existing national government-level forums. The usually episodic nature of major bushfire events adds to this perception of a lack of focus.

Although the Inquiry supports an all-hazards approach to emergency management, it considers it is also important to ensure that the perspectives, needs and expertise of fire agencies are adequately recognised and accommodated.

The COAG report on Natural Disasters in Australia recommended establishing:

new national machinery consisting of a Ministerial Council or Ministerial Implementation Forum, and a National Emergency Management High Level Group, to ensure effective collaboration and coordination of Commonwealth,

State Territory and Local Government action in implementing the reform commitments.¹²

It has been agreed that the Australian Emergency Management Committee is to be chaired by the Secretary of the Attorney-General's Department. Matters requiring ministerial consideration would be forwarded to the augmented Police Ministers Council once a year to consider emergency management questions as required, including bushfire. This approach reflects the fact that in many jurisdictions the Police Minister is also responsible for emergency services.

The concern expressed to the Inquiry about this arrangement is that the Australian Emergency Management Committee, as revised, will not usually include state and territory representatives of fire agencies or a representative of the Australasian Fire Authorities Council, thereby limiting the specialist fire advice available to government at the national level.

The Inquiry considers that having rural fire representation with observer status – probably through the Australasian Fire Authorities Council – on the Australian Emergency Management Committee would be the best possible arrangement for national fire policy and decision making. It has, however, already been decided that representative bodies should not be appointed as observers to the Australian Emergency Management Committee, so the Inquiry recommends that the Australasian Fire Authorities Council and relevant state and territory fire representatives be co-opted as advisers whenever bushfire mitigation and management are on the agenda or are likely to be discussed. Such an arrangement should also be instituted for the senior officials group that supports the augmented Police Ministerial Council. The Inquiry understands that this approach has support within the Australian Emergency Management Committee.

In principle, the approach taken by the Emergency Management Committee might be satisfactory, but the Inquiry notes that such an approach relies on a formal agenda process that could lack flexibility. Balancing this concern is the fact that the states and territories must have the opportunity to ensure that questions of bushfire mitigation and management are effectively represented by their members on the Committee.

Recommendation 10.2

The Inquiry recommends that the Australasian Fire Authorities Council be co-opted as an adviser to the Australian Emergency Management Committee whenever bushfire mitigation and management are to be discussed.

10.4.4 Organisational arrangements for bushfires

Three streams of fire agency respond to bushfires in Australia:

- urban fire agencies – generally responsible for protection and response in larger urban areas; normally career or part-time firefighters

¹² Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, p. vii.

- rural fire agencies – generally responsible for protection and response in non-urban areas, although coverage includes many rural towns and suburbs; normally or predominantly volunteer firefighters
- land management agencies – generally an element of forestry or national parks, responsible for fire management, protection and response on public lands; normally a small number of fire managers using personnel seconded from other land management functions as firefighters when required. Seasonal firefighters are also engaged by some agencies.

All three streams have either direct or indirect responsibility for bushfire response. fire and land management authorities have direct responsibility for bushfire mitigation.

State and territory organisational arrangements for bushfire mitigation and management vary to reflect local circumstances and approaches. These variations are illustrated in the summary of existing arrangements in Appendix E.

Fire agencies have not always operated well together. In the past, there have been unfortunate disputes about responsibilities, response areas and capabilities. These practices are no longer tolerated, and progress has been made in developing closer cooperation and compatibility. However, fire services are traditionally conservative institutions; the cultures of each fire agency stream must not be cause for impairing interoperability or operational efficiency. In Chapter 8, the Inquiry emphasises the need for a common purpose during mitigation and for unity of command during operations. Some fire agencies continue to plan in isolation and establish separate incident management teams for a single fire event. This is not in the interests of the communities served by fire agencies.

The disparate fire authority cultures have increasingly been drawn together, to the extent that fire services such as the Tasmania Fire Service and the Country Fire Authority in Victoria refer to themselves as integrated fire authorities, with career and volunteer firefighters serving both urban and rural communities. The Queensland Fire and Rescue Service is progressing towards this approach.

Other structural initiatives – such as the Northern Territory Police, Fire and Rescue Service, the Queensland Department of Emergency Services, the proposed Australian Capital Territory Emergency Services Authority, the Office of the Emergency Services Commissioner in Victoria, the South Australian Fire and Emergency Services Commission and the Western Australian Fire and Emergency Services Authority – are drawing together policy and administrative functions and, in some cases, operational planning and response. These structures also include other emergency services. The Inquiry notes this trend and commends all concerned.

In addition, legislation in South Australia and the Australian Capital Territory calls for the land management agencies to operate as an element of the rural fire service when responding to fires. They remain independent organisations for mitigation and land management. This implies a high level of operational coordination prior to response.

In New South Wales the *Rural Fires Act 1997* identifies four ‘fire fighting authorities’ – the Rural Fire Service, the New South Wales Fire Brigades, the Forestry Commission (now State Forests) and the National Parks and Wildlife

Service – with the Commissioner of the Rural Fire Service having the authority, under s. 44 of the Rural Fires Act, to take charge of fires in specified circumstances across all land tenures.

State and territory initiatives designed to improve interoperability and coordination between agencies are effective. Arrangements in Tasmania illustrate well what can be achieved through cooperative endeavour between Forestry Tasmania, the Parks and Wildlife Service and the Fire Service. Other jurisdictions have memoranda of understanding between fire agencies that facilitate service delivery.

The Inquiry is not suggesting that all states and territories should immediately move towards integrated fire services. In fact, we see merit in land management agencies' fire-suppression responsibilities remaining separate from those of fire agencies because of the relationship between land management and bushfire mitigation. Nevertheless, all fire authorities need to critically examine their mitigation and management arrangements – particularly for the rural-urban interface – to ensure that optimum efficiency and effectiveness are achieved from the available resources. The risk exposure at the rural-urban interface highlights the need for a holistic, seamless approach.

For the general public, structure is of little relevance: outcome is their sole concern at times of emergency. Coordinated service delivery and single, unified command of bushfire operations will provide the best service for the community. The effort required to coordinate disparate administrative and operational arrangements is an overhead that should be minimised or avoided. Although commitments to a coordinated approach might be present 'from the top down', much is reliant on goodwill, trust and relationships, and emergency circumstances place these elements under great pressure. Operational and legislative arrangements that best facilitate the required outcomes need to exist.

This calls for detailed collaborative planning, exercising, reviewing existing vehicles and equipment, ensuring that operational communications are interoperable and used, and having common, unified command structures. Introducing into service rural-urban pumpers in areas adjacent to interface zones is an obvious example of where fire authorities might be able to deal with challenges more effectively.

Perhaps more importantly, the attitudes of all volunteers and career staff need to be aligned to achieving the optimum operational outcome. Much work has already been done in developing a common approach, but more is needed. Cultural change is called for, and this involves sustained effort, is demanding, and takes time.

Box 10.1 The iZone project

The Queensland Fire and Rescue Service iZone project is about holistic service delivery for communities in the rural-urban interface zone. It is focused on Fire and Rescue Service personnel and how they can make a difference through a shift in culture, from separateness to inclusiveness. Resolving iZone challenges covers every aspect of service delivery, from the planning of new developments through to community education and awareness, service delivery planning, and response activities.

Finding 10.2

Urban and rural fire agencies are drawing closer together, and operational coordination within land management organisations is improving. Much has been achieved in the last 20 years. This trend should be encouraged: it reduces operational vulnerability during emergencies and provides the best possible service to communities. Regardless of the structure in place, though, a single, unified command and integrated operational planning and response must exist.

10.4.5 The Australasian Fire Authorities Council

The Australasian Fire Authorities Council was established in 1993 as a result of amalgamation of the Australian Association of Rural Fire Authorities and the Australian Assembly of Fire Authorities. It is the 'representative body for fire and emergency services in the Australasian Region'¹³, and it represents fire and land management agencies very effectively. The role and membership of the Council are detailed in Appendix H.

The Council has proved a most effective industry body, serving the interests of its members through policy development, advocacy, representation, learning and facilitation. It meets formally twice a year and its CEO and secretariat facilitate standing strategy groups focusing on specific matters and manage the annual Australasian Fire Conference. The Council is expanding its ties in the Asia-Pacific region.

The Council has low administrative overheads and a very focused purpose. Because it is essentially funded by its members, there is close scrutiny of costs and expenditure. Its recent achievements are impressive, among them training support, development of national standards, advocacy and preparation of the Bushfire Cooperative Research Centre bid, development of the National Aerial Firefighting Strategy, development of important policies (including the 'stay or go' position paper) and facilitating the uptake of the Australian Inter-agency Incident Management System in all Australian fire agencies.

One limitation of the Council is that it exists to serve its members, who themselves are responsible to their state and territory governments. It would therefore be inappropriate for the Council to represent jurisdictions in meetings with the Australian Government. But no other body has the detailed, practical knowledge of fire agencies' service delivery and bushfire mitigation and management. It is for this reason that the Inquiry recommends that the Australasian Fire Authorities Council be co-opted to advise the Australian Emergency Management Committee when bushfire mitigation and management are being discussed; the Council is also well placed to provide policy advice to the Australian Government through the augmented Police Ministers Council.

10.4.6 The Forest Fire Management Group

The Forest Fire Management Group, which can advise the Primary Industries Ministerial Council through the Forestry and Forest Products Committee, has

¹³ Australasian Fire Authorities Council, <www.afac.com.au/about/aboutafac.html>, viewed 24 March 2004.

proved an effective coordination body for members and continues to be valued by the agencies concerned. The Group was instrumental in organising recent deployments of fire managers to the United States to assist during fire emergencies. Although the Group's existence in part reflects the uncoordinated approach to bushfire-related matters within the Australian Government, the Inquiry considers that the Group should continue in its current form. Appendix I lists the Group's members.

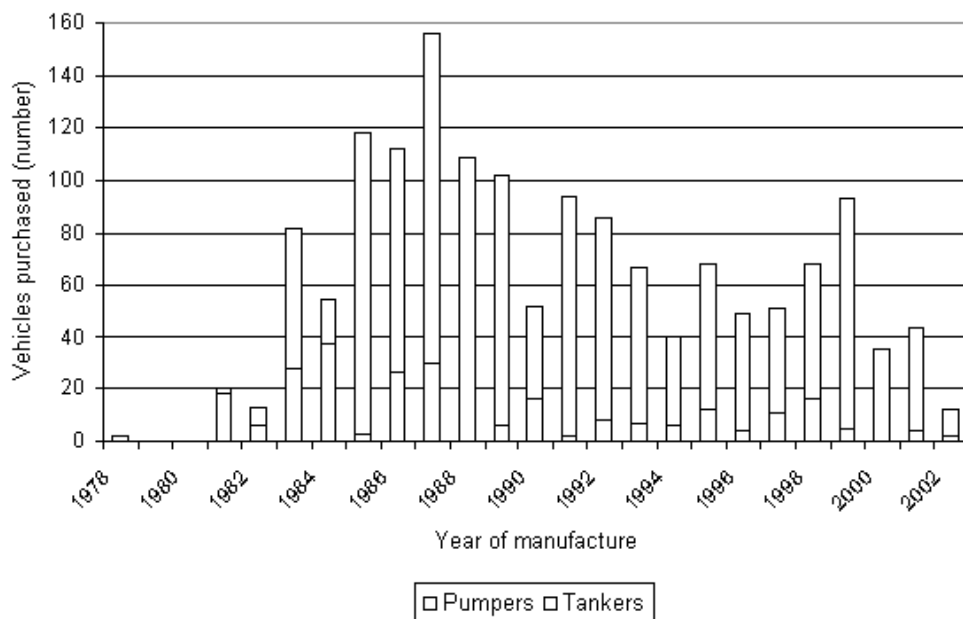
10.5 Common acquisition of equipment

In its discussion of aerial operations in Chapter 8, the Inquiry highlights the efficiencies associated with the National Aerial Firefighting Centre approach to acquiring aerial services for all jurisdictions. When the same goods or services are being sought by more than one jurisdiction, it makes sense to combine the purchase to achieve the best possible efficiencies.

The Australasian Fire Authorities Council is well placed to broker these arrangements. The Inquiry supports this approach and considers that significant savings could be achieved. The success of such an approach is, however, dependent on the adoption of common national standards.

The Inquiry was made aware of the future purchasing requirements of Victoria and South Australia in relation to rural tankers. Following the Ash Wednesday fires of 1983, both states embarked on major tanker-replacement programs. Many of these tankers will be reaching the end of their life later this current decade and will need to be replaced. Figure 10.1 shows tanker requirements for Victoria and a similar pattern – although a smaller quantity – is the case for South Australia.

Figure 10.1 Victorian Country Fire Authority: tanker requirements, 1978 to 2002



Source: Auditor General Victoria *Fire prevention and preparedness* May 2003

Table 10.1 provides a further indication of the quantity of vehicles and equipment involved in the case of Victoria.

Table 10.1 Victorian Department of Sustainability and Environment and Country Fire Authority firefighting vehicles and equipment, June 2002¹⁴

Department of Sustainability and Environment	Quantity	Country Fire Authority	Quantity
Fire tankers	82	Fire tankers and pumpers	1 520
4WD vehicles with slip-on units	360	All-terrain vehicles	3
Bulldozers	37	Urban aerial appliances	6
Trailers, camping equipment, and so on	369	Mobile control, rescue, incident units, and so on	46
Brigade-owned vehicles	0	Brigade-owned vehicles	551
Staff transport vehicles	0	Staff transport vehicles	234
Communications—radios, pagers, and so on	6 125	Communications—radios, pagers, and so on	19 500
Other—pumps, chainsaws, and so on	575	Other—portable equipment, and so on	1 848
Total number of items	7 548	Total number of items	23 708
Estimated replacement value (\$ million)	39.8	Estimated replacement value (\$ million)	700.0

Figure 10.1 and Table 10.1 illustrate that tanker replacement requirements for Victoria and South Australia will approach 200 a year for a number of years. If these vehicles or even their chassis could be purchased as a combined order, the potential savings are considerable.

Other opportunities for savings as a result of group purchasing are also evident:

- personal protective equipment
- firefighting equipment
- training equipment.

Finding 10.3

The potential savings from collective purchases of major equipment items between states and territories is extensive and should be explored through the Australasian Fire Authorities Council.

¹⁴ Cameron J W 2003, *Fire prevention and preparedness*, Auditor General Victoria p. 126.

11 Knowledge, learning and training



Australian National University students working in the field

(Photo: Geoff Cary, Australian National University)

The knowledge, learning and training necessary for informed and responsible action in bushfire mitigation and management can be acquired in several ways:

- through general schooling and community education
- through attainment of competency-based qualifications under the Australian Quality Training Framework and through professional development – for volunteer and career firefighters, land managers and others associated with bushfire mitigation and management
- through tertiary education for fire scientists, land managers and firefighters and the development of knowledge and skills in relevant specialist areas
- through recognition and use of Indigenous Australians' ecological knowledge and custom and through the integration of this with modern and local knowledge
- through the development of a 'learning organisation' culture¹ within agencies responsible for bushfire mitigation and management.

Bushfire-related school and community education is discussed in Chapters 3 and 7. This chapter deals with other aspects of knowledge, learning and training relevant to bushfire mitigation and management.

¹ Senge, P 2002, *The Fifth Discipline: the art and practice of the learning organisation*, Random House, Sydney.

11.1 Learning and training under the Australian Quality Training Framework

11.1.1 The Public Safety Training Package

Bushfire-related education and training under the Australian Quality Training Framework involves subjects² offered in the Public Safety Training Package³ and in the training packages of other sectors relevant to bushfire. Components of these packages are developed, delivered and assessed by a range of public and private registered training organisations that include most fire, emergency service and land management agencies. The training offered consists of nationally accredited competency-based programs with national qualifications and statements of attainment.

In other industry sectors TAFE institutions are a principal provider of this training. These sectors, such as those incorporating land management and conservation, also offer competencies and programs that develop knowledge and skills in land management and fire response. Programs delivered under the Framework through both approaches are available to volunteer and career members of organisations concerned with bushfire mitigation and management.

Training for bushfire mitigation and management has evolved and made considerable progress in the past 20 years. The National Training Reform Agenda has resulted in significant changes in vocational education and training in fire and land management agencies. Operational reviews have also had an influence on the focus of training, particularly in fire and emergency services agencies.

The public safety competency standards developed by the Public Safety Industry Training Advisory Body are now the agreed industry-wide benchmarks for workplace performance in fire agencies and emergency services. Before these national competencies were adopted, the Australasian Fire Authorities Council played a leading role in fostering a national approach to vocational education and training in the fire agencies. The Council developed and resourced the Australian Fire Agency Competencies and the National Fire Curriculum, developing resources in collaboration with the industry.⁴ These enjoyed wide acceptance and adoption among member agencies.

Implementation of the Public Safety Training Package has not always been easy in the transition from a curriculum-based training system to a competency-based one; the national recognition and cross-sectoral, and even cross-industry, portability of these competencies are, however, invaluable: the Inquiry acknowledges their merit. Implementation has varied nationally but considerable progress has been made. Expenditure on training facilities and training delivery for the fire, emergency service and land management agencies generally, and on training for bushfire mitigation and management specifically, has increased significantly in the

² Here, 'subjects' refers to both the units and the qualifications of a program of study.

³ Training packages are sets of nationally endorsed standards and qualifications for recognising and assessing people's skills.

⁴ The Council has continued this important role of supporting and coordinating training resources to assist members in developing and sharing materials for the national competencies and in mapping AFAC competencies to national competencies.

last 20 years, particularly since the finalisation of the Linton Coronial Inquest in Victoria (in 2001).

The Inquiry also notes the significant demands imposed on both volunteers and fire agencies by the formal competencies now required of volunteer firefighters (see Chapter 12). Continuing changes in competency requirements have greatly increased the training commitment required of and the cost implications for volunteers and agencies. We draw the Council of Australian Governments' attention to the substantial costs of providing minimum-competency training for Australia's 180 000 volunteer firefighters.

These costs have constrained the implementation of the current Public Safety Training Package by some agencies. In our view, there is a case for additional assistance, from the states and territories and through the Australian National Training Authority, for the development and delivery of learning and training resources.

Box 11.1 An increased commitment to training in Victoria

The Victorian Country Fire Authority, assisted by a funding injection of over \$20 million from the Victorian Government, will train 28 000 volunteers in 'Minimum Skills Training' by June 2005. This is being achieved through the employment of an additional 52 training staff to meet the increased demand. Volunteer associations say this additional training is being well received.⁵

11.1.2 The administration and durability of training arrangements

For the past decade the National Training Agenda, which is administered through the Australian National Training Authority, has been organised under 29 industry training advisory bodies, or ITABs. The Authority is currently proposing to restructure the ITABs into a smaller number (about 10) of industry skills councils. One of the consequences of this would be the absorption of the Public Safety ITAB, under which emergency services (including fire) industry standards are developed and endorsed, into a larger Public Administration Industry Skills Council.

Fire and emergency services agencies are concerned that the new arrangements will diminish their capacity to influence the development and delivery of future training needs and thus diminish the relevance and value of this training. Negotiations about future arrangements between fire and emergency services organisations, the Public Safety ITAB and the Australian National Training Authority continue at the time of writing.⁶

The Inquiry is conscious of the demands on volunteers' time if they are to meet training requirements (see Chapter 12) and is particularly concerned about the impact on volunteers' willingness to undertake further training if the proposals result in significant change in the Australian Quality Training Framework. We are not convinced that the flow-on effects for volunteers have been considered fully. Given the considerable training demands already imposed on volunteers, any

⁵ Cameron, JW (Victorian Auditor-General) 2003, *Fire Prevention and Preparedness*, Auditor-General, Melbourne, p. 117.

⁶ Information supplied by Emergency Management Australia.

further changes in competency requirements in the short term are likely to have a detrimental impact on volunteer training and retention.

The states' and territories' willingness to maintain their commitment to the Australian Quality Training Framework, regardless of the positioning of competency development in any future industry skills council, is more important than the administrative arrangements that are ultimately agreed. Their willingness is dependent on three factors:

- that the public safety sector retains a strong degree of influence over the training package
- that the planned training package review, in 2004–05, continues with the appropriate industry involvement
- that any industry advisory arrangements maintain effective representation structures.

The progress already made towards a consistent, nationally agreed competency standards framework is invaluable. The framework provides for transportability of qualifications between jurisdictions, commonality of skills when deployed interstate, and efficiencies in training delivery and resources. For these reasons, the maintenance of nationally agreed competencies should not be lightly set aside.

Box 11.2 Progress in Queensland

The Queensland Fire and Rescue Service has adopted the competencies and qualifications of the Public Safety Training Package for both career staff and volunteers. The Government's Volunteer Support Package has funded development of training and learning resources that are being used in support of training for volunteers. Once the program is completed, all firefighters will have rural fire competencies as a basic skill.

The preferred outcome of any new industry advisory arrangements for the public safety sector would be to retain arrangements similar to those that apply at present. Fire agencies and authorities have an important role in the all-hazards approach to emergency management, including preparedness for and response to terrorism, so it is important to ensure the optimal national integration of emergency management training. This is best achieved through the creation of a National Safety and Security Skills Council as an industry skills council within the revised industry advisory arrangements.

Recommendation 11.1

The Inquiry recommends that the Australian National Training Authority establish a National Safety and Security Skills Council to continue the development and administration of the Public Safety Training Package, including competencies and qualifications relevant to bushfire mitigation and management.

Recommendation 11.2

The Inquiry recommends that the states and territories and the Australian National Training Authority provide additional funding, as necessary, to registered training organisations to support the development and delivery of learning and training resources to all firefighters.

11.2 University education

Undergraduate and graduate courses⁷ relevant to elements of bushfire mitigation and management are offered at or in partnership with almost all Australian universities. Most of the courses focus on fire ecology or aspects of land management. As the House of Representatives Standing on Environment and Conservation noted in 1984⁸, there have been few courses that cover other elements of bushfire mitigation and management or that have sought to deal with the subject as a larger, more integrated whole.⁹ This has limited university graduates' ability to assume many bushfire-related responsibilities after graduation if they receive no further training.¹⁰ It has also limited the pool of students suited to bushfire-related honours and postgraduate research training and underlies some of the deficiencies in research capacity discussed in Chapter 5. There are, however, graduates with specialist skills – for example, in geographical information systems – who are able to contribute directly to aspects of bushfire mitigation and management.

The House of Representatives Standing Committee also noted that 'the provision of tenured fire science teaching specialists and specific theoretical and practical training are essential', but that 'given the staffing formulae which apply at Universities ... this would only occur if special dedicated funding was provided'. It therefore recommended that consideration be given to 'establishing a special fund to assist the universities to teach and carry out research in bushfire science'.¹¹ The Inquiry understands that no such fund was ever established, and the constraint recognised by the Standing Committee continues – albeit in a very different university funding environment.

Funds have, however, been committed to four cooperative research centres¹² with bushfire-related education and training programs (see Chapter 5 and Appendix F), and these programs now represent an important element of any undertaking to improve tertiary education relevant to bushfire mitigation and management. In particular, the cooperative research centres are able to support the development of

⁷ Here, 'course' refers to a defined subject of study, usually making up one-eighth of a full-time academic year program.

⁸ House of Representatives Standing Committee on Environment and Conservation 1984, *Bushfires and the Australian Environment*, HRSCEC, Canberra, paras 141–50.

⁹ Adams, M 2003, 'Fire rules and issues for resolution by government, industry and the community', Paper presented to BRAG meeting no. 2, 9 December.

¹⁰ Institute of Foresters of Australia submission.

¹¹ The Standing Committee also recommended that the then Tertiary Education Commission 'review the teaching of bushfire science in tertiary forestry and land management courses' and that 'an authoritative fire ecology textbook be commissioned ... for tertiary education purposes'.

¹² And to others conducting related research – see for example, Hill, R 2003, 'Frameworks to support Indigenous managers: the key to fire futures', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

relevant learning resources for both undergraduate and postgraduate students and to provide research training and practical experience with industry partners.¹³

The relevant knowledge base is now much better documented than it was in 1984¹⁴, and some learning resources are already being made widely available through the internet (as both open-access courses and as part of fee-paying courses¹⁵), so the challenge now is more one of encouraging uptake in suitable university curricula.

In the increasingly competitive Australian university sector, some institutions may see merit in further pursuing appointments and partnerships to strengthen bushfire-related programs and in promoting these as part of their competitive advantage. Some of the capacity-building initiatives identified in Chapter 5, such as Research Chair or joint appointments, would also greatly help to strengthen tertiary education and training relevant to bushfire mitigation and management. Another incentive would be if the Department of Education, Science and Training were to allocate a small number of additional undergraduate places, such as those identified in the Australian Government's 2003 Higher Education Package¹⁶, to universities that demonstrate a capacity to provide for growth in bushfire-related education.¹⁷

Some professional development programs also lead to post-graduate university qualifications¹⁸; these are discussed in Section 11.4.

11.3 Indigenous Australians' knowledge

Indigenous Australians have a rich knowledge of bushfire in their country and a strong tradition of using fire as a land management tool.¹⁹ Use of fire is also a fundamentally important part of Indigenous custom, through which obligations to country and to each other are honoured. Indigenous Australians' knowledge of fire thus has both practical and cultural significance. The value of this knowledge is being recognised by others working in bushfire mitigation and management, and there are growing numbers of initiatives where researchers, land managers and fire

¹³ These activities are not confined to universities that are CRC partners, but the CRC partners do receive additional resources.

¹⁴ Through textbooks such as those noted above, conference proceedings such as *Proceedings of the 3rd International Wildland Fire Conference*, journals such as the *International Journal of Wildland Fire*, and through internet sources such as <<http://sres.anu.edu.au/>>.

¹⁵ An example of free access is

<http://savanna.ntu.edu.au/research/projects/fire_savannas.html>; an example of a fee-paying course is <http://www.scu.edu.au/courses/unit_detail.php?spk_cd=FOR00100>.

¹⁶ <<http://www.dest.gov.au/highered/csp/default.htm>>, viewed 23 March 2004.

¹⁷ For example, through the development of 'majors' in bushfire-related themes.

¹⁸ For example, the AFAC-AIPM Executive Development Program, Graduate Certificate in Applied Management, offered by the Australian Institute of Police Management.

¹⁹ See, for example, Part V, 'Indigenous land and fire management', in G Cary, D Lindenmayer & S Dovers (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne; Whitehead, PJ, Bowman, DJMS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415-25; various projects of the Tropical Savannas and Desert Knowledge CRCs, as described in Appendix F.

agencies are working in partnership with Indigenous people, both to help retain and to learn from their knowledge.²⁰

There is now a substantial body of literature – and an active debate in the Indigenous, scientific, and fire and land management communities – about Indigenous knowledge and use of fire, its consequences and its future.²¹ The Inquiry notes the persuasive case made by many who advocate further development of various forms of partnership between researchers, land managers and fire agencies, to help sustain and to learn from Indigenous Australians' knowledge of fire. We also note the acknowledged difficulties in doing so – for example, the privileged nature of some Indigenous knowledge of fire²² and the fragmentation and loss of that knowledge in parts of Australia.²³

The Inquiry supports the emerging consensus that contemporary and future bushfire mitigation and management can benefit from greater sharing of knowledge between Indigenous and non-Indigenous Australians; we note, too, that this approach offers substantial benefits to Indigenous communities. As a result, we strongly support those partnerships already under way that give effect to this intent. Additionally, we note that it is fundamentally important to Indigenous Australians that such partnerships respect their rights and interests.

11.4 Further professional development

A number of submissions to the Inquiry²⁴ noted the benefits of professional development beyond the Australian Quality Training Framework, including at the higher levels of leadership and in multi-agency operational management. The Australasian Fire Authorities Council and Emergency Management Australia, among others, already offer a range of programs in generic and specialist areas, including in emergency management and leadership development.

Generic programs that cater for a wider cross-section of emergency managers have obvious benefits for capacity building and networking. A central concern, however, is the need for professional development focused specifically on bushfire mitigation and management. Skills and opportunities in this area are seen to have diminished as a consequence of changes (including downsizing) in many land management agencies and of changed management objectives for public lands. These changes are limiting the opportunities for some fire agency and land managers to gain practical experience in bushfire mitigation and management. Conversely, opportunities for professional development have been expanded by much greater levels of interstate and international deployment in the past decade.

²⁰ Whitehead, PJ, Bowman, DJMS, Preece, N, Fraser, F & Cooke, P 2003, 'Customary use of fire by indigenous peoples in northern Australia: its contemporary role in savanna management', *International Journal of Wildland Fire*, vol. 12, pp. 415–25.

²¹ *ibid*; see also various chapters in Abbot I & Burrows N (eds) 2003 *Fire in ecosystems of south-west Western Australia: impacts and management*; many papers in *International Journal of Wildland Fire*, vol. 12 nos 3, 4; Esplin, B, Gill, M & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 12.

²² Hill, R 2003, 'Frameworks to support Indigenous managers: the key to fire futures', pp. 176–186 in Cary G, Lindenmayer D & Dovers S (eds), *Australia Burning: fire ecology, policy and management issues*, CSIRO Publishing, Melbourne.

²³ Esplin, B, Gill, M & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne, ch. 12.

²⁴ For example, Walls; the Institute of Foresters of Australia.

Nevertheless, many people who are responsible for bushfire mitigation and management in land management agencies are concerned about the consequences of an ageing workforce and about the substantial diminution in capacity as a result of downsizing and an increasingly commercial focus.

A number of submissions pointed to the model of a 'National Bushfire Academy' or equivalent, as exists in the United States²⁵, as an example of how other countries have sought to deal with these difficulties. But Australia's relatively small population and limited financial resources compared with larger fire-prone countries such as the United States and Canada mean that, in the Inquiry's view, establishment of a national bushfire academy is not likely to be feasible or sustainable. Instead, we should build on existing resources, specialties and institutions to develop and sustain a coordinated national program – a 'virtual academy' – for higher level professional development for bushfire managers.

The Emergency Management Australia Institute at Mt Macedon in Victoria is one facility that already provides education and training programs for emergency services personnel, including those involved with bushfire. Graduate-level programs are now available, in structures that can articulate into Masters programs at partner institutions. Emergency Management Australia is also offering an executive management short course for senior executives in 2004.

The Australian Institute of Police Management provides executive leadership and management development for fire agency managers through an arrangement with the Australasian Fire Authorities Council. Two courses are conducted:

- the Executive Development Program, leading to the awarding of a graduate certificate of applied management
- the Executive Leadership Program, leading to the awarding of a graduate diploma of applied management.

The Australasian Fire Authorities Council has noted the need for a high-level executive development program for potential chief officers. Such a program would probably be similar to Defence programs for senior officers; these are conducted over an extend period and focus on the strategic and political levels. Although such courses operate in other countries, this is an expensive option, and it limits the exposure of senior fire executives to learning at this level.

The Australasian Fire Authorities Council, Emergency Management Australia and the Australian Institute of Police Management could all have a role to play in developing and running such a program, which would need to have a clear emergency management context and take a multi-agency, all-hazards approach. Alternatively, attachment to an existing program might be an option. The long-term strategic benefit of such a program for fire agencies, and ultimately the mitigation and management of bushfires in Australia, should not be underestimated.

Some states and territories already offer professional development opportunities, specifically relevant to bushfire mitigation and management, to their own staff and

²⁵ US National Fire Academy, Emmitsburg, Maryland, viewed 22 March 2004, <www.usfa.fema.gov/fire-service/nfa/nfa.shtm>.

to others from interstate.²⁶ The Inquiry considers the Australasian Fire Authorities Council and Emergency Management Australia are in a good position to coordinate the provision of a professional development program specifically relevant to bushfires. Such a program should draw on the expertise of the states and territories and on existing partnerships with universities and other institutions such as the cooperative research centres. A suite of topics reflecting state and territory expertise might be as follows:

State or territory	Possible professional development focus
Northern Territory	Savanna bushfire management Partnerships with Indigenous Australians
Queensland	Rural-urban interface operations Community fire management
New South Wales	Engaging with local and state government Rural fire investigation
Australian Capital Territory	Recovery
Victoria	Advanced aerial operations Community engagement
Tasmania	Integrated service delivery Interagency cooperation at policy and operational levels
South Australia	Incident control Professional mentoring
Western Australia	Fire incident leadership Fire mapping and strategic fuel-reduction burning

These topics are indicative only and do not suggest the superiority of any particular jurisdiction over another. Rather, the Inquiry considers that a nationally coordinated program – under which each state and territory specialises in the provision of one or more modules and delivers that training as a course available to all jurisdictions – would formalise the current less-coordinated arrangements to the advantage of everyone concerned.

A more active and coordinated program of professional development – including peer learning and mentoring and exchanges and visits to other fire and emergency services agencies – would be a cost-effective means of improving knowledge and practice and would engender a culture of continuous striving for best practice. Such a program should also be based on a culture that encourages the participation of women, who are currently under-represented in the senior ranks of many fire and land management agencies.

²⁶ The Australian Incident Leadership Program. Western Australian Department of Conservation and Land Management.

Recommendation 11.3

The Inquiry recommends that the Australasian Fire Authorities Council and Emergency Management Australia—in partnership with state and territory agencies and other education and research institutions—coordinate a national program of professional development focused on bushfire mitigation and management. Under the program, partners would deliver nationally coordinated professional development services to all jurisdictions.

11.5 Fostering organisational learning

A ‘learning organisation’ is one that is ‘skilled in creating, acquiring, interpreting, transferring and retaining knowledge, and purposefully modifying its behaviour to reflect new knowledge and insights’.²⁷ These attributes are central to more efficient and effective bushfire mitigation and management. Although many Australian fire, emergency services and land management agencies have sought to engender a learning organisation culture, there are particular challenges in the case of bushfire mitigation and management, as Garvin has described in the case of the United States:

There are a number of barriers that currently stand in the way of the firefighting community becoming more a learning organization. Many of these barriers are cultural. In particular, the penalty for mistakes is high, so errors are often hidden or left undiscussed; there is a strong hierarchical culture, which means that dissent from below is discouraged and minority views are given only limited attention; time is critical and attention is focused during the fire season, which means that reflective, thinking time spent on AARs [after action reports] or similar activities is often viewed as unproductive or a diversion from ‘real work’; and decisiveness is valued both within the community and by the media, which means that time spent learning is seen by many as unnecessary dithering and delay.

There are also technical and administrative barriers to success. Prescribed burns, especially when they get out of control, are frequently followed by reports and analyses, but each of these is a ‘one-off’. These reports tend to focus on the particulars of that situation rather than general principles; they also focus far more on the technical elements of the burn and less on social and group dynamics, communication and decision-making processes, or other administrative issues that could have produced problems. In addition, they almost focus on ‘things gone wrong’. Reports are not written about prescribed burns ‘gone right’. All of these factors make it very difficult to develop and distill a crisp set of practical, applied, generalisable lessons learned.²⁸

Creating learning organisations requires, first, a commitment to that culture. The Inquiry notes the progress already made towards this goal in a number of agencies and the various initiatives already under way that can further encourage a learning organisation culture, within and between agencies. There are a number of vital elements of a strategy to foster organisational learning relevant to Australian bushfire mitigation and management:

- institutional commitment to the adoption of a learning organisation culture

²⁷ *Improving Organisational Learning in the Wildland Fire Community*, <http://www.wildfirelessons.net/Special_Projects.htm>, viewed 25 March 2004.

²⁸ *ibid.*

- a continuing strong role for existing groups, such as the Australasian Fire Authorities Council and the Forest Fire Management Group, in facilitating the exchange of information and staff, between states and territories and internationally
- a continuation of regular meetings of people involved in particular aspects of bushfire mitigation and management – such as the Forest Fire Management Group, the Northern Australia Fire Managers Group and the Australasian Fire Authorities Council Strategy Group
- a continuation of both interstate and international deployments of response personnel
- wider adoption of various forms of benchmarking across the states and territories
- a process of cultural change, in fire agencies in particular, to increase the representation and contribution of women and of Indigenous Australians, who are generally under-represented in organisations responsible for bushfire mitigation and management
- establishment of a national Centre for Bushfire Lessons Learnt, as described in Section 11.6.

The Inquiry strongly supports the continuation and further development of initiatives that foster organisational learning within and between agencies responsible for bushfire mitigation and management.

11.6 A Centre for Bushfire Lessons Learnt

One of the primary characteristics of learning organisations is the existence of a process for capturing and sharing learning from real events. To add most value, such learning also needs to be shared between organisations. Traditionally, this has been achieved through a variety of formal and informal means – for example, publication of original or review articles in the scientific and professional literature, professional and scientific meetings, and study tours and staff exchanges. More recently, the internet has allowed easier sharing of information, and there has been recognition of the benefits of better publicising the historical record of reports of particular fires.²⁹ The Inquiry also sought to facilitate such learning through the summary of the recommendations of previous major bushfire inquiries it provides in Appendix C.

Another recent trend has been the establishment of groups charged specifically with facilitating learning from experience within and across organisations; a particularly relevant example here is the US Wildland Fire Lessons Learned Center.³⁰ The Inquiry considers that this approach has considerable merit in the Australian context, offering the potential to take up common challenges – for example, diminishing institutional memory, more limited operational experience

²⁹ For example, Alexander, ME & Thomas, DA 2003, 'Wildland fire behaviour case studies and analyses: value, approaches, and practical uses', *Fire Management Today*, vol. 63, no. 3, pp. 4–8.

³⁰ <<http://www.wildfirelessons.net>>, viewed 25 March 2004.

among staff, and the greater likelihood of operational deployment outside familiar territory.

The context for the establishment of an Australian Centre for Bushfire Lessons Learnt is more favourable now than at any time in Australia's history because of the confluence of a number of factors:

- the work of the Australasian Fire Authorities Council in the past decade
- the recent establishment of a nationwide cooperative research centre focused specifically on bushfires
- the experiences of interstate and international deployments during the past decade
- the national adoption of an all-hazards approach and a greater emphasis on preparedness and coordinated response
- the evolving governance arrangements discussed in Chapter 10.

These factors combine to create an environment conducive to the establishment and operation of such a Centre. The Centre would also be of substantial strategic benefit to bushfire mitigation and management, in Australia and elsewhere. State and territory fire and land management agencies and relevant national organisations strongly support this proposed initiative.

Consistent with our comments on the concept of a National Bushfire Academy, the Inquiry suggests that an Australian Centre for Bushfire Lessons Learnt be established in a form that builds most efficiently on existing institutions and arrangements. We see the Centre as having a small core working in partnership with staff from state and territory agencies, the Australasian Fire Authorities Council, Emergency Management Australia, cooperative research centres, and other relevant organisations such as CSIRO. It could be co-located with an existing research organisation to maximise synergies and efficiencies, and it should take advantage of the benefits to be gained from incorporating lessons learnt from the all-hazards approach. Emergency Management Australia already provides elements of such a program.

As with the National Aerial Firefighting Centre, the Australian Government should facilitate the establishment of the Centre for Bushfire Lessons Learnt by committing funding for an initial period, subject to co-funding by the states and territories. Funding of \$1 million a year, provided jointly by the Australian Government and state and territory governments, for an initial period of five years would be necessary for the establishment of a well-functioning Centre. It would be highly desirable and advantageous for the Centre to draw, in culturally appropriate ways, on Indigenous Australian's knowledge and experience of fire. Doing so would be one means of facilitating the sharing of Indigenous and other forms of knowledge and would build on partnerships already established in many parts of Australia. It would also be internationally distinctive and of considerable potential benefit to our nation's profile internationally.

Recommendation 11.4

The Inquiry recommends that the Council of Australian Governments support and fund the establishment of an Australian Centre for Bushfire Lessons Learnt, for an initial period of five years.

12 Rural fire service volunteering



Rural fire service volunteering is no longer confined to being a rural property activity. Training demands, community expectations and service delivery aims require professional commitment.

(Photo: Peter Kanowski)

Volunteering has occurred in Australia for a long time. Although structured volunteering was recorded soon after European settlement, involvement of Indigenous communities' in cultural volunteering is likely to have existed for many thousands of years. Volunteering has progressed to the point where 32 per cent of Australians aged more than 18 years now do volunteer work of some kind.¹ This occurs in a wide range of sectors, and volunteers carry out a great variety of tasks – as informal groups, in organisations and as part of government agencies. Some sectors of volunteering involve activity that is unique, but generally there is a broad commonality to the things volunteers encounter in their work.

The International Year of Volunteers, in 2001, generated an increased focus on volunteering and a number of important results, one of which was the development of the National Agenda on Volunteering.² This National Agenda provides a framework for the future of volunteering in Australia and is directly relevant to emergency services volunteers.

Volunteers contribute to a strong society by building community capacity and resilience. Their accumulated civil engagement generates considerable social capital. This is arguably strongest in small rural communities, often through activity associated with rural fire brigades. Bushfire brigades have been cited as an example of a mutual organisation that institutionalises social capital through efficacy and the production of norms of trust and reciprocity.³ Brigade volunteers participate in activities such as brigade meetings, fundraising events, training sessions and fire response, and they contribute to community building by fostering the trust, obligation and sense of belonging necessary in a democratic society.⁴

¹ Australian Bureau of Statistics data 2000.

² National Community Council of Advice 2001, *A National Agenda on Volunteering: beyond the International Year of Volunteers*, Volunteering Australia, Melbourne.

³ Lyons, M 2000, *The Third Sector: the contribution of nonprofit and cooperative enterprises in Australia*, Allen & Unwin, Sydney.

⁴ Winter, I (ed.) 2000, 'Part A contributions/functions of the nonprofit sector: the criteria', in Australian Institute of Family Studies, *Social Capital and Public Policy in Australia*, AIFS, Melbourne.

12.1 Emergency services volunteers

The history of emergency service volunteering – like much of volunteering in general – has its foundations in the ideals of altruism and charity and the need for self-preservation. The notion of helping neighbours in times of difficulty or danger is part of most societies and is now relied on by communities and governments across Australia. The progression from intimate, localised groups of families and neighbours acting in the interests of altruism, charity and self-preservation has resulted in what is now regarded as service provision on behalf of governments.⁵

Emergency services volunteers make a major contribution to the safety and wellbeing of Australian society. It is estimated that each year around 250 000 such volunteers (predominantly rural fire volunteers) contribute about 21.5 million hours assisting the Australian community. Their skills and experience are applied to a multitude of tasks, spanning risk reduction, readiness, response and recovery. The cost of service provision is significantly subsidised by voluntary labour and the contributions of employers and the self-employed through lost productivity and income. Additional to this personal contribution is the element of danger and personal risk as volunteers work to moderate the effects of an emergency.

This volunteer effort is the basis of Australia's emergency service response. The *Natural Disasters in Australia* report notes that it deserves appropriate recognition, protection and incentives by all levels of government.⁶

Detailed later in this chapter but requiring recognition now is the changing profile of rural fire volunteers. Although the Inquiry was advised that the overall number of fire service volunteers is relatively stable, there are fewer volunteers in country areas and this is being offset by more volunteers in rural-urban fringe areas. Even in country areas, more of the volunteers live in country towns and fewer on rural properties. This drift towards urban centres is a trend that appears set to continue.

12.2 Recognising the services provided by volunteers

In reviewing the range of rural fire volunteer matters raised with it, the Inquiry found a considerable degree of shared experience across the emergency services sector. Accordingly, unless it is necessary to identify a particular factor as applicable specifically to rural fire volunteers, the broader emergency services volunteer context is used here.

Recent high-impact fire seasons have given prominence to the role of volunteers in bushfire emergency response. What may be less clear to the public are the relatively recent changes to rural fire brigades and their volunteers. One such change relates to the increase the number of in people living in the rural-urban interface who are rural fire service volunteers: the volunteer base is no longer predominantly drawn from rural residents and landholders. The general change in providing community services by these brigades and volunteers has been institutionalised. It is taken for granted by society generally that volunteer-based rural fire services are the alternative to paid service provision.

⁵ Lyons, M 2000, *The Third Sector: the contribution of nonprofit and cooperative enterprises in Australia*, Allen & Unwin, Sydney.

⁶ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra.

That unpaid contribution is huge. Recent estimates from Victoria put the annual contribution of voluntary fire services at \$460 million.⁷ Australia-wide, an annual contribution approaching \$1200 million is likely. This warrants appropriate recognition at every level of government.

Options for financial concessions to be made available to volunteers as a mechanism for recognition are discussed later in this chapter. Recognition of volunteer service can, and does, take a number of forms. The states and territories and various agencies provided details of numerous programs and processes that acknowledge the contribution volunteers make to the safety of their communities. The following are examples:

- the Victorian Premier's Protecting Victoria package – which provides for recognition and rewards
- the Victorian Country Fire Authority's volunteer purchase scheme
- the New South Wales National Parks and Wildlife Service's 'All Parks' pass
- the Industry Sponsored Volunteer Leaders Program – facilitated by the Australasian Fire Authorities Council
- the Volunteer Summit – sponsored by Emergency Management Australia
- the New South Wales V21 partnership⁸
- the Commonwealth Department of Family and Community Services small equipment grants⁹
- the Queensland Department of Emergency Services volunteer support package
- South Australia's recognition of volunteers' employers.

Further recognition is provided through the Australian Honours system and local community awards.

Box 12.1 New South Wales National Parks and Wildlife Service's 'All Parks' pass

The New South Wales National Parks and Wildlife Service issues to interested active volunteer members of the Rural Fire Service an 'All Parks' annual pass. The pass provides free access to all fee-charging national parks and reserves in the state and is linked to a nominated vehicle registration. This is in recognition of service provided by the volunteers during suppression and mitigation operations.

⁷ Hourigan, M 2001, 'The value of the volunteer contribution', Consultant's report to the Victorian Country Fire Authority – cited in the CFA submission to the Economic Development Committee of the Parliament of Victoria.

⁸ <<http://e-learn.acu.edu.au/v21/index.html>>, viewed 3 March 2004.

⁹ <http://www.facs.gov.au/internet/facsinternet.nsf/aboutfacs/programs/sfsc-sml equip_grants_2004.htm>, viewed 3 March 2004.

Although recognition of volunteer effort at the personal level is important, the collective recognition of volunteerism within a rural fire service is deserving of equal attention. This includes activities and resources such as the following:

- compilation of accurate and complete statistical data
- volunteer training and competency records
- gaining an understanding of volunteers' motivation for joining and their reasons for leaving
- providing adequate opportunities for volunteer consultation and representation.

12.3 Reasonable commitment during operations

In recent years fire seasons have been of a scale that has required long, sustained efforts by fire agencies and staff. Interstate and international resources and staff assisted with response efforts in which volunteers made an enormous contribution in many ways – but, in particular, in terms of their time. For some volunteers the time commitment was of such magnitude that it has had a continuing impact on their lives and income. Fires requiring responses of such long duration are known as 'campaign fires'.

Campaign fires are the accentuated peaks in any longer term consideration of volunteer response activity. During an average fire season volunteer activity is, to a large extent, of short duration – usually only a few hours – and of limited frequency. On occasion, responses can be more frequent and at times extended, although generally a continuing individual commitment of greater than 72 hours is uncommon.

Use of the incident control system during operations should effectively manage and limit the commitment volunteers are expected to make during an incident. Later in this chapter the question of support to employers and the self-employed is discussed in relation to longer duration fire response. Impacts of volunteer absence from employment or income-producing activity might be further managed through a pre-planned understanding of the consequences and effects of any extended absence of a volunteer. Clear understanding of the probable extent of volunteer commitment between agencies, employers and volunteers is in the best interest of all and for the continuing support of volunteering generally.

The Inquiry notes the New Zealand practice that limits the expectation of initial volunteer commitment, with planning for career firefighters to take over after a specified period. This may not be an option in Australia – for reasons such as the distances involved and the availability of career firefighters – but it does identify a particular concern.

12.4 Volunteer representation

A number of volunteer associations, at both the state and territory and the national levels, presented submissions to the Inquiry; this included the Australian Emergency Management Volunteer Forum and the Australian Assembly of

Volunteer Fire Brigade Associations, which we consulted further during the course of our work. Each state and territory has active volunteer associations that provide representation and consultation to advise government in relation to volunteer participation in service delivery.

At the national level, the Volunteer Summit of 2001, sponsored by Emergency Management Australia, offered emergency services volunteers, associations and organisations an excellent forum for discussion and review. Emergency Management Australia plans a further summit for 2005. The Inquiry sees merit in providing such opportunities for volunteers supporting emergencies and natural disasters to meet, exchange views and develop positions. However, it sees Volunteering Australia as the most appropriate body to channel those views to the Australian Government, with recent changes to Volunteering Australia's membership arrangements improving national representation. The Inquiry considers rural fire service volunteer associations are likely to be most effective at the local and state and territory levels.

Finding 12.1

Existing state and territory arrangements for the representation of rural fire service volunteers are sound and provide an appropriate vehicle for volunteer consultation at agency and government levels. Questions of national significance should be directed through Volunteering Australia.

12.5 Legal protection and compensation

Australia is an increasingly litigious society, and protection from liability is causing widespread concern in the community. Understandably, this concern is reflected in the ranks of career and volunteer workers, particularly those involved with the emergency services. The ability to act swiftly in circumstances of great risk or danger is underpinned by the common law principle of acting in good faith and without negligence. Emergency response agencies across Australia have for many years included 'good faith and without negligence' protection clauses in their enabling legislation. The protection afforded by the legislation varies across jurisdictions and is dependent on the particular circumstance. In any event, volunteers and permanent employees are generally covered by the concept of vicarious liability.¹⁰

Coronial inquests and inquiries have highlighted the degree of examination bushfire events can attract. The decisions of volunteers as well as career staff are placed under intense scrutiny during such inquiries. This has led to some volunteers opting out of command positions in volunteer brigades.

The tort of negligence has undergone change in recent years as courts have handed down judgments that, from a volunteering perspective, have created uncertainty about the legal protection for volunteers. The 'insurance crisis' further deepened concerns about possible liability, the protection afforded volunteers and career staff, and the possibility of large and uninsured compensation payments that could

¹⁰ The principle of vicarious liability holds an employer liable for the wrongful acts of an employee or agent performing duties within the scope of their authority.

follow a civil conviction. The Ipp report¹¹ considered volunteer liability and concluded that the number of negligence claims against volunteers was statistically low and was not a factor in discouraging people from engaging in voluntary work. It also concluded that both for-profit and not-for-profit organisations share a common responsibility for ensuring that their operations do not cause suffering or injury and that it is therefore not in the public interest to provide limited liability for the activities of volunteers.¹²

Following the circulation of the Ipp report, states and territories enacted legislation to give volunteers protection from civil liability. (The South Australian legislation preceded the report.) This occurred within an organisational framework that requires volunteers to be aware of and work within the scope of authorised activities and the organisation's instructions. The relevant statutes are as follows¹³:

- *The Volunteer Protection Act 2001 (SA)*
- *Civil Liability Act 2002 (NSW)*
- *Civil Law (Wrongs) Act 2002 (ACT)*
- *The Civil Liability Act 2002 (Tas)*
- *Wrongs and Other Acts (Public Liability Insurance Reform) Act 2002 (Vic)*
- *Volunteer (Protection from Liability) Act 2002 (WA)*
- *Personal Injuries (liabilities and Damages) Act 2003 (NT)*
- *Volunteers Protection Act 2003 (Cwlth)*
- *The Civil Liability Act 2003 (Qld).*

The various provisions of these Acts are not consistent across jurisdictions; McGregor-Lowndes provides comprehensive coverage of the differences.¹⁴ The Inquiry does not consider the differences require reconciliation – apart from ensuring that existing provisions remain extant when members of rural fire services deploy interstate.

In addition, liability under statute law could affect emergency services and their volunteers. Concern has been expressed about industrial manslaughter legislation. The Australian Capital Territory has enacted such legislation and other jurisdictions are considering the options. The legal position of volunteers in the legislation is unclear, although – having been recognised in some jurisdictions as

¹¹ On 30 May 2002 a Ministerial Meeting on Public Liability, comprising Ministers from the Australian Government and the state and territory governments, jointly agreed to appoint a panel of four people to examine and review the law of negligence, including its interaction with the *Trade Practices Act 1974*. The Ipp report, *Review of the Law of Negligence*, is the report by that panel.

¹² <<http://www.revofneg.treasury.gov.au/content/review2.asp>>, viewed 3 March 2004, see p. 59, para. 4.3.

¹³ McGregor-Lowndes, M 2003, *Australian Volunteer Protection Provisions*, vol. 8, no. 2, Volunteering Australia, Melbourne.

¹⁴ *ibid.*

employees, and with the fire ground acknowledged as a workplace – it is unlikely that volunteer firefighters would be exempted.

Occupational health and safety legislation also affects emergency services volunteers. The concepts of ‘duty of care’ and ‘obligations’ are well known but less well understood by some volunteers in terms of how they apply in an operational environment such as a fire ground. The requirements for ‘reasonable precautions’ and ‘due diligence’ have different meanings on a fire ground compared with, say, an office environment. An added consideration for a person in a command position is the duty of care owed to all people in the workplace – a fire ground, as noted, being considered a workplace. Further, a fire ground, as a workplace, might include not only response personnel but also members of the public who are outside normal agency control and are providing assistance not directly related to dealing with the emergency.

It was proposed to the Inquiry that national legislation was necessary in order to provide uniform protection from liability for volunteers. The Inquiry understands that protection and compensation arrangements available to volunteers are a state and territory responsibility and outside the constitutional powers of the Australian Government.¹⁵ As a way of measuring the degree of conformity across jurisdictions, the *Natural Disasters in Australia* report compared the status of legal protection for emergency services volunteers against 12 criteria.¹⁶ Since that time states and territories have enacted new legislation for the protection of volunteers from civil liability and for employment protection. The Inquiry considers that consistency in outcomes – not necessarily identical legislation – is important for volunteers nationally, and it urges the states and territories to keep abreast of developments in this area, to ensure that their emergency services volunteers are not disadvantaged.

Finding 12.2

The Inquiry is satisfied that existing state and territory legislation dealing with occupational health and safety is sound and that the effort required to achieve a nationally uniform approach is not warranted. In other areas where volunteer firefighters may be liable, the Inquiry is satisfied that volunteers do not face greater exposure than other citizens. We do, however, urge the states and territories to maintain a process of review, to ensure that judicial interpretations are reflected in policy and procedures and that volunteers are not disadvantaged, particularly when they deploy interstate.

12.6 The costs of volunteering and mechanisms for support

While emergency service volunteering saves governments and the community many millions of dollars a year, it is not without cost, for both the volunteer and the organisation concerned.

Firefighting volunteers have benefited from the states’ and territories’ commitment to support and resource their volunteers appropriately. The provision of personal protective equipment, the supply or subsidy of equipment and vehicles, together

¹⁵ *ibid.*

¹⁶ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra.

with supporting organisational structures and processes, create a situation far removed from the days when rural firefighters used wet bags and branches to put out fires. This formal support by governments has progressed a great deal. The intensity and frequency of more recent fire events and changed community expectations about what constitutes a reasonable contribution towards costs have brought to prominence questions of payment and compensation for volunteers.

The prolonged fire event in New South Wales in 2001–02 and the publicity given to the plight of some volunteers led the Deputy Prime Minister to offer a measure of compensation for the volunteers' time and effort in relation to that event. The Inquiry was advised that only a very small number of rural fire service volunteers took up the offer and the issue became divisive. Volunteer firefighters are not seeking payment for their service – a position confirmed by volunteer associations and reflected in submissions to the Inquiry.

Nevertheless, submissions and advice to the Inquiry overwhelmingly endorsed an approach that ensured that volunteering did not cost volunteers or their employers more than they were prepared to give. While the act of volunteering or releasing volunteers during working hours was a cost that participants were generally prepared to endure, out-of-pocket expenses were seen as a cost volunteers should not be expected to bear. The Inquiry agrees.

A typical view expressed to the Inquiry is: 'Volunteers are firm in their view that they don't want to be paid for their services because it undermines the volunteer ethos ... on the other hand, volunteers don't want to be out of pocket'.¹⁷ Both of these concepts are embodied in the National Agenda on Volunteering¹⁸ and in Volunteering Australia's National Standards.¹⁹ A number of fire agencies have established procedures for all members, including volunteers, to claim out-of-pocket expenses, although few volunteers appear to have actually made claims and taken up this form of recompense.

Volunteers may not be lodging claims for legitimate expenses through choice or because of uncertainty about the required process, because of concerns about peer perceptions of 'rotting the system' or, more likely, because of an existing culture of not seeking any form of payment. Regardless of why a volunteer might not claim reimbursement, it was suggested to the Inquiry that recompense for costs incurred would provide a measure of equity with career staff and recognition. Recent volunteer forums have recommended that out-of-pocket expenses that were not reimbursed be dealt with under the taxation system as tax deductions.

12.7 Tax concessions for volunteers

The Inquiry examined whether emergency services volunteers warrant special consideration within the volunteering sector and concluded that they do because their circumstances are not common in the volunteering sector. For example:

¹⁷ Volunteer Fire Brigades Victoria submission.

¹⁸ National Community Council of Advice 2001, *A National Agenda on Volunteering: beyond the International Year of Volunteers*, Volunteering Australia, Melbourne.

¹⁹ <<http://www.volunteeringaustralia.org/publications/standards.html>>, viewed 3 March 2004.

- The demand for them to volunteer may occur at any time of the night or day, which precludes any ability to plan the timing and impact of their voluntary commitment. Having chosen to volunteer for a rural fire brigade, there is a strong sense of obligation to respond when paged, or 'called out'.
- Hazard-reduction and response activities expose volunteers to danger. Emergency services volunteers generally face greater dangers in the course of their volunteering than do other volunteers.
- Working conditions can be difficult, even severe, requiring extreme physical exertion and exposing volunteers to heat, smoke, and often long periods of discomfort.
- The operational environment of a fire ground exposes volunteers to liability.
- Attainment and maintenance of compulsory basic and advanced firefighting competencies require significant training and time commitment.

The option of taxation concessions for emergency services volunteers has received considerable support. At the September 2002 meeting of emergency services ministers, the Western Australian Minister for Police and Emergency Services gained support for the development of a paper on taxation concessions for emergency services volunteers.²⁰ The paper was developed and distributed to emergency services organisations for comment in August 2003 and is currently under consideration. It deals with three areas of possible taxation support to volunteers:

- tax deductions for expenses incurred by eligible emergency services volunteers
- tax rebates payable through the taxation system being available only for eligible emergency services volunteers
- government contributions to superannuation or other concessions for qualifying emergency services volunteers.

The paper considered each option and ultimately came down in favour of taxation rebates, stressing the need for further consultation with emergency services agencies to establish viable implementation. It concludes that such an initiative is a demonstration of appreciation to emergency services volunteers and will encourage long-term volunteerism. The Inquiry supports this sentiment, acknowledging that there may be potential flow-on considerations for other volunteers.

The Inquiry was not, however, in a position to further analyse the proposal for a tax rebate for emergency services volunteers. It did receive from the Australian Government Department of Treasury advice that does not support the introduction of such a measure:

²⁰ PKF Chartered Accountants 2003, 'Regarding tax concessions for emergency service volunteers', Options paper prepared on behalf of the Fire and Emergency Services Authority of Western Australia, Perth.

Treasury does not consider that tax concessions for emergency service volunteers are the appropriate mechanism for providing financial recognition of the important roles of these volunteers.

- Tax deductions are generally allowable only where the expense is necessarily incurred in gaining or producing assessable income. This principle is applied in an effort to get an accurate picture of a taxpayer's effective disposable income so that tax can be levied fairly across all wage and salary earners. Expenses incurred in volunteering are not connected with the income earning activity and therefore are not deductible.
- Tax deductions are generally considered to be inferior to outlays measures in encouraging behavioural change, as the degree of benefit an individual receives from a tax deduction is dependent on the marginal tax rate they face and therefore their income. In particular, allowing a deduction for expenses incurred in volunteering would be of most benefit to those who receive the highest income in their paid employment. Similarly, rebates can generally only benefit people who pay tax. Any volunteers who do not pay tax would generally not be able to access a benefit provided in this form.
- Furthermore, benefits provided through the tax system are claimed in an individual's income tax return. This will often mean that a volunteer cannot receive a benefit until 12 months after they incurred the expense.
- As the proposal would link an expense with income incurred in a different year, it would introduce substantial complexity into the tax system, and increase the compliance burden on taxpayers.
- The Government announced on 23 December 2003 that qualifying donations to volunteer fire brigades and their coordinating bodies were tax deductible. This is consistent with the deduction that is available for gifts of cash and property to organisations supporting other worthy causes in the community.²¹

Recommendation 12.1

The Inquiry recommends that an opportunity for reimbursement of out-of-pocket expenses should be available for each volunteer rural fire agency. In addition, the Council of Australian Governments should decide on the question of tax concessions as raised in the paper prepared by PKF Chartered Accountants on behalf of the Western Australian Government.

12.8 Support for employers of volunteers

Compensation for productivity lost and income forgone by employers of volunteers and by self-employed volunteers was raised in submissions to the Inquiry and was recommended in the *Natural Disasters in Australia* report.²² Specific support has been expressed for a scheme similar to that applying to employers of Defence reserves through the *Defence Legislation Amendment (Enhancement of the Reserves and Modernisation) Act 2000*. The Australian Emergency

²¹ Australian Government comments on draft report, 23 March 2004.

²² Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra, p. 68.

Management Volunteer Forum supported this approach, submitting, 'There is great merit in introducing a scheme which provided support to the employers of emergency sector volunteers'.

The Inquiry's attention was drawn to a circumstance in which a rural fire service volunteer might be involved, for example, in over 200 call-outs during a year but not on consecutive days. How this level of commitment (where volunteers' employers receive no compensation) can be balanced against a volunteer who once a year deploys for four days on a campaign fire (and, under the proposal, receives compensation) is problematic. Further difficulties arise from distinguishing between volunteers who may deploy interstate for four days and those who remain in their home locations and provide fire cover for that area, without leaving their employment. Both voluntary services are vital. While acknowledging how demanding campaign fires can be of the ability of employers and the self-employed to support voluntary contributions, the difficulties in implementing such a scheme for emergency services volunteers, and the potential inequities, led the Inquiry not to endorse the proposal for payment to the employers of emergency services volunteers.

Nevertheless, the Inquiry considers that the employers of volunteers need greater recognition. We commend existing schemes and arrangements developed by fire agencies to support the employers of volunteers through listing in annual reports, certificates and stickers of recognition, functions and ceremonies. The support of employers remains a vital element of volunteer firefighting in Australia.

Box 12.2 Employer recognition in South Australia

In an effort to highlight the support provided by employers of volunteers in South Australia, the Country Fire Service publishes the names of these employers in its annual report. Formal recognition is given to employers who are willing to release volunteers during working hours. This complements other programs, such as certificates, stickers and employer support functions, which are also operated by many other rural fire agencies.

Finding 12.3

The Inquiry commends employers of emergency services volunteers for their contribution in allowing volunteers to deploy during emergency events. Their contribution is critical to the viability of volunteer fire brigades and needs to be recognised at every opportunity.

12.9 Commonwealth legislation

12.9.1 Tax-deductible gifts

A further area of concern in connection with taxation concessions available to emergency services has been the Commonwealth's draft Charities Definition Bill. If accepted as drafted, proposals in the Bill would cause rural fire brigades to lose their charitable status, as a result of which gifts by individuals and corporations to a brigade as a means of fundraising would no longer be tax-deductible. Arguments

presented by the Australasian Fire Authorities Council and others resulted in the following statement being issued by Treasury on 23 December 2003:

The Treasurer today announced that the Government will amend the *Income Taxation Assessment Act 1997* to ensure that gifts of \$2 or more donated to the Country Fire Authority and the Victoria State Emergency Service will continue to be deductible for income tax purposes. The Government will also legislate to ensure that equivalent coordinating bodies in other States and Territories also benefit from being able to receive tax deductible gifts.²³

The Inquiry commends the Australian Government on this outcome.

12.9.2 Centrelink form lodgment

During the fire season of 2002–03 some volunteers experienced problems with lodgment of forms for the payment of social security benefits through Centrelink.²⁴ Both the extended duration of responses and the deployment of volunteers outside their home locations often prevented the lodgment of forms and, when required, attendance at Centrelink within the prescribed time frame. Some volunteers and people displaced by the fires were penalised by loss or delay of benefit payments.

This appears to have been a problem in some states and territories but not in others. It is something the Inquiry considers should have been amenable to resolution through liaison at the appropriate level between state and territory and Australian Government officials. Volunteers need to highlight these potential difficulties early and, once advised, Centrelink needs to display adequate flexibility to accommodate the needs of volunteer firefighters deployed during campaign fires and people who are displaced or cut off by bushfires. The Inquiry discussed the matter with the Department of Family and Community Services and is optimistic that it should not be a problem in the future.

Finding 12.4

Access to Centrelink payments for volunteers deployed on campaign fires and other people who are displaced or cut off by fires was a problem in some states. The Inquiry considers this matter should be amenable to resolution through liaison at the appropriate level between state and territory and Australian Government officials.

12.10 Training of volunteers

Training in relation to agencies that have responsibility for fire management or response is discussed in a wider context relevant to all staff (including volunteers) in Chapter 11. There are, however, some aspects of training that are unique to volunteers.

For volunteers, the change in training expectations and methodologies has been dramatic. Through their agencies, associations and national forums, volunteers have expressed concern and a degree of discomfort at the implementation of

²³ <<http://www.treasurer.gov.au/tsr/content/pressreleases/2003/114.asp>>, viewed 1 March 2004.

²⁴ Information provided by the Victorian Government on behalf of volunteers.

competency-based training. The main concerns are to do with the demand for increased training and the processes for recognition of previous training and the maintenance of current competencies.

Rural volunteers' limited availability for training and assessment and restricted access exacerbate the problem. These limitations are, however, common across rural industries and are not unique to fire and emergency volunteers. The experience gained by other rural industry training sectors in developing their training packages could provide solutions. The Inquiry notes that for fire and emergency volunteers there are no generic learning resource materials such as the Australian National Training Authority's Toolboxes, which are common in other rural industries. These Toolboxes provide a training resource for online and distance learning that would be a significant benefit for rural volunteers, particularly in relation to developing the underpinning skills and knowledge required by new competency-based training programs.

12.10.1 A public safety training package

The current Australian Government proposals through the Australian National Training Authority to restructure the Industry Advisory Arrangements, which would see the demise of the Public Safety Industry Training Advisory Board, are discussed in Chapter 11. Any outcome for volunteers from the negotiations between the Authority and the Board in relation to location within an Industry Skills Council should ensure, as a minimum at the least, that the mechanisms for consultation and input that came within the Board's structure and arrangements continue to exist.

12.10.2 Basic firefighter training

The Inquiry acknowledges state and territory efforts to ensure that basic competency requirements for volunteers are matched to skill and knowledge demands commensurate with the level of risk. Identification of these 'core competencies' minimises the training requirement for volunteers while accommodating essential elements of safety. We also acknowledge the overall progress in raising the training competencies of rural firefighting volunteers during the last five years. Although national competencies are not being used in all situations in all jurisdictions, there has been significant development in their adoption.

12.10.3 Volunteers as trainees

A recommendation of the Volunteer Summit of 2001 first raised the question of emergency services volunteers being supported through recognition as 'trainees' within the national training system. The concept was given additional impetus as recommendation 58(c) – 'recognise emergency management volunteers as trainees' – in the *Natural Disasters in Australia* report.²⁵ A number of submissions to the Inquiry expressed support for the idea, although no detail of how it may operate and be of actual benefit to fire agency volunteers was provided. Most states and territories were silent on the matter.

²⁵ Matthews, K (Chairperson) 2002, *Natural Disasters in Australia*, COAG, Canberra.

One point of agreement related to potential alternative funding support through adoption of the scheme, although no evidence was provided as to how this funding provision might operate. Engagement of a trainee in other industry sectors is targeted at the traineeship provider, just as much as the employee, through an employment subsidy. The following are some of the benefits that can be gained through traineeships:

- formal recognition of skills in a national framework of qualifications
- skill development in a work-based, practical environment
- training at no cost to the trainee
- concessions for travel and accommodation.

The Inquiry formed the view that, in this regard, there is a need to separate fire volunteers from the larger pool of emergency services volunteers because the implications differ. It is unclear to the Inquiry how trainee recognition for fire agency volunteers, who are already supported within a structured organisational framework and gain nationally agreed competencies, would benefit fire agencies or volunteers. Fire agency volunteers have support benefits that flow from the 'registered training organisation' status of their agencies. Perhaps more importantly, the Inquiry is unconvinced that the governance implications of devolving some or all training responsibilities to external providers such as TAFE colleges have been considered fully. On the basis of the available information, the Inquiry cannot support this proposal for fire service volunteers.

This is one of the few matters where the Inquiry does not support the recommendation of the COAG-endorsed *Natural Disasters in Australia* report.

Finding 12.5

The Inquiry received no information to suggest that state and territory rural fire services would benefit from the recognition of their volunteers as trainees. There was concern that such a change might lead to fire agencies losing control of key training responsibilities. On the basis of the available information, the Inquiry does not support this proposal.

12.11 Recruitment and retention of volunteers

The number of rural fire volunteers in fire agencies has been causing concern for some time. Declining numbers are affecting the rural brigades of some fire agencies; others are seeing a shift in numbers, with fewer rural volunteers but more volunteers from urban settlements and the rural-urban interface being a consistent trend. The Country Fire Authority of Victoria has researched the question over a number of years. The survey results suggest a decline in the order of 4.5 per cent a year for rural fire volunteers.²⁶ Among the factors attributed to this decline, as captured in exit surveys, are social and economic pressures that affect

²⁶ Woodward, A & Kallman, J 2001, 'Why volunteers leave', *Australian Journal on Volunteering*, vol. 6, no. 2.

voluntary commitment. Only one of the seven main reasons for leaving the Country Fire Authority was recorded as ‘internal organisational matters’.

Considering Australia’s dependence on volunteers for bushfire mitigation and response, any declining numbers are a concern – not just for agencies but for states and territories and the nation as a whole. A decline in volunteering in rural communities will not only have an effect on fire agencies’ ability to mitigate threats and manage bushfires: it directly affect the social health of local communities and will confront the wider community’s capacity to pay to replace the lost volunteer service.

Maintaining a viable volunteer force entails a number of social and professional challenges that need to be understood from a national perspective if appropriate responses are to be developed. These include:

- changes to the volunteering profiles, such as the duration of individual volunteering commitment becoming shorter
- demographic change related to population distribution
- an ageing population
- rural decline
- lost corporate knowledge and land management skills
- changing organisational structures.

In some states and territories there is a substantial body of knowledge about volunteering. On a national basis, however, this knowledge is not as well grounded. The Bushfire Cooperative Research Centre’s ‘Enhancing Volunteerism’ project aims to provide a baseline profile of fire agency volunteers that can be used in garnering government support for volunteers, developing community attitudes, and promoting organisational sustainability and change. It will also identify further research priorities for improving recruitment and retention rates.²⁷

Additionally, the project needs to examine what professional development is required for the managers of volunteers. Although many bushfire managers come from volunteering backgrounds, all would benefit from professional development in managing volunteering. This is examined further in Chapter 11.

Finding 12.6

The Inquiry endorses the Bushfire Cooperative Research Centre’s volunteerism research project. Consideration should be given to expanding the project to include an examination of the professional development needs of managers of volunteers.

²⁷ Bushfire Cooperative Research Centre project, ‘Enhancing Volunteerism: identification of research needs and development of agency-relevant research plans’, Bushfire CRC.

12.12 Models of rural fire service volunteering

Submissions to the Inquiry and remarks made in *A Nation Charred*²⁸ suggest that some volunteers and agencies are experiencing problems with contemporary models of rural firefighting volunteering. The ability to maintain sufficient numbers of rural volunteers is at risk because of factors such as:

- reduced rural populations
- increased employment of rural workers through contract, rather than salaried, positions – which is more likely to lead to a loss of income when volunteering during work hours
- off-farm employment – leading to farm residents often working long distances from their properties
- loss of bushfire-related skills and knowledge.

Information provided to the Inquiry cited a direct connection between an increased training requirement and reduced volunteer numbers.²⁹ Among other organisational factors noted – which are perhaps more anecdotal than empirical – were a perceived loss of local control and decision making (particularly in relation to safety), increased bureaucratic requirements, and a failure to value local knowledge and experience. This theme is evident in the submissions and recommendations of the House of Representatives Select Committee’s report *A Nation Charred*.³⁰

Agencies evinced sensitivity to these concerns and a desire to find solutions through variations in structure and training programs. Less structured models of volunteering or changed brigade classification systems and levels of commitment are being considered. The application of risk management principles is helping agencies develop solutions that will be specific to each state and territory and could reflect a particular situation – for example, Fire and Emergency Service Authority brigades in Western Australia, a combination of fire and state emergency service provision. Other states and territories are developing brigade classification systems to accommodate the concerns and capabilities of local volunteers. Such situations are not confined to brigades and volunteers in rural regions: there are different, but equally challenging, influences in maintaining the required level of volunteers with the necessary skill and experience in rural-urban interface areas.

Finding 12.7

Use of a brigade classification structure based on risk assessments is a sound approach, providing greater flexibility for volunteer commitment, particularly for rural volunteers who are unlikely to fight bushfires outside their local area.

²⁸ House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra. pp. 194–201.

²⁹ Information provided by South Australia.

³⁰ House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra. pp. 141–70.

Further development and implementation of this approach will allay some of the concerns expressed by volunteers in relation to increased demands and training obligations.

Box 12.3 Queensland rural fire brigade classifications

In Queensland the character and method of operation of brigades varies considerably, from simply a group of property owners joining together for their mutual protection against fire to urbanised brigades with a formalised structure operating from a fire station. Brigade members decide on the brigade's level of participation in activities.

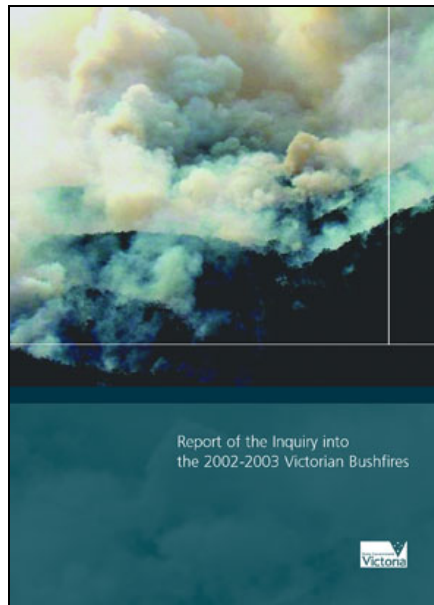
Brigades are separated into four classifications based on risk-management profiles:

- Class 1 – rural farmlands, scattered dwellings, property-based equipment
- Class 2 – more closely settled rural areas;
- Class 3 – generally located near the rural-urban interface
- Class 4 – high-density rural-urban areas.

12.13 Conclusion

Bushfire mitigation and management in Australia are reliant on an estimated 180 000 volunteers. This impressive level of contribution is consistent with volunteer assistance in other community sectors. What is unique, though, is rural fire service volunteers' willingness to be called out without warning, to put themselves in danger, and to undergo significant levels of training to meet national competencies. The community benefits are considerable. There are direct savings through no payments for volunteer contributions and employers not seeking reimbursement for labour lost when volunteers respond during working hours. But the community benefits are far greater. In many places, volunteer fire brigades are an important element of the fabric that binds the neighbourhood and contributes to overall wellbeing. Governments at every level must do all they can to recognise, foster and encourage this volunteering.

13 Reviewing performance



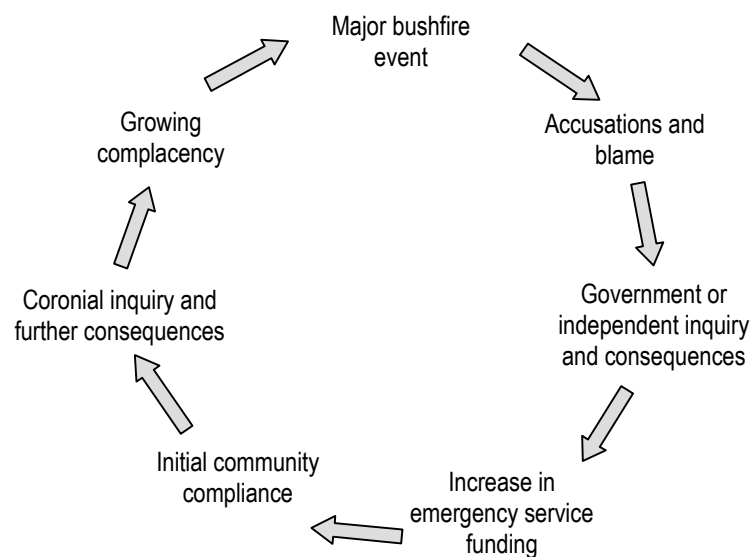
The cover of the report of the Inquiry into the 2002–2003 Victorian Bushfires

The Inquiry gave much thought to the reports of previous bushfire-related inquiries and inquests, the recommendations of which are listed in Appendix C. A cycle of governance actions and community response and consequences follows each major fire event. Some elements of the cycle are positive and constructive; others are not.

13.1 The bushfire cycle

The bushfire cycle occurs principally in southern Australia. It proceeds until the next major event and can extend over 20 to 50 years. A series of cycles can also occur concurrently but with different starting times – see Figure 13.1.

Figure 13.1 The bushfire cycle



The question is whether the cycle is inevitable or whether there is an opportunity to influence outcomes and mitigate the impact of the various elements. Although a central theme of this report is that bushfires are inevitable and Australians must learn to live with the exposure, the Inquiry concluded that some community and government action *can* be taken to reduce the impact of, or even eliminate altogether, elements of the cycle. Apart from the risk-reduction strategies discussed in Chapter 6, what other action can the states and territories, and communities, take?

13.2 Indicators of good practice

National indicators of good practice that set a benchmark for the states and territories should be developed. State and territory governments would then have agreed indicators against which local governments, communities and rural fire agencies can report. In this way each government would receive advice about how its jurisdiction is performing relative to the national indicators. A report would be generated by the jurisdiction itself: it would not be a contribution to a national report. This approach offers two additional benefits:

- Performance trends within a jurisdiction could be identified.
- There would be opportunities to relate existing performance to bushfire risk, particularly when approaching high-risk bushfire seasons.

Having a set of good-practice indicators and reporting regularly against them would obviate the current reality whereby the states and territories gain an appreciation of fire mitigation and management performance only when there is a major bushfire event. Some states and territories do conduct performance audits, but they are not based on nationally agreed criteria.

The Inquiry emphasises that the nature of the reporting system would be a matter for each state and territory, rather than being part of a national structure. To some degree, a national review mechanism already exists with the Productivity Commission's report on government service provision, although the coverage of bushfire performance is not extensive. In addition, the variations in jurisdictions' reporting limit the value of interstate comparisons, and land management agencies are generally not accounted for. As the Commission notes, 'Interpreting landscape fires data across jurisdictions is problematic because current data limitations make it difficult to measure the number and impact of landscape fires'.¹

Perhaps more importantly, the Inquiry sees it as inappropriate to review the performance of fire agencies in isolation. If the themes of this report are to be taken up, local governments and communities must also take responsibility for elements of bushfire mitigation and management, and their performance should be reviewed as part of a state or territory's overall assessment of performance. This should occur on an annual basis, before the bushfire season.

There are other limitations to the Productivity Commission's report in that, despite identifying an equality, efficiency and effectiveness framework, the majority of

¹ Productivity Commission 2004, *Report on Government Services, Part D, Emergency Management*, Productivity Commission, Canberra, p. 8.29.

performance measures focus on response. In the Inquiry's opinion, national bushfire indicators of good practice should focus on the five mitigation and management factors it has identified, these being research, information and analysis; risk modification; readiness; response; and recovery – the 5Rs.

The Inquiry sees the Australasian Fire Authorities Council as a suitable forum for developing and gaining agreement on the indicators of good practice. State and territory performance should also be reviewed against nationally agreed bushfire principles, as discussed in Chapter 14. This approach would provide both a vertical and a horizontal review of fire agencies', local governments' and the community's performance – against nationally agreed measures.

Recommendation 13.1

The Inquiry recommends that the states and territories agree to a common set of national bushfire indicators of good practice, based on the five mitigation and management factors it has identified—the 5Rs. These indicators, together with an assessment against the proposed national bushfire principles, would provide a consistent framework for review and reporting in each state and territory.

13.3 Greater sharing of learning

Another step that should be taken to reduce the impact of the bushfire cycle, and possibly eliminate some elements, is to encourage greater sharing of learning. The Bushfire Cooperative Research Centre's projects will assist with this in the longer term, and the proposed Centre for Lessons Learnt would provide guidance in the short term, as discussed in Chapter 11.

13.4 Coronial inquiries

Coronial inquests and inquiries are undertaken to investigate deaths and in most but not all states and territories, may be used to investigate major fire events that do not result in deaths. The Inquiry fully accepts the need for coronial investigations into deaths as a result of a bushfire event.

Due to the legalistic and potentially adversarial approach that can develop during coronial inquiries into bushfire events, significant periods of time are involved in the establishment, conduct and finalisation of coronial inquiries. Such complexity and delay is problematic for several reasons:

- Operational issues that require rectification may not be identified prior to the next fire season.
- Individuals involved in decision making during a bushfire event are placed under enormous stress for an extended period, often including the following bushfire season, until the coronial process is complete.
- Those that have suffered during the fire event fail to benefit from a timely resolution.

- The public and media are involved in considerable speculation during an extended period of uncertainty.
- The ‘value for money’ from a public perspective is open to question.

The Inquiry questions whether coronial inquiries are the best option for investigating operational issues not directly related to bushfire deaths. We favour practices where a major fire event is followed by an independent inquiry that commences as soon as practical after the event and is concluded in time for changes to occur prior to the next fire season. By their nature and process, coronial inquiries generally are not able to do this. The extent to which coronial inquiries should investigate the operational issues of a major bushfire – other than those concerned directly with the fire deaths – needs to be critically reviewed.

The Inquiry is unconvinced that the public interest is best served by coronial investigations inquiring into operational decisions that are not directly related to the deaths. Coronial investigations into operational issues may reinforce blame and risk avoidance, rather than improving a shared understanding and promoting a learning culture. This is likely to be counter productive in the longer term. The Inquiry favours post incident investigations and reviews that are most likely to achieve improvements to operational performance and a positive overall result. While individuals need to be held accountable for their decisions and the public needs to be satisfied that all matters of concern have been investigated, bushfire mitigation and management will not progress if blame dominates over learning.

Finding 13.1

All reviews and investigations into bushfire events, at any level—internal or independent—need to focus on learning not blame. The inquiry approach needs to focus on this outcome, in the interests of all involved. Coronial inquests into bushfire matters other than deaths may not be the most suitable form of inquiry.

13.5 Conclusion

Adoption of a common set of national indicators of good practice and subsequent state and territory auditing against them will not stop bushfires happening. Regular review and effective post incident operational inquiries will, however, provide – for state and territory and local governments, fire authorities and communities – transparent, consistent measures across a broad range of areas relating to bushfire mitigation and management. National indicators of good practice should not be used to compare the performance of the various states and territories: the focus should be on regularly reviewing overall performance, thereby reducing the impact of, or eliminating altogether, elements of the bushfire cycle. Were this achieved, major bushfire events’ effects on communities, the environment and individuals would be considerably reduced.

Part Five
National bushfire principles

14 National principles for bushfire mitigation and management



Heathland and sedgeland ecosystems have many plants that regenerate after fire by resprouting from roots and stems. This *Banksia robar*, in the foreground, shows the dead stems burnt in a recent fire and the lush growth of the resprouting foliage.

(Photo: Rob Whelan)

There is no consistently expressed common understanding of or approach to the mitigation and management of bushfires throughout Australia. This situation reflects the history of bushfire mitigation and management in this country, but it is a poor foundation for the future, which should be characterised by both increased interjurisdictional cooperation and greater integration of bushfire mitigation and management with broader 'natural disaster management.

The Inquiry notes and commends the work and achievements of the Australasian Fire Authorities Council and Emergency Management Australia in developing national approaches to many elements of bushfire mitigation and management within an all hazards approach. But this work has yet to result in a national statement of principles for bushfires. In the Inquiry's view, such a statement is rightly the responsibility of the Council of Australian Governments.

This chapter seeks to redress that shortfall.

14.1 Why national principles are needed

There are five primary reasons for having national principles for bushfire mitigation and management.

14.1.1 Establishing shared goals

Bushfire mitigation and management will be neither fully effective nor efficient in the absence of shared goals. The Inquiry notes that there has been considerable development of goals shared between agencies with bushfire responsibility within particular states and territories. It notes, too, that the states and territories see this as the basis for the considerable gains made in bushfire mitigation and management within their jurisdiction.

14.1.2 Communicating shared goals

The Inquiry argues that engendering a shared understanding – between governments, agencies, communities and individual Australians – of bushfire mitigation and management, and of the shared responsibility this entails, is the basis for more effective and efficient action. A ‘national principles’ document, written in plain English (and translated into other languages in common use, as appropriate), would assist in communicating that shared understanding. This statement of principles should be in addition to any more general all hazard document.

14.1.3 A common framework for a national challenge

Bushfires are part of life in Australia. The nature and timing of fire seasons differ around the nation and the impacts of bushfires vary between regions and years, but all Australians have to live with bushfire. Agreement on national principles would be an acknowledgment that bushfire mitigation and management is a matter for all Australians and would help us acquire the focus and resources needed to significantly reduce their impact.

14.1.4 Crossing borders

Major bushfire events do not recognise local government boundaries or interstate borders, or the distinction between private and public lands. They can have wide-ranging impacts across landscapes and communities, including on shared assets such as air quality and biodiversity or shared challenges such as greenhouse emissions. Increasingly, firefighting resources are deployed across state and territory borders, as well as across tenures. Agreed national principles can facilitate cooperative approaches and responses – regardless of landscape, jurisdiction, or agency responsibility – without prejudicing operational considerations.

14.1.5 Performance and compliance

At present there are no national performance standards for bushfire mitigation or management – as discussed in Chapter 13. The Productivity Commission has made some observations about efficiency and effectiveness, although these are centred on urban fire. While coronial and independent inquiries and performance audits can provide comment after major events, national principles would provide the basis of a common framework for performance assessment and community accountability.¹

National principles should not specify how or how often performance review would occur, since this is essentially a state and territory responsibility – although reviewing performance against the national principles is required.

¹ The Inquiry notes the Victorian Code of Practice for Fire Management on Public Land as a good example of what can be established, agreed and communicated and provide the basis for monitoring and auditing. However, that Code is a much more detailed and operationally focused document than the national principles we propose.

At Appendix G we detail bushfire and land management terminology. While this is not part of national principles, common terminology is consistent with the approach the Inquiry is seeking.

Box 14.1 describes the essential principles of a national approach to bushfires in Australia. Adoption of the principles will focus the understanding, effort and resources required to improve efficiency and effectiveness. This does not necessarily mean the incidence of bushfires will decrease; their impact will, however, be mitigated and Australians will be helped to manage rural fires better.

Recommendation 14.1

The Inquiry recommends that the Council of Australian Governments adopt a statement of national principles as the framework for the future direction of bushfire mitigation and management in Australia.

Box 14.1 Indicative national bushfire principles

Bushfires are understood, accepted and respected

Like other natural hazards, bushfires cannot be prevented. In many instances, bushfires are an important tool to assist in achieving land management objectives. The impact of unplanned fires needs to be minimised through effective action based on learning and understanding. This also requires strong self-reliance.

Shared responsibility

A philosophy of responsibility shared between communities and fire agencies underlies our approach to bushfire mitigation and management. Well-informed individuals and communities, with suitable levels of preparedness, complement the roles of fire agencies and offer the best way of minimising bushfire risks to lives, property and environmental assets.

Decisions within a risk management framework

No single action will lead to the elimination of bushfire risk. The best approach to minimising risk is to make decisions about bushfire mitigation and management within an integrated risk management framework.

Integration of learning and knowledge

Analysis of fire events is based on operational and scientific evidence and research. This should be informed by extensive and consistent national data, including fire regime mapping. The best results will be achieved by integrating all forms of knowledge, and good information about fire history, with analysis at the local and regional levels.

Manage fire according to the landscape objectives

Australia has a great diversity of climates, environments, land uses and built assets. Fire management objectives and outcomes will vary across landscapes and over time. Clear agreed objectives and an adaptive management approach are required for implementation.

Consistency of purpose and unity of command

There needs to be consistency of purpose during bushfire mitigation and unity of command for all fire response, irrespective of organisational structures.

Protection of lives as the highest consideration

Firefighter and community safety must be at the forefront of bushfire mitigation and management deliberations. Although there should always be a balance between safety, effective response and environmental considerations, it is personal safety that must be the greatest concern.

Monitoring performance

The states, territories and local governments need to regularly review their performance against these principles and other appropriate indicators. Performance review should not be allowed to wait until after a major bushfire event. If the principles are to improve performance and bring about change, they must be monitored on a regular basis.

Appendixes

Appendix A The Inquiry's terms of reference

The Council of Australian Governments issued the following terms of reference for the Inquiry in September 2003.

Introduction

Bushfires are a natural feature of the Australian landscape but their frequency and a range of factors, some of which can be affected by human intervention, may influence severity. The loss of four lives and around 500 homes in the ACT during the 2002-03 bushfire season has highlighted that bushfires are as much a part of metropolitan life as they are for those living in regional and rural Australia. It is now estimated that a total of 3.1 million hectares of land has been burnt in bushfires this season. While the most severe fires have occurred in New South Wales (NSW), Australian Capital Territory (ACT) and Victoria, there have also been major fires in the majority of other jurisdictions.

NSW and the ACT appear to have had their worst bushfire seasons. For NSW, the area burnt is almost three times what was burnt in 2001-02 (estimated at 754,000 hectares). Over half of the land area of the ACT, and around 90 per cent of Namadgi National Park has been burnt. The 1.3 million hectares burnt in Victoria is exceeded only by the 1.5 million hectares burnt in 1939.

Objectives of the inquiry

Against this background, the Commonwealth, State, Territory and local governments, under the auspices of the Council of Australian Governments, will commission an independent inquiry into bushfire mitigation and management in Australia. Acknowledging that bushfire management and mitigation is constitutionally an area of State and Territory responsibility, this inquiry will add value by considering issues and identifying situations where there may be opportunities to enhance national cooperation and achieve best practice. The inquiry will outline the facts on this season's major bushfires (including where the fires started and what was affected). Having established the facts, the inquiry will examine the efficiency with which major bushfire fighting resources are managed on a national basis and the effectiveness of current management practices particularly in crown lands, state forests national parks, other open space areas adjacent to urban development and private property. The inquiry will also explore measures such as local government planning and best use of technology to minimise the impacts of bushfires.

Scope of inquiry

Having established the facts in relation to the major bushfires in the 2002-03 season, the inquiry will address the following issues:

- the current state of bushfire management in Australia, including:
- risk factors contributing to bushfires, including deliberate fire lighting;
- bushfire mitigation strategies in national parks, state forests, other Crown land, other open space areas adjacent to urban development and private property;
- the impacts of bushfires on the environment, human life, property and the economy;

- the impacts of fire mitigation strategies, such as hazard reduction, on the environment, human life, property and the economy;
- the adequacy of infrastructure and human resources for fire mitigation purposes; and,
- the use of existing fire fighting resources, including an examination of the efficiency of resource use and co-operation between agencies and between jurisdictions; and
- the identification of best practice national measures, cooperation and standards that can be undertaken by all levels of government, industry and the community, and the economic, social and environmental costs and benefits of such measures.

In undertaking the inquiry, the panel shall:

- take account of and draw on bushfire inquiries, distilling from them the common threads and lessons in relation to opportunities for national cooperative bushfire mitigation and management;
- be mindful of the capacity of existing strategies and arrangements, including urban design and land use planning, at all levels of government, to protect life and property from major bushfires and minimise negative environmental impacts of bushfires, and bushfire mitigation regimes; and
- also take into account national and regional objectives and variation in relation to vegetation types, land management processes, land management processes, biodiversity, terrain, long term climate conditions and other environment and heritage issues.

Timing

The inquiry will provide a final report in the first quarter of 2004.

Appendix B Submissions and consultations

B.1 Submissions

The Inquiry received submissions from the following government agencies and non-government organisations and individuals.

B.1.1 Government agencies

1. Department of Agriculture Fisheries and Forestry – Australia
2. Emergency Management Australia
3. Bureau of Meteorology
4. Australian Capital Territory Chief Minister’s Department
5. South Australian Department of Premier and Cabinet
6. Queensland Department of Premier and Cabinet
7. CSIRO
8. Indigenous Land Corporation
9. Department of Defence
10. New South Wales Cabinet Office
11. Department of the Environment and Heritage
12. Department of Transport and Regional Services
13. Department of Family and Community Services

B.1.2 Non-government organisations and individuals

1. WA Forest Alliance
2. Acacia Rose Media (2)
3. Don Matthews
4. Robert Macoun
5. Fred Rich
6. David and Yvonne Ward
7. W Greg Burns
8. Emission Traders International Pty Ltd
9. Merike Johnson

10. Joint Across Border Working Party (2)
11. Richard Oh
12. ALP Risk Management
13. Sandra Hardiman
14. Dr Ross Florence
15. Jenny Filmer
16. Australasian Fire Authorities Council
17. WC Geary (4 in-confidence submissions)
18. Greg Pobar
19. PhOZ Chem Pty Ltd
20. Insurance Council of Australia
21. W Greg Burns
22. Australian Emergency Management Volunteer Forum
23. Australian Management Consolidated Pty Ltd (2)
24. CHAP Air Tech Pty Ltd
25. Field Air
26. Vic Eddy
27. Jim Williamson
28. Southeast Queensland Fire and Biodiversity Consortium (SEQFABC)
29. Aerial Agricultural Association of Australia Ltd
30. Joint Across Border Working Party
31. Bush Users Group
32. Eurobodalla Shire Council
33. WA Farmers Federation
34. Fred Ward
35. Timber Towns Victoria
36. Australian Assembly of Volunteer Fire Brigade Associations
37. The Bushfire Front
38. Dr Geoff Cary
39. Bob Foster
40. AJ Pedro
41. Col Adams Aerial Services

42. Community Awareness about the Health Effects of Burning Wood in Residential Areas
43. IQ Wireless GmbH
44. Athol Hodgson
45. Confidential submission
46. David Packham OAM
47. Mountain Cattlemen's Association of Victoria
48. Institute of Foresters Australia
49. Green Triangle Forest Products
50. Captain Creek firefighters – Elena Gacia and Alan Jamison; Glenis and George Gibson; Lloyd and Colleen Ruhl; Claus Temple
51. Kim Middleton
52. Timber Communities Australia
53. Australian Forest Growers
54. Airborne Defence Research Organisation
55. Stephen Walls
56. Environmental Systems and Services P/L
57. National Air Support Marketing
58. Forest Owners Conference
59. National Association of Forest Industries
60. Rob Backhouse
61. Licola Fire Brigade
62. Alastair Paton
63. Alastair Paton (In confidence submission)
64. Nic Gellie
65. Horst Leins
66. Roger Underwood
67. Nola McCallum
68. Advocates for Clean Air (2)
69. Conservation Council of WA (2)
70. Airwatch – Australia
71. Nature Conservation Council of NSW

72. National Parks Australia Council Inc.
73. EMR Safety Network – International
74. World Wildlife Fund Australia
75. Bush Users Group, Indigo Region
76. NSW Farmers Federation
77. Horst Leins
78. Volunteer Fire Brigades Victoria, Victorian Urban Fire Brigades Association, Victorian Rural Fire Brigades' Association
79. Shoalhaven City Council
80. Emergency Management Spatial Information Network Australia (EMSINA)
81. Evergreen International Aviation Inc.
82. Dr Lachlan McCaw – Research Working Group 6 (Forest Fire Management)
83. NSW Bush Fire Coordinating Committee

B.2 Consultations

Members of the Inquiry panel and secretariat consulted the following representatives of agencies and organisations and experts.

Date	Place	Organisation
15.10.2003	Canberra	Experts from various organisations: <ul style="list-style-type: none"> – CSIRO – Australasian Fire Authorities Council – Metis Associates – Australian National University
20.10.2003	Canberra	Department of Transport and Regional Services
24.10.2003	Canberra	Malcolm Gill
27.10.2003	Brisbane	Queensland government agencies: <ul style="list-style-type: none"> – Department of Premier & Cabinet – Department of Emergency Services <ul style="list-style-type: none"> Strategic and Executive Services Queensland Fire and Rescue Service Rural Fire Operations Counter Disaster and Rescue Services – Department of Natural Resources and Mines – Department of Primary Industries—Forestry – Environmental Protection Agency <ul style="list-style-type: none"> – Queensland Parks and Wildlife Service
29.10.2003	Melbourne	Australasian Fire Authorities Council
30.10.2003	Sydney	New South Wales government agencies: <ul style="list-style-type: none"> – Cabinet Office – NSW Rural Fire Service – Department Environment & Conservation – NSW Fire Brigades – Office for Emergency Services – Department of Lands – Department of Local Government – NSW Police
05.11.2003	Sydney	Northern Sydney Regional Organisation of Councils
	Adelaide	South Australian government agencies: <ul style="list-style-type: none"> – Cabinet Office – Country Fire Service – South Australia Police – Department of Environment and Heritage – Metropolitan Fire Service – Forestry SA – Security and Emergency Management Office – Planning South Australia – Water SA Local Government Association Australian Assembly of Fire Brigade Associations SA Volunteer Fire Brigade Association
11.11.2003	Sydney	Forest Fire Management Group
11–12.11.2003	Melbourne	Australasian Fire Authorities Council
13.11.2003	Canberra	Australian government agencies: <ul style="list-style-type: none"> – CSIRO – Bushfire Cooperative Research Centre – Department of the Environment and Heritage

Date	Place	Organisation
14.11.2003	Darwin	– Department of Defence
		– Bureau of Meteorology
		– Department of Education, Science and Training
		– Emergency Management Australia
		– Department of Transport and Regional Services
		– Department of Prime Minister and Cabinet
		Northern Territory government agencies:
		– Department of Chief Minister
		– Department of Infrastructure, Planning and Environment
		– Fire and Emergency Services
		– Bushfire Council
		– Parks and Wildlife Service
	Darwin	CSIRO Northern Territory
	Darwin	Tropical Savannas Cooperative Research Centre
24–25.11.2003	Perth	Western Australian government agencies:
		– Department of Premier and Cabinet
		– Fire & Emergency Services Authority
		– Department of Conservation and Land Management
27.11.2003	Tasmania	Tasmanian government agencies:
		– Department of Premier and Cabinet
		– Tasmanian Fire Service
		– Department of Tourism, Parks, Heritage and the Arts
		– Forestry Tasmania
28.11.2003	Canberra	Emergency Management Australia
01.12.2003	Melbourne	Victorian government agencies:
		– Department of Premier and Cabinet
		– Commissioner for Emergency Services
		– Country Fire Authority
		– Department of Sustainability and Environment
		– Department of Victorian Communities
		– Department of Primary Industries
02.12.2003	Canberra	Australian Capital Territory government agencies:
		– Chief Minister's Department
		– Department of Urban Services
		– ACT Forests
		– Environment ACT
		– ACT Planning and Land Authority
		– Department of Justice and Community Safety
		– ACT Emergency Services Bureau
04.12.2003	Canberra	Australian Local Government Association
	Canberra	Chair and Members, House of Representatives Select Committee on the Recent Australian Bushfires
09.12.2003	Melbourne	Bushfire Research Advisory Group Meeting
09.12.2003	Melbourne	Bushfire Cooperative Research Centre Launch
	Melbourne	Volunteering Australia
15.12.2003	Canberra	CSIRO—Phil Cheney
	Canberra	Malcolm Gill
15.01.2004	Canberra	CSIRO—Gail Kelly
21.01.2004	Canberra	Department of Agriculture, Fisheries and Forestry
22.01.2004	Canberra	Department of Defence
23.01.2004	Canberra	Department of the Environment and Heritage
27.01.2004	Canberra	Department of Transport and Regional Services

Date	Place	Organisation
	Canberra	Australian Capital Territory—Department of Urban Services
28.01.2004	Canberra	Australasian Fire Authorities Council
29.01.2004	Perth	Western Australian Conservation Council
	Perth	Desert Knowledge Cooperative Research Centre
30.01.2004	Perth	Western Australian government agencies: <ul style="list-style-type: none"> – Department of Premier and Cabinet – Fire & Emergency Services Authority – Department of Conservation and Land Management
	Perth	Independent consultant—Roger Underwood
02.02.2004	Sydney	New South Wales Rural Fire Service
	Sydney	New South Wales government agencies: <ul style="list-style-type: none"> – Cabinet Office – NSW Rural Fire Service – Department Environment & Conservation – NSW Fire Brigades – Office for Emergency Services – Department of Lands – Department of Local Government – NSW Police
	Sydney	New South Wales Nature Conservation Council
03.02.2004	Sydney	Insurance Council of Australia
	Sydney	Australian Broadcasting Corporation
	Sydney	New South Wales National Parks and Wildlife Service
04.02.2004	Canberra	Emergency Management Australia
	Canberra	Australian Capital Territory government agencies: <ul style="list-style-type: none"> – Chief Minister's Department – Department of Justice and Community Safety – Bushfire Recovery Taskforce Secretariat – Emergency Services Bureau
05.02.2004	Canberra	Department of Defence
	Canberra	Department of Family and Community Services
06.02.2004	Adelaide	South Australian government agencies: <ul style="list-style-type: none"> – Department of Premier and Cabinet – Country Fire Service – South Australia Police – Department of Environment and Heritage – Metropolitan Fire Service – Forestry SA – Planning South Australia
	Adelaide	Indigenous Land Corporation
10.02.2004	Melbourne	Victorian government agencies: <ul style="list-style-type: none"> – Department of Premier and Cabinet – Emergency Services – Country Fire Authority – Department of Sustainability and Environment – Department of Victorian Communities – Department of Primary Industries
	Melbourne	Bushfire Cooperative Research Centre
	Melbourne	Bureau of Meteorology
11.02.2004	Canberra	New South Wales Rural Fire Service
12.02.2004	Canberra	Australian Government Department of the Prime Minister & Cabinet

Date	Place	Organisation																
13.02.2004	Hobart	Tasmanian government agencies: <ul style="list-style-type: none"> – Department of Premier and Cabinet – Tasmanian Fire Service – Department of Tourism, Parks, Heritage and the Arts – Forestry Tasmania 																
17.02.2004	Canberra	Office of Spatial Data Management																
18.02.2004	Canberra	Geoscience Australia																
20.02.2004	Canberra	Australian Government Department of Defence																
04.03.2004	Canberra	Australian Communications Authority																
10.03.2004	Canberra	Invited specialists forum: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Michael Pengilly</td> <td style="width: 50%;">Klaus Braun</td> </tr> <tr> <td>Kevin O'Loughlin</td> <td>Malcolm Gill</td> </tr> <tr> <td>Phil Cheney</td> <td>Len Foster</td> </tr> <tr> <td>Jeremy Russell-Smith</td> <td>Peter Cooke</td> </tr> <tr> <td>Ross Bradstock</td> <td>Peter Moore</td> </tr> <tr> <td>Gary Morgan</td> <td>Paul de Mar</td> </tr> <tr> <td>Ross Smith</td> <td>Peter Galvin</td> </tr> <tr> <td>Cam Stafford</td> <td>Andrew Stanton</td> </tr> </table>	Michael Pengilly	Klaus Braun	Kevin O'Loughlin	Malcolm Gill	Phil Cheney	Len Foster	Jeremy Russell-Smith	Peter Cooke	Ross Bradstock	Peter Moore	Gary Morgan	Paul de Mar	Ross Smith	Peter Galvin	Cam Stafford	Andrew Stanton
Michael Pengilly	Klaus Braun																	
Kevin O'Loughlin	Malcolm Gill																	
Phil Cheney	Len Foster																	
Jeremy Russell-Smith	Peter Cooke																	
Ross Bradstock	Peter Moore																	
Gary Morgan	Paul de Mar																	
Ross Smith	Peter Galvin																	
Cam Stafford	Andrew Stanton																	
17.03.04	Melbourne	Council of Australian Governments—representatives forum: <p>Australian Government</p> <ul style="list-style-type: none"> – Emergency Management Australia – Department of Transport and Regional Services <p>Australian Local Government Association</p> <p>Western Australia</p> <ul style="list-style-type: none"> – Fire & Emergency Services Authority – Department of Conservation and Land Management <p>South Australia</p> <ul style="list-style-type: none"> – Department of Premier & Cabinet – Country Fire Service <p>Queensland</p> <ul style="list-style-type: none"> – Department of Premier & Cabinet – Queensland Fire & Rescue – Queensland Department of Emergency Services <p>Victoria</p> <ul style="list-style-type: none"> – Department of Premier & Cabinet – Emergency Services Bureau <p>Tasmania</p> <ul style="list-style-type: none"> – Department of Premier & Cabinet – Tasmania Fire Service <p>New South Wales</p> <ul style="list-style-type: none"> – NSW Rural Fire Service – National Parks & Wildlife Service – Office for Emergency Services <p>Australian Capital Territory</p> <ul style="list-style-type: none"> – Emergency Services Bureau – Urban Services <p>Northern Territory</p> <ul style="list-style-type: none"> – Bushfires Council of the Northern Territory 																
18.03.04	Canberra	Emergency Management Australia																
22.03.04	Canberra	CSIRO Office of Space Science and Applications																

Appendix C Previous inquests and inquiries: major recommendations

C.1 Introduction

During this Council of Australian Governments Inquiry, the reports of inquests and inquiries into major bushfires in Australia were important points of reference. The Inquiry identified a number of consistent themes in the recommendations of these reports – see Section C.1.2.

Some of these reports are difficult to obtain, so the recommendations of twelve of the most significant ones are presented here as a convenient source of reference. Although this is not a comprehensive listing of all reports, the Inquiry considers it presents a good summary of findings and recommendations relating to bushfire mitigation and management over more than 60 years.

C.1.1 Reports

The recommendations of the following reports are presented:

- the report of the Royal Commission into the 1939 Bushfires in Victoria, by Judge Leonard Stretton
- the report of the Royal Commission into the Bush Fires of December 1960 and January, February and March 1961, Western Australia, by GJ Rodger, Esq., BSc, Royal Commissioner
- *Fire Prevention and Suppression – Report of Committee appointed by His Excellency the Administrator-in-Council to make recommendations with respect to future measures in consequences of the Bush Fire Disaster of 7th February, 1967*, Mr DM Chambers QC, Solicitor-General for Tasmania; Mr GG Sinclair, OBE, former Secretary, Country Fire Authority (Victoria); Mr AG McArthur, BSc (For.), Forest Research Institute (Canberra); Mr DL Burbury, Warden of Oatlands
- a report by the House of Representatives Standing Committee on Environment and Conservation – *Bushfires and the Australian Environment* (Australian Government Publishing Service, Canberra, 1984)
- the report of the Select Committee on Bushfires, Parliament of New South Wales Legislative Assembly, Sydney, 1994
- recommendations from the New South Wales Inquiry into 1993/94 Fires, before Senior Deputy State Coroner JW Hiatt, 28 February 1996
- *Report of the Investigation and Inquests into a Wildfire and the Deaths of Five Firefighters at Linton on 2 December 1998*, State Coroner's Office, Victoria (Graeme Johnstone, State Coroner), January 2002

- recommendations from the Inquiry into the Fire at Mt Ku-Ring-Gai Chase National Park, before Senior Deputy State Coroner, J Stevenson, Friday, 14 December 2001
- *Report on the Inquiry into the 2001/2002 Bushfires*, Joint Select Committee on Bushfires, Parliament of New South Wales Legislative Assembly, Sydney (Chair, John Price), June 2002
- Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne
- McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra
- House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra.

C.1.2 Consistent themes

Increased emphasis on risk reduction

A consistent theme has been that greater emphasis, resources and activity should be directed towards what are commonly referred to as ‘prevention activities’. This includes things such as education and awareness, clearing of fuel around buildings, track access and fuel reduction.

The value of volunteers

Reports from as early as 1939 highlight the value of volunteers, what they contribute to the community, and how much they save a jurisdiction.

Education and awareness

Education is a consistent recommendation in reports from 1939 to 2003. The recommendations refer to both school-based programs and community information and awareness.

Complacency

A level of community complacency appears to have existed before every major fire event.

The adequacy of resourcing

Since 1939 comment has been made consistently about the poor levels of resourcing in both fire agencies and land management agencies.

Protective burning

Concern about the need for protective burning has been a theme since 1939.

Communication

Communication and telecommunications infrastructure support have been a consistent theme since 1961.

The importance of access

The importance of track access and maintenance is a consistent observation in reports from as early as 1939.

Local knowledge

The advantages of local knowledge and engaging people who have local knowledge were identified in most reports and have featured particularly strongly in recent reports.

Local government

Since 1967 the role and responsibilities of local government have featured with increasing prominence.

The insurance industry

The role and contributions of the insurance industry – as the single greatest beneficiary of emergency services – are discussed in reports from 1961 on.

C.2 The report of the Royal Commission into the 1939 Bushfires in Victoria¹

C.2.1 Major recommendations

Judge Stretton's recommendations hoped to achieve a clearer demarcation of fire and forest management, better cooperation between competing government departments, and more flexible and comprehensible laws of fire protection and prevention.

Forests Commission

1. The Forests Commission should have complete control of all forests.

The Forests Commission should be given responsibility for forest fire protection in all unoccupied Crown lands, except where special exemptions exist.

This would include 'protected forests' as well as 'reserved forests' (the two categories that made up the whole of the State Forests). In addition, the Forests Commission should control the use of fire on a strip of land (at least half a mile wide) beyond state forests and national parks.

The Forests Act 1939 increased the Forests Commission's territorial fire responsibility threefold. The buffer strip of land was extended to a width of one mile.

2. The Forests Commission must pay greater attention to the reclamation and rehabilitation of forests and cease to be too preoccupied with revenue production.

Commercial interests have had too much influence on forest policy. Forest debris and waste from sawmilling should be cleared by means of light fire and mobile equipment. Prevention and suppression of fire is an absolute priority.

The capacity for early detection and containment of fires needs to be improved, through the provision of more look-out towers, roads, fire-fighting equipment, better communication and water conservation in dams and tanks throughout the forests.

In the decade after the fires – a period of intensive salvage of fire-killed timber – resources were taken away from silvicultural (tree cultivation) work. But from the end of the 1940s, scientists and foresters began to learn how to cultivate and manage the regenerating forests of mountain ash.

¹ Report of the Royal Commission into the 1939 Bushfires in Victoria, by Judge Leonard Stretton, viewed 31 March 2004, <www.abc.net.au/blackfriday/royalcommission/index_recommendations.htm>.

State Fire Authority

3. A State Fire Authority should be established.

This body should consist of representatives of the Bush Fire Brigades, the Country Fire Brigades, the Forests Commission and the relevant municipalities.

The new authority should define general policy for preventing and suppressing bushfires outside State Forests, protecting life and property, organising and recruiting local brigades, and maintaining discipline of brigades and local fire authorities.

The State Fire Authority must not be involved in the internal policy of public bodies that control forests. The authority should zone Victoria according to environmental and social conditions that affect fire risk, and should have the power to proclaim acute fire danger periods in particular areas.

The Country Fire Authority was established in April 1945.

Land Utilisation Committee

4. A Land Utilization Control Committee should be established.

Such a committee, comprising experts from all relevant public departments, would help reconcile the conflicting claims and duties at present invested in forest lands. Bush fires are an important contributing cause of soil erosion, and a land utilization committee would consider methods of prevention of destruction of soil and its products.

A Soil Conservation Board was established in Victoria in 1940. Judge Stretton strengthened this recommendation in his 1946 Royal Commission into Forest Grazing when he spoke of 'an inseparable trinity – Forest, Soil and Water' and renewed his call for a land utilization authority. In 1950 the Victorian government created a Land Utilization Advisory Council chaired by its first Minister for Conservation, Henry Bolte.

The Forests Commission

5. The Forests Commission must recognise the necessity for protective burning in its areas and should respect local forest lore.

Where practicable, autumn burning is preferable for protective purposes. Forest officers should be stationed in one district for as long as possible. It is essential that forest officers who manage fire practices have a thorough knowledge of local forest lore and of the district in which they have authority. It is equally important that the local rural populace recognise that the officers have such knowledge.

Following the Black Friday fires, controlled burning increasingly became an official fire management practice.

Safety precautions

6. Safety precautions at sawmills must be improved.

Better clearing about sawmills and better provision of water is essential. The construction of dug-outs at all mill settlements, and at winches during the fire season should be compulsory.

The Forests Act 1939 enabled the Forests Commission to enforce the installation of fire-refuge dugouts at mills built in protected forests as well as reserved forests.

Education

7. The education of adults and children about fire prevention and protection must be taken seriously.

A law which is not acceptable to the many is made to be broken.

A Save the Forests Campaign was established in Victoria in 1944. It aimed to cultivate a 'forest conscience' through public education.

C.3 The report of the Royal Commission into the Bush Fires of December 1960 and January, February and March 1961, Western Australia²

It is recommended that

1. The Bush Fires Board take a more active part in enlightening the public generally and the local communities in particular to their responsibilities on fire control;
2. All members of the Board be selected for their interest in and experience and knowledge of matters directly associated with bush fire control and not merely as representatives of particular organisations, that the Chairman of the Board be appointed by the Governor instead of being an ex officio appointment, and that the Bush Fires Board be Strengthened by the appointment of another forester, a member of the timber industry, a police officer and a person with a sound knowledge of weather and its effect upon fire behaviour.
3. The Bush Fires Board appoint a Standing Committee of about six of its members, all of whom are likely to be available at any time during the bush fire season to meet and take executive action as necessary;
4. The Bush Fires Board appoint a Regional Committee of Board members and co-opt local members for each climatic region of the State to study the bush fire control problems of the region and advise the Board so that inter alia adequate attention may be given by the Board to co-ordinating the beginning and termination of the prohibited burning times in adjoining districts and to any advisable variations of these duties according to seasonal condition each year;
5. Before the bushfire season starts the Minister on the recommendation of the Board nominate a person and a deputy person who will be instructed to take charge of fire fighting operations in each district should a dangerous fire occur and render such an appointment advisable;
6. That care be exercised in recommending the application of emergency bush fire periods so that they will not be applied to districts where their application is unnecessary;
7. Local authorities prosecute in all cases of deliberate breaches of the provisions of the Bush Fires Act and that failing this the Bush Fires Board take appropriate action to initiate such prosecutions;
8. Local authorities select bush fire control officers for their knowledge and experience of bush fires and their qualities of leadership and that as far as practicable, they be captains of bush fire brigades so that the person issuing the permit to burn has the responsibility of extinguishing the fire if it escapes;

² Report of the Royal Commission into the Bush Fires of December 1960 and January, February and March 1961, Western Australia, by GJ Rodger, Esq., BSc, Royal Commissioner.

9. The relative seniority of bush fire control officers be determined with a view to appointing group leaders as chief bush fire control officers. The Shire Clerk should generally be a liaison bush fire control officer rather than a chief fire control officer;
10. Landowners desiring to carry out developmental burns be required to inform the local authority sufficiently early to enable that body to direct them or request the local bush fire brigade to carry out protective burning around the area before the prohibited season starts;
11. It be made clear to all fire control officers that the conditions for burning prescribed in the Bush Fires Act are minimal only, and that it is their duty to prescribe such further conditions as will ensure that should unfavourable weather conditions unexpectedly develop a situation would not arise which the local bush fire control organisation could not reasonably be expected to handle;
12. No opportunity be lost of encouraging the formation of bush fire brigades and the maintenance of enthusiasm and that the Bush Fires Board assist the brigades in any way possible to obtain adequate training and equipment;
13. A fund be established to subsidise the purchase of equipment for bush fire brigades but that the granting of subsidies depend upon a certificate being received from the Bush Fires Board that the brigade in question is of a standard that will be available at all times for effective use and that adequate facilities are available for its storage and maintenance at a centre suitable for the brigade;
14. Insurance companies be asked to subsidise the bush fire equipment fund by an amount at least equal to the amount they at present remit on premiums received for fire insurance in approved districts and that the Government contribute an amount to the fund at least equal to that contributed by the Insurance Companies;
15. All local authorities form advisory committees of persons from bush fire brigades and of bush fire control officers to plan co-operation in effort and co-ordination between brigades, to group brigades under brigade group officers and to advise the local authority upon all matters of fire control, including the planning of the district fire break layout and prosecuting for breaches of the Bush Fires Act;
16. The Commonwealth Government be asked to complete as far as practicable, the connection of telephones to outlying country centres before the end of 1961;
17. A sub-committee of telecommunications officers and representatives for the Bush fires Board be appointed to investigate and encourage the development of a modern system of radio equipment for bush fire brigades;
18. The Forests Department direct more staff to the planning and co-ordination of its bush fire control organisation so that emergency conditions can be met immediately by ample reserves of labour and equipment and that co-ordination between the Department, the local authority, sawmills and

other sources of man power and equipment in and around forestry districts is as complete as possible. This particularly includes co-operative protective burning around the boundaries of forest areas;

19. The Forests Department carry out more research into both the technical and practical side of fire control as a necessary accompaniment to the expenditure of money on the forest works and that forest fire control officers be sent overseas at intervals to gain information regarding the latest developments in this work;
20. The Forests Department make every endeavour to improve and extend the practice of control burning to ensure that the forests receive the maximum protection practicable consistent with silvicultural requirements;
21. No opportunity be lost by the Forests Department to improve the efficiency of their fire fighting gangs, radio and other equipment in the light of the latest practical and scientific developments;
22. A committee be formed and provided with the finance necessary to enable it to supplement the activities of the local bush fire brigades in districts in the far south-west of the State where ratable values are particularly low and the proportion of Crown lands high, and that the Forests Department be authorised to give approval for control burning of Crown land throughout the State by bushfire brigades within two miles of a State Forest and that outside this distance the Bush Fires Board through its wardens have a similar authority;
23. The management of all National Parks in the State be concentrated under one authority to ensure co-ordination in administration and protective measures.
24. A fire control research advisory committee be formed to co-operate with the Forests Department in carrying out scientific research into fire control';
25. Local authorities and if necessary the Minister take active steps to enforce the removal of fire hazards from the vicinity of buildings in rural areas and that special attention be given to the removal of dead trees on the edges of pasture land and on firebreaks in timbered country;
26. That needs in the direction of a fire emergency service be met as far as practicable by the Bush Fires Board in its training programme and in the tactical organisation of existing brigades for use as reserves in districts other than their own;
27. The State Emergency Service be used to meet any additional needs but that as far as possible, requests for assistance be directed in the first instance to the bush fires Board or at least referred to that board by the State Emergency Service for advice before action is taken.

C.4 Fire Prevention and Suppression—Report of Committee appointed by His Excellency the Administrator-in-Council to make recommendations with respect to future measures in consequences of the Bush Fire Disaster of 7th February, 1967³

C.4.1 Summary of principal recommendations of the Committee

General

1. All fire-fighting services, both urban and rural, should be brought under a single Ministerial control.
2. The amount of finance available to both urban and rural fire-fighting services should be increased.
3. There should be the closest possible liaison and co-operation between all fire-fighting services.
4. Every effort should be made to bring about a greater public awareness of the dangers of fire and the measures that can and ought to be taken to prevent it.
5. Local councils should exercise greater responsibility in fire prevention and suppression, particularly with respect to the removal of fire hazards.
6. The fringe area lying generally to the west of the cities of Hobart and Glenorchy should be declared a special fire area. Administration of fire control should be in the hands of a Special Committee comprising the State Fire Control officer, representatives of the Hobart and Glenorchy City Councils, the Kingborough Municipality, and a representative of the Hobart Fire Brigade Board.
7. The existing Mountain Park fire fighting force established by the Hobart City Council should form the nucleus of a rural fire brigade organisation for this special area. Sections of the rural fire brigade should be formed in strategic areas under the control of deputy captains.
8. Uncontrolled fires burning in the Hobart-Glenorchy fringe area should be completely extinguished as a matter of regular routine practice.

Urban

1. The Chairman of the Rural Fires Board should be ex officio a member of the Fire Brigades Commission so as to facilitate close liaison between the two bodies.

³ *Fire Prevention and Suppression – Report of Committee appointed by His Excellency the Administrator-in-Council to make recommendations with respect to future measures in consequences of the Bush Fire Disaster of 7th February, 1967*, Mr DM Chambers QC, Solicitor-General for Tasmania; Mr GG Sinclair, OBE, former Secretary, Country Fire Authority (Victoria); Mr AG McArthur, BSc (For.), Forest Research Institute (Canberra); Mr DL Burbury, Warden of Oatlands.

2. The Commission should be given power to transfer officers and equipment between brigades in the event of any emergency.
3. The Commission should examine the position to see whether greater efficiency would be achieved by the amalgamation of some of the existing fire brigade boards.
4. Any new Brigades that are formed should be put under the jurisdiction of an existing board, unless special circumstances exist.
5. A Chief Officer (or General Superintendent) should be appointed to the staff of the Commission as its technical adviser and with an overall responsibility throughout the State for the organisation and training of brigades.
6. A Deputy Chief Officer (or Deputy General Superintendent) should also be appointed when financial considerations permit and be stationed in Launceston.
7. An up-to-date technical manual with special reference to Tasmanian conditions should be issued to all brigades.
8. The Commission should aim at having every modern fire engine equipped with a first aid water tank of a capacity of at least 150 gallons with a major pump and live hose reel.
9. The Commission should adopt a long-range, but not inflexible, plan of standardisation of all major and minor fire appliances, including the threads on appliances.
10. Fire districts proclaimed under the Fire Brigades Act should not exclude portions of the settled area solely on the ground that they are not serviced with an adequate water reticulated system.
11. There should at all times be close liaison between urban brigades and neighbouring rural brigades.
12. When the establishment of new fire stations is being considered, a high priority should be given to a station to serve the Kingston-Taroona area.
13. Section 28 of the Fire Brigades Act should be replaced
14. Greater efforts should be made by local authorities for the removal of fire hazards and Section 610 of the Local Government Act should be amended to strengthen their existing powers.

Rural

1. The Rural Fires Act 1950 should be wholly repealed and a new and less complex Act passed in substitution for it.
2. The Rural Fires Board should be reconstituted and enlarged so as to include a Chairman appointed by the Governor, a representative of rural fire brigades, the Hydro-Electric Commissioner or his nominee and

increased representation for both the Municipal Association and farmers' organisations.

3. A specific duty should be placed on the Board to encourage and assist the formation of rural fire brigades throughout the State.
4. The Rural Fires Board should appoint a State Fire Control Officer to be its chief executive officer and technical adviser.
5. The present system of fire wardens should be abolished.
6. For the purpose of more efficient rural fire control, the State should be divided into five regions and a regional officer should be appointed for each and should live in the district. (this is an increase of three on the present full-time field staff)
7. Each municipality should be required to appoint a Municipal committee of not less than three persons for the purpose of advising on a local fire policy, hazard removal and other matters including the issue of permits to burn.
8. Permits should be issued by a Fire permit officer and each municipality required to appoint a sufficient number of such officers, their appointment to be subject to approval by the Rural Fires Board.
9. The Rural Fires Act should provide for only two periods of restrictions on lighting fires in the open, namely, a fire danger period and day or days of total fire ban.
10. The present fixed summer period of restrictions operating from 1 December to 31 March should be abolished so as to allow flexibility in the proclaiming of fire danger periods, having regard to seasonal and climatic conditions in different parts of the State.
11. Subject to any statutory exception, during a fire danger period a written permit should be required for the lighting of fires in the open air and all fire lighting should be prohibited on a day of total fire ban.
12. Permits should be subject to certain standard prescribed conditions and such other conditions as a fire permit officer imposed. Power to revoke a permit should be vested in the State Fire Control Officer, the Regional Officer, the rural fire brigade captain and the fire permit officer.
13. The present provision allowing for 'fire protected areas' should remain but there should also be provision made for declaring 'special fire areas' in the case of localities where fire protection responsibility is difficult to establish.
14. There should be more planned burning undertaken at suitable times and under proper supervision so as to reduce the fuel hazard.
15. There should be more intensive training for members of rural fire brigades.

16. A system of equipment subsidisation should be introduced to provide brigades with the more costly items of fire equipment needed to bring them to a reasonable level of proficiency. The subsidy scheme should be contributed to by local councils and be matched by the Government.
17. Equipment should be standardised as far as possible and the Rural Fires Board should issue a list of approved types of equipment for brigades.

C.5 A report by the House of Representatives Standing Committee on Environment and Conservation—*Bushfires and the Australian Environment*⁴

The Committee recommends that:

1. The Minister for Territories and Local Government request the Local government Minister's Conference to review the adequacy of existing land use and land use planning as it relates to bushfire mitigation;
2. The Minister for Housing and Construction request the housing Ministers' Conference to consider adopting and publicising a housing bushfire protection standard;
3. The State Ministers responsible for Local government and for fire Services in consultation with the Australian Insurance Industry Council, review the funding of rural fire brigades with a view to finding more equitable arrangements than insurance premium levies;
4. The Department of Home Affairs and Environment co-operate with State Departments to develop a national awareness campaign dealing with bushfire survival, building protection, fire prevention and the role of fire in the Australian environment;
5. The Commonwealth Department of Education and Youth Affairs assist State Departments and authorities to develop video programs and education kits concerning bushfire topics which would be suitable at senior secondary levels;
6. The Minister for Education and youth Affairs request the Commonwealth Tertiary Education commission to review the teaching of bushfire science in tertiary forestry and land management courses;
7. The Minister for Primary Industry request the Australian Forestry Council to consider establishing a special fund to assist the universities to teach and carry out research in bushfire science;
8. An authoritative Australian fire ecology textbook be commissioned by the Commonwealth Government through the CSIRO for tertiary education purposes;
9. The Minister for Defence review the role of the Natural Disasters Organisation in respect of the operation of the Australian Counter Disaster College with a view to providing a national centre for bushfire training;
10. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) provide the resources necessary to enable the completion of the experimental and data analysis phase of Project Aquarius;(paragraph 161)

⁴ House of Representatives Standing Committee on Environment and Conservation 1984—*Bushfires and the Australian Environment*, Australian Government Publishing Service, Canberra.

11. The Department of Science and Technology conduct a symposium to discuss the development and co-ordination of computer modelling and remote sensing related to bushfires;
12. The Australian bureau of Statistics examine the need for, and the problems involved in, a nation bushfire statistics series;
13. The Minister for Home Affairs and Environment and the Minister for Primary Industry request the Australian Environment Council, the Council of Nature conservation Ministers and the Australian Forestry Council to discuss the co-ordinating unit within an appropriate authority, such as the CSIRO;
14. The Commonwealth and State Ministers responsible for bushfire matters, jointly discuss the establishment and financing of a national bushfire research fund;
15. The CSIRO maintain a significant bushfire research program after the completion of Project Aquarius;
16. The Commonwealth review its research priorities to determine the feasibility of increasing funding for CSIRO research in the ecological impact of fire regimes;
17. The Department of Defence review its bushfire procedures to ensure they provide for full consultation with local authorities about fire prevention and pre-fire planning;
18. The Commonwealth Departments of Administrative Services and Defence review the cost imposition to rural fire authorities caused by Defence land holdings and consider the need to provide additional financial assistance;
19. The Minister for Home Affairs and environment review the bushfire protection and management practices of properties of international and national importance; (paragraph 189)
20. The Minister for Defence review the role of the Armed Services in bushfire fighting operations and establish mechanisms to facilitate closer co-operation with civilian bushfire authorities;
21.
 - (i) the Bureau of Meteorology continue to provide free fire weather services during the bushfire season,
 - (ii) special purpose funds be provided to enable the Bureau to employ specialist fire weather meteorologists in each State.
 - (iii) special purpose funds be provided to establish a network of remote weather stations;
22. The Natural Disasters Organisation investigate the need for, and the means of establishing, a national bush fire fighting support service to acquire and deploy equipment that the State authorities cannot singly acquire;

23. The Commonwealth Minister for primary Industry request the Standing Committee on Soil Conservation of the Australian Agricultural Council to consider formulating a proposal for Commonwealth Assistance with post fire soil protection works.

C.6 The report of the Select Committee on Bushfires, Parliament of New South Wales Legislative Assembly, Sydney, 1994⁵

C.6.1 Hazard reduction

Current hazard reduction practices

From all the submissions and evidence received, the Committee recommends that appropriate hazard reduction programs are best developed at a local level by District Bushfire Officers

Hazard reduction on private land

From the submissions received by the Committee and other evidence taken, the Committee believes the recommendations made by the Cabinet committee and the recent amendments to the *Bush Fires Act* deal sufficiently and adequately with the problem of hazard reduction on private land.

Hazard reduction on land owned by public authorities

Generally the committee received information that many fires start from rail lines. The Committee believes that State Rail needs to take further precautions and develop better fire prevention programs.

Under section 13(1) of *Bush Fires Act 1949*, public authorities are not included in the jurisdiction of a council to require an owner and occupier of the to conduct hazard reduction. The Committee recognises that there may be good reasons for exempting public authorities from the requirements of section 13(1). However, the Committee also recognises that bushfires do start on land owned by public authorities. The Committee recommends that all public authorities accept the responsibility to conduct adequate hazard reduction and the provision and maintenance of fire trails on their land. The Committee also recommends that the Department of Bush Fire Services establish a minimum standard for fire trails, directing all government and public authorities to provide a fire trail maintenance schedule to all relevant fire control officers.

Restrictions on hazard reduction

The Committee recommends that the Department of Health provide the community with quantitative information as to the effects of controlled burning on human health

Fire permits

The Committee recommends that the amendment to the *Bush Fires Act* to reduce the period for which a fire permit may be granted from 21 days up to 14 days be introduced into the Parliament without delay.

⁵ Parliament of New South Wales Legislative Assembly, Select Committee on Bushfires, Report, November 1994 Parliament House Sydney.

C.6.2 Welfare measures

The Committee wishes to commend the Department of Community Services on their extraordinary efforts performed under most difficult circumstances.

However, the Committee wishes to express concern at the number of properties damaged or destroyed in the January bushfire that were underinsured or not insured at all. The Committee believes that the payments made to those persons who were inadequately insured should not be seen to set a precedent for future disasters.

C.6.3 Compensation for firefighters

The Committee believes that the present system is satisfactory

C.6.4 Systems for alerting the public of danger

Media's role

The Committee recommends the adoption of a standard emergency warning signal, which is sounded to get the attention of listeners before the warning is read. The sound can be used from vehicles to alert people in their homes that a police car was coming past with an important message. At present there is no such system operating in New South Wales.

The Committee that the media be approached with the view to establishing a formal 'Situation Report' in the form of a regular bulletin delivered by an authorised officer at the Fire Control Centre.

Police evacuations

Unfortunately, as the Coronial inquiry is not yet concluded, the Committee was not able to call the Police Service to comment upon their role in the January fires. The Committee is aware that the Coroner will make comment on this issue in due course and therefore declines from making any comment on its own.

C.6.5 Equipment, communication and training

Equipment

Adequacy of present equipment for bushfire brigades

The Committee notes that more work is being done to bring all areas up to approximately the same standard of equipment. The Committee recognises this cannot be achieved overnight, but would hope that it could be achieved as soon as possible.

The Committee recommends that the proposed Standing Committee on Natural Disasters (see Chapter 12) should be charged with the responsibility of monitoring the standard of bushfire fighting equipment throughout the State.

Funding

The Committee recognises that a number of submissions have raised complaints about funding for equipment. However, the Committee is of the view that there is little concern with the method of funding and this system should be retained.

Communications

The Committee believes that the problem experienced with communications during the major bushfires is a most pressing concern. Communications problems have arisen continually with almost every major bushfire in Australia in the last 30 years. Improvements in communications have not been adequate enough to resolve difficulties to a level which could be considered satisfactory. The Committee, therefore, wholeheartedly support any measure taken to expedite the implementation of an effective and universal communications system in New South Wales.

The Committee recommends that the proposed Standing Committee on Natural Disasters (Chapter 12) closely monitor the implementation of the Government Radio Network.

C.6.6 Building regulations for bushfire prone areas

Almost all submissions to this Committee have endorsed the adoption of Australian Standard 3959 (*The standard details the minimum acceptable construction requirements for new homes in bushfire prone areas*). The Committee therefore, recommends the adoption of this standard into the Building Code of New South Wales

C.6.7 The Commonwealth's role

CSIRO Bushfire Research Unit

This Committee would endorse the Senate Committee recommendation that funding for the National Bushfire Research Unit be increased and recommends that the State Government review its contributions to the Nation Bushfire Research Unit.

C.6.8 Aircraft

The Committee, recommends that the State Government request the Federal Government to establish and fund a new review of all current aerial technology suitable for use in bushfire fighting in Australia

Current use of aircraft

The Committee recommends that the Department of Bush Fire Services educate Fire Control Officers and s41F nominees as to their authority to engage aircraft prior to and after a s41F declaration.

C.6.9 Landuse decisions, development planning and the responsibility of property owners

The Committee, recommends that this issue be investigated further by the proposed Standing Committee on Natural Disasters (see Chapter 12) in the next Parliament.

C.6.10 Standing Committee on Natural Disasters

The Committee recommends that the Parliament establish a Standing Committee on Natural Disasters. This Committee would be able to examine in greater depth the issues which this Committee could not resolve. Also there were issues which arose out of the January bushfires relating to the general area of disaster management that are more appropriately considered by the proposed Standing Committee.

C.7 New South Wales Inquiry into 1993/94 Fires – Senior Deputy State Coroner JW Hiatt⁶

C.7.1 Recommendations

The Court is of the opinion that consideration should be given to making it mandatory that all development applications in bushfire risk areas, be referred to the Fire Control Officer, or nominated officer of the NSWFB, whichever is appropriate having regard to the area.

There is an abundance of evidence to satisfy the Court that the Australian Standard 3959 'Construction of Buildings in Bushfire Prone Areas' should be adopted within the State of New South Wales.

Further, all developments of residential areas should be refused until adequate provision is made for separate access and exit roads for use by emergency vehicles.

Preferably there should be perimeter roads located between the outside building block and the bushland. No developments should be allowed on the bushland side of the perimeter road which should be at least 20 metres wide.

Fire Hydrants should be located on the bushland side of the roads.

The planning of the residential area should be concerned with a pattern of roads which aid in the evacuation of residents during dangerous fires, whilst at the same time allowing access to emergency vehicles.

Town Planners and Fire Control Offices should review all existing residential areas which are bushfire prone to establish whether modification to existing risk conditions can take place to overcome danger posed to residents and fire fighters.

It appears to the Court that the fire fighting authorities have to face the fact that there is a need for adequate permanent personnel to carry out these works rather than depending upon volunteers.

There is a need for the Government to give serious consideration to how Emergency Services can obtain instant access to the electronic media, to broadcast appropriate, accurate information in these circumstances. It may well be that there could be particular provisions made in legislation for particular media outlets to carry out these functions or for the creation of a facility to be operated by the State for that purpose.

Nevertheless, authorities should recognise the need to establish strong links with the electronic media to implement a scheme whereby official warnings are given at periodic intervals, preceded by an appropriate distinctive Emergency Signal which will alert people to the importance of the announcement.

The evidence satisfied the Court conclusively, that throughout NSW during the period 1989-1993, the fuel was not managed as intended by Parliament and high fuel loads were principally responsible for the intensity of the uncontrollable fires.

⁶ 28 February 1996.

The proper inference to be drawn is that the appropriate Ministers were aware that Section 41A Plans were not being prepared and approved, and were also aware of the existence of heavy fuel loads.

The Court is of the view for reasons previously outlined, that the issue of powers of evacuation during S.41F declarations is still not clear and should be the subject of further consideration.

In the restructuring of the Fire Service, in the Courts opinion, the role of a Bush Fire Council, as presently constituted, is not necessary.

There is a need in the short term, in the Courts opinion, for a Rural Fire Service with a command structure directly to regions, districts, localities, so there can be accountability.

The role the Councils now play in respect of Bush Fire Administration should be modified.

The Fire Control Officers should be employed permanently in the new Rural Fire Service but keeping contact and liaison with their local areas through Councils and by supervision and control of the local volunteer Bush Fire Brigades.

Whilst the Court appreciates, having regard to some evidence before this Court, that volunteers don't want to be full time or paid, in the Courts opinion they should be dealt with the same as retained NSW Fire Brigade personnel except that the fees for retainment of each volunteer and the service of each volunteer, should be allocated to each volunteer Bush Fire Brigade, with such amounts being appropriated towards the administration and resources of the Brigade.

The Fire Control Officer should be the focal point of each of the Districts with responsibility for both Fuel Management Planning and Operations, and accountable to the Commander who should have ultimate responsibility. In each local area, there should be at least one designated Prevention Officer besides the Fire Control Officer and other required staff.

In the Courts opinion, having regard to these authorities importance, both in fuel management planning, suppression of fire, and their relationship with other fire services and the public, each should have a designated Commissioner of Fire Services who should join the Commissioners of the NSW Fire Brigade and Bush Fire Brigades on a board to administer the whole of the fire service in New South Wales.

Under the provisions of Section 22A of the Coroners Act, 1980, the Court recommends to the Government of New South Wales:

- That a permanent Board of Commissioners be created, responsible to a Minister, to administer, manage, control and regulate, fire services in New South Wales.

Such permanent Board of Commissioners should be representative of the interests of the two principle fire services the NSW Fire Brigade and the Department of Bush Fire Services, and of the land managers National Parks & Wildlife Service, State Forests, and local Councils who also have responsibility for fire management policy.

The emphasis should be placed on a permanent structure composed of members with relevant qualifications in Fire Management and Operation with at least one member having Administrative, Management and Legal qualifications.

The Board should be the apex of a fire fighting service, primarily responsible for initiating policy and allocating resources. There should be an appropriate command structure supporting the Board with a Government Department to give effect to Administration, Management, Regulation, Control & Operation.

All financing should be allocated from existing financial sources available to the NSW Fire Brigade, Bushfire Services, Local Councils, National Parks & Wildlife Service, and State Forests in respect of Fire Management and Operations managed by the Board of Commissioners.

That initially, there be two principal divisions of the Fire Service.

1. Metropolitan; and
2. Rural Fire Service

Metropolitan

The existing NSW Fire Brigade structure and fire districts should be maintained in the Metropolitan, Newcastle, Wollongong and town areas under the provisions of the Fire Brigades act, 1989.

Each fire district should be responsible for its own fire management policy with priority in respect of the bushland urban interface

At each fire district, the equivalent of a fire control officer, and also a prevention officer should be permanent positions with responsibility for Fire Management policy. There should be appropriate resourcing to ensure policy objectives are achieved.

It should be the responsibility of the dedicated Fire Control Officer, to formulate Fuel Management and Operational Plans for the fire districts in association with permanent, dedicated officers from National Parks & Wildlife Service, State Forests, the Police Service, and local Councils. Such planning operations could be set up by Regulation under the Fire Brigade Act with the Fire Control Officer being accountable through his command structure to the Board and the Minister.

The Fire Brigades Act, 1989 should be amended to provide for a Board of Commissioners and to give the Board and its Fire Control Officers jurisdiction, powers and authority to Plan (similar to S.41A of the Bush Fires Act, 1949); and functions similar to S.41B and Section 13 & 14 of the Bush Fires Act, 1949.

It has to be emphasised that these powers must be given to the NSW Fire Brigade in respect of their fire districts, so that fire hazards can be quickly identified and reduced by a permanent, dedicated service, within the windows of opportunity as they arise. These powers are necessary to obtain objectives on the bushland-urban interface.

In an emergency fire and in respect of all fires, the NSW Fire Brigade should coordinate all operations where fires originate in their fire districts. Each fire

district, through the Fire Control Officer, should have a structure permanently in place of nominated persons forming an Incident Control System modeled on A.I.I.M.S. (Australian Inter-Service Incident Management System).

All persons who will be expected to participate in a fire operation of a degree of emergency identified in the operational plan should be trained to understand the Australian Inter-System Incident Management System.

Whilst all fire fighting during emergencies involving inter agencies should be based on cooperation, the presence of representatives of the Board of Commissioners and regulations under the Fire Brigades Act should ensure acceptance of responsibility and accountability. If necessary there should be complementary amendment of existing legislation governing other agencies to ensure cooperative fire management and operation.

The provisions of S.41F of the Bush Fires Act, 1949 should not be applicable to fire fighting operations in NSW Fire Brigade fire districts. There should be maintenance of a provision within the Fire Brigades Act, 1989 whereby the NSW Police Service and State Emergency Services give all necessary assistance to the NSW Fire Brigade where an emergency falls short of a declaration of a State of Emergency.

In the case of a fire emergency under the provisions of the Fire Brigades Act, 1989, when members of the Police Service are giving such assistance to the operation, their specific powers in respect of evacuations and road closures should be set out in the Fire Brigades Act, 1989.

The NSW Fire Brigade are presently structured to Regions, Zones and Districts with access to the 000 communications system and their areas relate also to Council areas.

Rural Fire Service

There should be a Rural Fire Service with a command structure from the Board of Commissioners through a commander incorporating Fire Control Officers and voluntary bush fire brigades.

Each fire district (schedule 3 and section 17) as set out under the provisions of the Bush Fires Act, 1949 should be maintained and identify as closely as possible to existing Local Government areas.

The provisions of the Bush Fires Act, 1949 should regulate the Rural Fire Service with amendments to account for new administrative, management and control arrangements.

The provision of a permanent, structured, Rural Fire Service with greater presence in priority areas, should also provide for the Volunteer Brigade component in the same way as retained personnel are part of the NSW Fire Brigade organisation.

The provisions of S.41F of the Bush Fires Act, 1949 should be repealed with all operations being coordinated by the permanent command structure.

There should be no provisions in the Act relating to the Bush Fire Council, Those functions, duties and responsibilities should be taken over by the Board of Commissioners and provided for in the Bush Fires Act, 1949.

In each Council area, the responsibilities for volunteer Bush Fire Brigades should be taken over by the Fire Control Officer who would be employed by the Government Department charged with the administration of the Fire Services. Existing volunteer bushfire brigades should be taken over by the Fire Control Officers already having responsibility for their management.

- Each Bushfire district should have a Fire Control Officer and a Prevention Officer dedicated to Fire Management Policy and responsibilities comparative to those already outlined for the Metropolitan Fire Service in these recommendations.

Like the NSWFB Fire Control Officers, they should be responsible and accountable for Fuel Management and Operational Planning at the Local level. This planning activity should occur in association with permanent dedicated officers from National Parks & Wildlife Service, State Forests, NSW Police Service and local Councils, set up by regulation under the Bush Fires Act, 1949. Such Fire Control Officer being accountable through his command structure to the Board of Commissioners and the Minister.

It should be emphasised that a permanent structure and dedicated personnel are imperative to achieve objectives of identification of fire hazards and reduction by a permanent service within the limited windows of opportunity, so as to protect assets at risk in the Rural areas.

The Fire Control Officer, with a permanent Rural Fire Service in place within his District, should be the Coordinator of Fire Fighting Operations.

Each Fire District, through the Fire Control Officer, should permanently have in place a structure of nominated persons forming an Incident Control System modeled on A.I.I.M.S. (Australian Inter-Service Incident Management System).

All persons who will be expected to participate in a Fire Operation of a degree of emergency identified in the operational plan, should be trained to understand the Australian Inter-Service Incident Management System.

There should continue to be provision in the Bush Fires Act, 1949 whereby the NSW Police Service and State Emergency Services give all necessary assistance to the Rural Fire Service where an emergency falls short of a declaration of a State of Emergency.

Specific powers of evacuation for members of the NSW Police Service, Emergency Services and the Rural Fire Service should be set out in the Bush Fires Act, 1949. Specific Police powers in respect of road closures should be provided.

When structuring the Rural Fire Service, consideration should be given to providing Regions, Zones and Districts comparable to those designated to Metropolitan Fire Service areas.

Both the Metropolitan Fire Service and Rural Fire Service should utilise a computer system linked to the NSW Police COPS Computer. There should be a facility

whereby, in cases of deliberate lit fires particularly, they can be identified and investigated at the earliest point of time. Such a procedure should be used to assist in forming profiles of offenders. It follows that both the Metropolitan Fire Service and the Rural Fire Service should be supported by a well resourced Fire Investigation Unit.

Communications

The Court recommends to the Government of New South Wales that it ensures the Government Radio Network is implemented totally to provide an effective radio communications system for the Fire Services of New South Wales, including an efficient fire ground communications system which will enable all fire fighters participating in operations to communicate with each other and the Fire Control Centre.

Building codes

The Court recommends to the Government of New South Wales that the Australian Standard 3959, 'Construction of Buildings in Bushfire prone areas' be adopted within the State of New South Wales.

Amalgamation of fire services

The Court recommends to the Government of New South Wales that, ultimately, consideration be given to the reformation of all legislation covering the provision of fire services in New South Wales to provide a single Fire Service under a single Act of Parliament, amalgamating the Metropolitan and Rural Fire Services.

C.8 Report of the Investigation and Inquests into a Wildfire and the Deaths of Five Firefighters at Linton on 2 December 1998⁷

C.8.1 Recommendations

Recommendation 1

The CFA and DNRE develop a modified set of 'Hierarchy of Controls' relating to firefighting and wildfire to assist all those working in the area towards improving the general understanding of the application of occupational health and safety and related risk management principles.

The controls would specify that the system of work or fire suppression methodology (technique) is at the top of the hierarchy (and give examples). Examples of advantages and disadvantages (risks) of particular firefighting control techniques for certain circumstances would be demonstrated. Options like withdrawing where the standard technique would be likely to put firefighters at unnecessary risk would also be specified. Examples of other control methods in the hierarchy table would also be listed.

The modified set of 'Hierarchy of Controls' should be developed in full consultation with representatives of the Peak Unions/ Associations and the Victorian WorkCover Authority. Also the assistance of occupational risk management specialists may be necessary.

It also may be necessary to include some brief explanation of occupational health and safety principles in the CFA's Operations Guidelines – A Guide to Operations and Tactics in the Field. Other publications should be reviewed to ensure consistency of approach.

Recommendation 2

The CFA consider ensuring that OH&S and incident reporting, investigation and related research become a regular part of the agenda of Board meetings.

Recommendation 3

The Victorian Fire Services consider introducing the additional function of 'Safety' to the other four 'functional areas' of the Incident Control System of AIIMS.

The ICS manual would need to be amended and an appropriate chapter dealing with the functions and responsibilities of the Safety Section be scoped (safety may need to include 'community safety' as well as 'occupational' safety). This should be undertaken with the assistance of emergency services, occupational health and safety specialists and the Peak Unions/ Associations.

⁷ *Report of the Investigation and Inquests into a Wildfire and the Deaths of Five Firefighters at Linton on 2 December 1998*, State Coroner's Office, Victoria (Graeme Johnstone, State Coroner), January 2002.

Also the other four functional areas (Control, Operations, Planning and Logistics) should include the objective of 'safety' (and how it is to be achieved) clearly specified in the chapter relevant to the particular function.

The Safety Section would also be responsible for the audit function envisaged in Recommendation 4.

The amendment to the system would need to be developed in consultation with the Australian Fire Authorities Council.

Recommendation 4

The Victorian Fire Services consider introducing an audit function straddling the functional areas of the Incident Control System of AIIMS.

The audit function would be conducted during the fire by a small team of auditors under the auspices of the Safety Section (see Recommendation 3). The auditors' role would be to regularly check on the operation of the other AIIMS-ICS functions with a focus on how the range of systems integral to safety (including information flows) were operating both within the Incident Management area and on the fire-ground.

In the event that systems problems are identified the auditor would advise the Safety Section. The Safety Section would have a role to assist in resolving the identified problem through the Incident Controller. The amendment to the system would need to be developed in consultation with the Australian Fire Authorities Council.

Recommendation 5

The CFA and DNRE develop the position description and responsibilities for the members of the Audit Team. The role, position description and responsibilities of the Audit Team should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

Recommendation 6

The CFA and DNRE develop training packages for the Audit team function. The training packages for the role of Auditor should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

Recommendation 7

The CFA and DNRE should deliver, as part of training for firefighters (volunteers/full time) and incident managers, a full explanation of role of the Audit Team.

The training for firefighters/incident managers should underscore that the role of the Audit Team is as an important adjunct to the 'Safety First' culture and that the allocation of such positions at a wildfire does not alleviate individual responsibility for safety.

Recommendation 8

The CFA and DNRE should develop standards relating to the number of Audit Team members required at a particular type of fire. The standards should be aimed at ensuring sufficient human resources are at the fire to assist in appropriately managing the audit function.

This standard should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

Recommendation 9

The CFA and DNRE consider a requirement that a Safety Officer be appointed to assist in the management of safety at every wildfire incident (it is recognised that in the early stages of a fire this might not always be possible). Once the wildfire escalates (or is likely to escalate) to a 'Type 3' incident, safety at the fire should be managed by a Principal Safety Officer. Also when a wildfire escalates to a 'Type 3' fire a Safety and Audit Team should be formed to assist the Principal Safety Officer in the management of safety at the incident (the role of the Audit Team has been considered separately).

Recommendation 10

A 'Safety Officer' at a wildfire should have the limited ability to effect an operational decision and only where that decision is reasonably likely to put the lives of firefighters at immediate unnecessary and unjustified risk.

During the management of an incident, if the 'Principal Safety Officer' raises a safety issue with the Incident Controller that requires modification to the system of work on the fireground (or elsewhere) and the Controller decides not to follow the advice the issue and reasons for decision should be documented in the log.

Recommendation 11

The CFA and DNRE develop the position description and responsibilities for the respective roles of Safety Officer and Principal Safety Officer.

The roles, position description and responsibilities of Safety Officer and Principal Safety Officer should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority. Ideally the Principal Safety Officer should have Occupational Health and Safety qualifications as well as experience as a senior firefighter.

Safety Officers would have both appropriate firefighting training and experience combined with a sound knowledge of occupational health and safety principles.

Recommendation 12

The Safety Officers and Principal Safety Officers should have strong links with the Occupational Health and Safety Department of the relevant agency. They should also have links to the Audit Team.

Recommendation 13

The CFA and DNRE develop training packages for the respective roles of Safety Officer and Principal Safety Officer.

The training packages for the respective roles of Safety Officer and Principal Safety Officer should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

Training for each of the roles should include a significant component of occupational health and safety with a 'risk management' focus. In view of the importance of the roles, some aspects of the training should also be given by independent occupational and risk management professionals. Regular updated revision of training should also be delivered. Training should be regularly audited to ensure appropriate levels of delivery, understanding and relevance to firefighting, occupational health and safety and risk management.

Recommendation 14

The CFA and DNRE should deliver, as part of training for firefighters (volunteers/full time) and incident managers, a full explanation of the respective roles of Safety Officer and Principal Safety Officer.

The training for firefighters/incident managers should underscore that the role of Safety Officer is as an important adjunct to the 'Safety First' culture and that the allocation of such positions at a wildfire does not alleviate individual responsibility for safety.

Also training of all firefighters/incident managers in the general roles of 'Safety Officer' should be regularly audited to ensure appropriate levels of delivery and understanding of firefighters/incident managers to the concept and position as it applies to occupational health and safety and risk management.

Recommendation 15

The CFA and DNRE should develop standards relating to the number of Safety Officers required at a particular fire. The standards should be aimed at ensuring sufficient human resources are at the fire-ground to assist in appropriately managing safety.

This standard should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

Recommendation 16

The CFA (with the assistance of DNRE) develop, as part of its training program, a package of information focusing on general occupational health and safety issues aimed at improving the knowledge and understanding of firefighters (full-time and volunteers) and supervisors of this area. Also the package should explain how occupational health and safety principles apply to firefighting (and in particular, wildfire suppression).

The occupational health and safety training package should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority.

All firefighting training publications would need to include an explanation of occupational health and safety principles and practices as applying generally and specifically to wildfire. The training in this area should be regularly audited to ensure appropriate levels of delivery, understanding and relevance to firefighting, occupational health and safety and related risk management.

Recommendation 17

The CFA (with the assistance of DNRE) develop, as part of its training program, a generic package focusing on delivering the skills necessary for competent supervision required by individuals acting in a range of management positions during a testing incident like a wildfire.

This package should be developed in full consultation with representatives of the Peak Unions/Associations and the Victorian WorkCover Authority. It may also require input from management or other experts.

Recommendation 18

The provision of regular and timely situation reports should be considered by the firefighting agencies and all firefighters as vital for efficient and safe management of a fire.

The CFA and DNRE should ensure that supervisors check with their teams in the event that situation reports are not regularly forthcoming from the fire-ground (or elsewhere in the management structure).

Management systems should be developed to assist supervisors with this important function. Also auditing of the provision of situation reports during the fire should be considered by all firefighters as important to efficient and safe operation.

Recommendation 19

The CFA consider introducing a system of 'mentors' to ensure that new firefighters and firefighters going into a new firefighting environment for the first few times receive appropriate guidance and directed experience. DNRE should also consider extending its mentoring system to its firefighters who fall into this category.

In order to ensure the 'Mentoring' system is workable, practical, delivering appropriate levels of guidance and experience to all new firefighters (or firefighters going into a new firefighting environment for the first few times) the Peak Unions/Associations would need to be involved at the outset and at all levels of system development and auditing. System development may also require guidance from occupational health and safety and/or training specialists.

Also, where practicable, DNRE may consider seconding experienced firefighters who are 'mentors' for short periods to the CFA to assist in the process of broadening the experience base of CFA firefighters.

Recommendation 20

Both CFA and DNRE should consider developing a standard, a training package and an accreditation system for 'mentors'.

Recommendation 21

Both the CFA and DNRE train an appropriate number of ‘mentors’ to the standard referred to in Recommendation 20.

Recommendation 22

The CFA and DNRE consider developing an audit process to ensure that appropriate and effective guidance is being delivered by the mentoring system to firefighters.

Recommendation 23

The CFA and DNRE, ensure as soon as possible that:

- minimum wildfire competencies are agreed;
- agreed competencies are developed for all roles in the incident management system; all fire personnel are competent to undertake their assigned role;
- the competencies of all fire personnel are recorded and made available to the Incident Control Centre in a timely way;
- the training materials used to develop core competencies in forest firefighting are common; and
- programs to maintain competency are introduced and managed.

Recommendation 24

The CFA and DNRE, ensure that training and management processes re-enforce the necessity for all crews to report to the Staging Area or Control Point (if established) for registration and allocation of tasks. This process is essential for safe tasking and management of resources in a wildfire operation.

For crews that have been working on the fire-ground before a Staging Area is established there needs to be early attention to reviewing competence and appropriateness of current allocation. Systems of registration for existing crews and timely audit of competence therefore need to be established by DNRE and CFA (see Recommendation 25).

The historical, ad hoc problem of self-deployment of fire crews is dangerous and operationally inefficient. Procedures need to ensure that this problem is addressed.

Recommendation 25

The CFA establish, as soon as possible, an audit system to ensure that there is regular, timely checking of competence of crews and individuals who are working on the fire-ground and in incident management positions.

Not only is it necessary to ensure that initial tasking is correctly undertaken, but the actual allocation of the task is checked as against the initial process.

Ideally, the Audit Team referred to in Recommendation 4 would be delegated this task.

Recommendation 26

The CFA ensure that an officer be available at the 'home' brigade to answer inquiries from the Staging Area (or Control Point) and/or Audit Team about the training and experience of local brigade crews and individuals allocated to the wildfire.

As these inquiries may be made at any time, allowance would need to be made for shift change and hand-over of information between home brigade officers. A system of afterhours contact via telephone and/or pager may be necessary for smaller brigades.

The importance of accurate, up to date recording of training/experience and rapid access via computer links between the IMT and Brigades cannot be underestimated. Other technological solutions such as an identity card or 'T card' with bar coding of relevant information on competence also need to be explored.

Recommendation 27

The CFA (and where necessary with DNRE) consider establishing the position of Allocations Officer at the Staging Area to help ensure that trained and experienced firefighters are appropriately tasked to the fire-ground and to

- a contact point for those working on the fire-ground (including Safety Officers);
- a contact point to and from a home brigade for inquiries about the developing nature of the fire and tasking of its crews;
- assistance to the Audit Team, etc.

Recommendation 28

The CFA and DNRE review the Standard Fire Orders/Watchouts to determine current relevance and safety effectiveness during an operation. The number of orders/watchouts may be an issue.

The Standard Fire Orders and Watchouts should be reviewed on a regular basis to determine relevance, simplicity of message and effectiveness for safety.

Recommendation 29

The CFA review the Operations Guidelines to determine current relevance, level of awareness, simplicity of message for safety effectiveness during an operation.

Recommendation 30

The CFA examine other methods of delivering information which is vital for safety (in addition to radio) to ensure that the message contains sufficient and accurate detail and is not only delivered to all personnel involved in firefighting operations but that its relevance to safety is clearly understood.

The role of supervisors under AIIMS-ICS is critical in this regard. New information technology in fire tankers may also provide additional (but limited) potential.

For example, information on weather (wind speed) should give, estimated time of arrival (with appropriate variables), speed and direction. Consideration should be given to enhancing safety aspects of the message by additional simple safety instructions like 'keep to the black' or 'keep to a safe anchor point', etc. The message may need to allow for different work environments on the fire-ground.

It should be clearly noted that, in developing methods for more effective delivery of safety messages, there should be no substitution for direct supervision, communication and instruction at all levels of the chain of command.

Recommendation 31

The firefighting agencies and the Bureau of Meteorology consider undertaking an audit to identify potential gaps in the AWS network.

Recommendation 32

In the event that unacceptable gaps in the AWS network are identified by audit then the agencies (firefighting and Meteorology) should consider providing the equipment to fill the gaps. In this context unacceptable should be taken to mean that it has potential to effect safety.

Recommendation 33

The Bureau (with assistance of CFA/DNRE) continue to undertake regular research and auditing into the accuracy of the respective forecasting models used by the Bureau (European 'ECMWF' and the local 'meso-LAPS'). The Bureau should also continue other general research into weather and wildfire behaviour as this information has potential to effect safety.

As this research is both in the interest of improving the accuracy of forecasting for wildfire and has potential benefits for safety it is vital that adequate resources be made available.

Recommendation 34

The Bureau undertake regular auditing of its forecasting performance for the fire season (as any lessons learnt may have potential to improve firefighter and community safety).

Recommendation 35

The firefighting agencies consider introducing the position of 'Weather Reporting Fire Officer' to be stationed at the Staging Area (for Type 3 wildfires) with a role to assist in providing that a consistent (and informed) level of information is delivered to those working on the fire-ground.

Recommendation 36

The firefighting agencies consider introducing a weather briefing by a trained 'Weather Reporting Fire Officer' at the Staging Area (for Type 3 wildfires) to ensure consistency of information delivered to those working on the fire-ground.

Recommendation 37

The CFA, DNRE and the Bureau consider working together to provide a management and support structure for the informal weather collecting groups.

The individuals or groups need to be identified. The agencies should work with the groups to ensure that appropriate resources (training, equipment, etc) are made available to provide for timely information on weather to enhance firefighter safety.

Recommendation 38

The CFA and DNRE (in conjunction with the Peak Unions/Volunteer Associations) develop standards for the content and time-lines for delivery of Communications and Incident Action Plans, for wildfire incidents.

Also accurate preparation by the management team and timely delivery of these documents to firefighters through the management structure should be subject to audit.

Recommendation 39

The CFA consider specifying 1000 litres as the minimum amount of water to be retained on firefighting tankers for protection of firefighters during potential or actual wildfire operations.

In view of the reliance of CFA training on the use of water fog sprays on a tanker as a last resort engineering solution for an entrapment, tankers that have a water carrying capacity not allowing for the minimum of 1000 litres to be kept for protection of firefighters should not be used.

This should be seen as the minimum interim measure pending accurate scientific design research indicating the safety limits of the fog spray systems (depending on fire intensity).

Recommendation 40

The CFA consider, in addition to warning lights and audible devices, a requirement that future design of CFA tankers include a two stage water tank capacity (similar to large DNRE tankers).

Two stage water tanks would assist in further reducing the risk of a crew, concentrating on the job of fire suppression, inadvertently using some of their protective water supply. It is an essential element to further reduce the risk of crews using the protective water supply (eg: Geelong West).

Recommendation 41

The CFA continue to examine the design issues associated with its firefighting tankers to pro-actively aim at a process of continual improvement in protective safety design. The types of issues raised in the research paper by Dr. Paix need to be constantly reviewed with the aim of design improvement.

In the context of design improvement research is vital in relation to the safety limits (depending on fire intensity) of the fog spray system for tankers used by

firefighting agencies. It may be necessary to consider (with DNRE and Standards Australia) the development of a protective safety design standard for large firefighting tankers that are to be used in wildfire.

Recommendation 42

The CFA and DNRE consider establishing a reporting system that ensures all situations where fog sprays are used during operations for personal protection are regarded as an 'incident', thus reported and thoroughly investigated looking at root cause analysis. The activation of 'fog sprays' during a wildfire suppression operation should immediately be reported to the incident controller.

In the event that this recommendation is followed the CFA and DNRE should ensure that all firefighters are informed of the benefits to safety of reporting this type of incident. Firefighters should also be regularly advised of the outcome of investigations and of any resultant improvement to safety systems.

Recommendation 43

The CFA and DNRE consider jointly establishing a permanent, well resourced, Fire equipment Safety Design and Development Unit (with links to the Research Unit and the respective Occupational Health and Safety Department of each agency to pro-actively examine safety design improvements in fire tankers and other protective equipment. This may need to be developed in conjunction with the MFESB (as there may be some common design issues).

It may be useful to consider linking the Design and Development Unit with a university engineering school and accident research specialists (ie: Monash University School of Engineering and Monash University Accident Research Centre).

Recommendation 44

Where practicable, the firefighting agencies (CFA/DNRE) should consider working together on joint reviews of technology and communications systems as well as design, development, implementation and evaluation of systems. This recommendation should not exclude other agencies that may have a potential need for common systems (ie: MFESB, SES).

Recommendation 45

Wildfire safety should be regarded as one of the major issues for the respective OH&S Committees of the CFA and DNRE. As there may be common issues being discussed by the two Committees, the CFA and DNRE (in consultation with their respective OH&S Committees) should establish and resource an overarching Steering Committee to assist in the efficient, timely consideration and management of common safety issues between the Committees.

It is important that the Volunteers be represented on the CFA's OH&S Committee.

Recommendation 46

That the CFA and DNRE consider establishing a system of regular (in the sense of a permanent part of the safety system), detailed, independent safety audits of a

limited number of randomly selected wildfires of different levels of incident classification.

Such a limited Wildfire Safety Audit system needs to:

- be adequately resourced;
- be conducted by professional risk analysts (with specialist occupational health and safety expertise);
- ensure that the auditors had full access to individuals and relevant fire agency information;
- be undertaken, as far as is practical, in a blame free environment for individuals with the intention of receiving maximum information on the management of an incident;
- form part of rigorous process of audit would include 'hunting for errors' in systems (or no system at all);
- ensure that the auditors test any relevant system (not just examine the paperwork) to ensure that the system was working;
- be undertaken in accordance with developed standards (see Recommendation 47);
- provide for the auditors to be rotated to ensure that the potential for differing views on wildfire safety management is maximised;
- become part of the due diligence of the fire fighting agencies in the management of safety at a wildfire. *The Wildfire Safety Audit reports should also become part of a timely, continual management process aimed at improving safety for firefighters. Auditors' recommendations should be identified and followed-up;* and
- ensure that where an auditor's recommendation is not followed then the reasons (and alternative solutions – if relevant) are reported to the appropriate Government Department.

The discovery of errors in systems following a pro-active safety audit should be regarded by the entire organisation as a positive result for the process.

Recommendation 47

The firefighting agencies (CFA and DNRE) with the WorkCover Authority and the Peak Unions/ Associations consider developing a standard governing the scope and methodology for Wildfire Safety Audits. It may be useful to involve Standards Australia to assist in the development of an appropriate standard. A Wildfire Safety Audit Standard would need to apply to both external (independent) and internal (agency based) audits.

Recommendation 48

The firefighting agencies (CFA and DNRE) ensure that the operational management of all significant wildfires is internally reviewed in accordance with the Audit Standard referred to in Recommendation 47.

The firefighting agencies should consider providing, where appropriate, self-critical reports similar to that undertaken by the Office of Corrections.

Recommendation 49

The CFA and DNRE review their policies on the reporting of incidents and 'near-miss' incidents and develop a compatible system of reporting.

Recommendation 50

In the context of Recommendation 49 the CFA and DNRE develop a 'going fire' incident/near miss reporting system. The aim of the system would be to give the Incident Management Team the best possible and up to date intelligence on potential safety and operational problems that may be developing during its watch.

Recommendation 51

In the context of Recommendations 49 and 50 the CFA and DNRE consider developing:

- an investigation standard and training package for investigators;
- a data collection model for all incident investigations and recommendations (this also may need be developed for the CFA's Operational Analysis system);
- a procedure for follow-up of results, recommendations or research from investigations (see also Recommendation 46 – Wildfire Safety Audits);
- a method of regularly informing all firefighters of benefits of reporting/investigations; and
- a procedure and requirement for regular audit of investigations to ensure standards are followed and to identify any problems in reporting or investigatory methodology that may require rectification.

Recommendation 52

The CFA and DNRE use incidents (including near misses) and coronial findings for scenario and safety training.

Recommendation 53

The firefighting agencies (CFA and DNRE) consider establishing an independent 'Investigation and Review Unit' to operate either as an individual unit or as a shared unit between the agencies. Ideally, the unit would be a joint operation, positioned with links to the agencies' Occupational Health and Safety Department and the Research Unit. The unit would undertake and supervise audits (internal and independent) and incident investigations.

To enhance its role, importance for safety and independence the Investigation and Review Unit should report to the Chief Officer and Chief Fire Officer of CFA and DNRE respectively. In the case of the CFA the information from the Investigation and Review Unit should be regularly made available to the Board.

Recommendation 54

The CFA and DNRE consider establishing a joint Research Unit to pro-actively review, research and report on safety issues flowing from:

- all external/internal analyses of particular operations;
- all reported incidents (and 'near misses'); and
- local, interstate and overseas information on incidents and trends in safety for firefighters.
- Consideration should also be given to involving the MFESB (as there may be common risks).

It is envisaged that a Research Unit would have links to each agency's Occupational Health and Safety Department and the joint Investigation and Review Unit. Links to an accident research agency like Monash University Accident Research Centre may also be useful to broaden the base of the Unit's approach to research. To enhance its role and importance for safety the Research Unit should report to the Chief Officer and Chief Fire Officer of DNRE and CFA respectively. In the case of the CFA the information from the Research Unit should be regularly made available to the Board.

Recommendation 55

The Department of Justice (perhaps with the assistance of the Office of the Emergency Services Commissioner) auspice a review of the range of additional recommendations (not already covered in this Chapter) delivered by some of the parties in submissions to the Coroner.

The review should be undertaken by a committee comprised of a range of relevant agencies (with the assistance of experts if necessary).

C.9 Recommendations from the Inquiry into the Mt Ku-Ring-Gai Tragedy at Ku-Ring-Gai Chase National Park - 2000⁸

C.9.1 Recommendations

The Coroner's recommendations were:

1. That hazard reduction burns/prescribed burns to be undertaken on NPWS lands not be undertaken before the plans for such are reviewed and approved by persons qualified in such burns. It is not sufficient that such burns be approved by a senior officer. That senior officer must have knowledge relevant to prescribed burns, hazard reductions or wildfire.
2. That no hazard reduction be undertaken in any area where ground crews are to be utilised without such area being inspected and ground truthed to ascertain safety areas, exits, potential hazards, etc.
3. Persons undertaking duties at prescribed burns should be totally familiar with the incident control system and the relevant duties ascribed to positions under that system.
4. That usage of titles or terms not identified under the NPWS Incident Control System no longer be used within the NPWS in relation to fires.
5. That all persons assigned to attend a prescribed burn be notified well in advance of such burn to permit their attending the fireground with suitable safety equipment and sustenance.
6. That a full briefing be carried out with all persons who are to undertake a prescribed burn. Such briefing to include topographical features, safety areas, exit points, and other relevant features in accordance with the NPWS Incident Control system. All members of the crew are to be given a relevant map and be encouraged to seek any information from those carrying out the briefing that may be relevant to their own safety.
7. A senior officer should check and verify that occupational health and safety issues have been addressed prior to prescribed burns being undertaken.
8. At every prescribed burn, an effective control centre is to be established which is to be staffed by a person who:
 - has an advanced First Aid qualification and relevant medical equipment
 - has the capacity to communicate with the fireground and senior officers
 - has been fully briefed as to the burn; and

⁸ Recommendations from the Inquiry into the Mt Ku-Ring-Gai tragedy, before Senior Deputy State Coroner, J Stevenson, Friday, 14 December 2001.

- has been supplied with a list of all personnel involved in the burn and their ascribed roles.
9. That the NPWS develop or assist in the development of a suitable method of testing drip torches to ensure they are manufactured to such a standard to withstand such heat that they not become dangerous during a fire.
 10. That the NPWS has available to the Incident Controller for any burn information as to the level of training undertaken by crew members who are to undertake a burn and to allocate to each person a more qualified officer to act as their mentor.
 11. That no person be permitted to enter a fireground unless suitably attired.
 12. To this end, all recruits should be issued with and trained as to the care and maintenance of new and appropriately sized fire clothing, including two-piece proban-treated suits and undershirts, fire resistant footwear goggles, masks, gloves and helmet. The recommendations contained in the report of Mr Richard Donarski of the Rural Fire Service are commended to the Minister.
 13. Consideration be given to personnel on the fireground to be issued with a personal and portable fire protection blanket.
 14. That the NPWS stress to staff that safety of personnel is paramount at all times. Should any one person undertaking prescribed burns or any burn be concerned as to any aspects of safety, they are to be encouraged to bring this to the attention of those who are in authority. No burn is to be undertaken until the concern raised has been considered or addressed at the highest relevant level.
 15. That a review be undertaken of the NPWS communication equipment and the effectiveness of use of such equipment on firegrounds, including that the efficacy of a fire relay base be considered.
 16. That there be kept at all times during the prescribed burn or hazard reduction a log of radio and other communications to indicate actions taken on the fireground so that they can later be considered and assessed.
 17. That the NPWS assist other firefighting bodies in formulating a burn guide for the Sydney basin.

C.10 Report on the Joint Select Committee Inquiry into the 2001/2002 NSW Bushfires⁹

C.10.1 Recommendations

Recommendations – Hazard reduction

1. That all public and private owners and/or managers of land in bushfire prone areas of New South Wales are made aware of their responsibilities to protect their own and neighbouring properties from bushfire through active implementation of appropriate hazard reduction regimes and the application of appropriate standards in building construction and maintenance.
2. That by 30 March 2003, all state land management agencies should prepare schedules, identifying those areas within their tenures where hazard reduction activity has been planned but postponed in the previous 36 months.
3. That all state land management agencies apply the necessary resources to ensure that their annual planned programs of hazard reduction are achieved in each reserve OR, where planned hazard reduction by means of controlled burning is postponed more than twice in any reporting year, that contingency/catch-up plans are developed and implemented within a reasonable time-frame to be negotiated with the appropriate Bushfire Management Planning Committee.
4. That the Bushfire Coordinating Committee should develop a Statewide communications strategy to generate and disseminate educational and information materials about the bushfire management process for the general public and for all stakeholders involved in bushfire management. The strategy should accommodate specialised information activities related to bushfire management undertaken by individual land management agencies in NSW.
5. That the National Parks and Wildlife Service should develop and implement a Statewide strategy for community information, education and engagement in regard to the responsible management of parks and reserves, including the training of key personnel in large group facilitation and consultation.
6. That the NSW Rural Fire Service should offer assistance to local government bodies to assist in catch up activities, such as mapping and hazard reduction. Where individual councils seek to apply a levy to undertake such work, the Department of Local Government should give such applications sympathetic consideration.
7. That implementation of the Government's strategy to streamline the approval process for hazard reduction be evaluated by December 2003 by a

⁹ *Report on the Inquiry into the 2001/2002 Bushfires*, Joint Select Committee on Bushfires, Parliament of New South Wales Legislative Assembly, Sydney (Chair, John Price), June 2002.

review panel convened by the Commissioner of the NSW Rural Fire Service. The review panel membership is to include (but is not limited to) representatives of volunteer fire fighters, private land holders, local government representatives and other Government stakeholders.

8. That the reporting procedures by all land managers for the implementation of hazard reduction be standardised and adopted by the Bushfire Coordination Committee.
9. That performance audits of implementation of Bushfire Risk Management Plans be undertaken by the Commissioner of the NSW Rural Fire Service in accordance with a Strategic Audit Plan to be approved by the Minister for Emergency Services.
10. That consistent with the emphasis on coordinated bushfire fighting, there be ongoing cooperation between the planning and operational arms of the land management agencies and the firefighting authorities in the implementation of hazard reduction plans as well as in firefighting activities.
11. That all developments approved in fire prone areas from the date of proclamation of the Rural Fires and Environmental Assessment Legislation Amendment Bill 2002, should make provision for a property protection zone within the area of the proposed development in accordance with the planning guidelines in the *Planning for Bushfire Protection* booklet.
12. That land management agencies, including National Parks and Wildlife Service, State Forests and Department of Land and Water Conservation, develop Village Protection Strategies as part of their Bushfire Management Plans for all settlements adjacent to their lands.
13. That the Minister for the Environment, in appointing community members to NPWS parks advisory committees, consider amending the criteria for community membership of to ensure that each committee has a member with firefighting knowledge and experience.

Recommendations – Fire trails

1. That the Commissioner of the NSW Rural Fire Service arrange for an audit of the adequacy of the strategic fire trail networks across the tenures of all state land management agencies, including an assessment of the security and condition of each trail, in accordance with a Strategic Audit Plan to be approved by the Minister of Emergency Services and the Ministers responsible for each agency.
2. That a cyclic maintenance plan for all fire trails on State owned land be developed by each of the land management agencies .
3. That maps of fire trails within their land holdings be updated by the land management agencies and submitted to the local Bushfire Management Committee, with changes of condition, or any closures and additions to the network notified annually by 30 August each year.

4. That a Statewide system of identifying, mapping and marking of registered fire trails be developed by the Bushfire Coordinating Committee.
5. That land management agencies be encourage to explore with appropriate recreational groups, where suitable, arrangements for maintenance and clearance of fire trails.

Recommendations – Fuel loads

1. That the Audit of streamlined approval process for hazard reduction burning to be carried out by December 2003 specifically examine the number, extent and reasons for any delays in executing an approved burn.
2. That the NSW Rural Fire Service ensure that training materials for fire fighters be regularly reviewed to ensure that the findings of verified research studies into fire behaviour (such as Project VESTA) are incorporated in service delivery training and in training manuals at the first available opportunity.
3. That the Commissioner of the NSW Rural Fire Service prepare a report on the implications of findings of Project VESTA for firefighting, as soon as the project is complete and its findings confirmed. and their implications for firefighting in NSW as soon as practicable.
4. That the issue of fuel load as an element of the fire cycle be referred to the proposed national Cooperative Research Centre for bushfire management for further investigation.
5. That all District Bushfire Management Committees consider the relevant Management Plans of land management agencies with adjoining tenures, with particular attention to National Parks and Wildlife Service parks and reserves, and jointly identify areas where dangerously high fuel loads have accumulated because scheduled burns have not taken place, to develop priority.

Recommendations – Biodiversity

1. The New South Wales Government endorse the zoning approach involving Asset Protection Zones, Wildfire Strategic Advantage Zones and Heritage Management Zones, as defined in Bushfire Risk Management Plans and Reserve Fire Management Planning, for bushfire hazard reduction.
2. The Bush Fire Coordinating Committee develop a set of agreed guidelines to minimise the impacts on the natural and cultural heritage of wildfire suppression, particularly in relation to the use of earthmoving equipment and fire retardants.
3. The NSW Government supports a national approach to research and technology development as a critical component of continually improving the effectiveness and environmental sensitivity of fire management.
4. The NSW Government welcomes the establishment of a national Cooperative Research Centre devoted to bushfire management, and

supports the involvement of major land management agencies and NSW Firefighting authorities as foundation participants.

5. It would be advantageous to bring together all research currently being conducted into the implications for biodiversity and biophysical processes of frequency and intensity of bushfires, and that the NSW Bushfire Coordinating Committee be required to consider how this might be achieved.
6. Any community education and information activity relating to bushfire management should address the fact that, in developing acceptable fire management practices, there will be a need to understand and manage perceived tensions between the objectives of preserving biodiversity and protecting life and property, while maintaining a clear understanding that where there is any doubt, the preservation of life and property is always paramount.
7. Streamlined processes be established as an integrated part of all fire management plans, to ensure that appropriate rehabilitation is implemented where fire control works have been undertaken on private and public land.

Recommendations – Biophysical processes

1. That protection zones continue to be maintained around riparian zones of water courses and lakes throughout the State.
2. That the Bushfire Coordinating Committee develop guidelines that will enable fire control works to be undertaken in such a way as to minimise environmental impacts.
3. That the Department of Health be asked to furnish to the Commissioner of the NSW Rural Fire Service a copy of the report of their current study into the incidence of asthma coincidental with major bushfire events, as soon as it becomes available.

Recommendations – Application of research, technology and management techniques to minimise the impacts

1. That a more coordinated approach to all fire-related research, and to the dissemination of validated findings be supported by the NSW Government.
2. That the NSW Government supports the establishment of the proposed National Bushfire Cooperative Research Centre as the focus of developing practical information about all aspects of fire management and fire suppression for the use of land managers and fire-fighters.
3. That the Commissioner of the NSW Rural Fire Service seek access to any analysis of the massive fire events currently raging through the western part of the USA, in order to apply any key lessons to fire management within NSW where appropriate.

4. That the Commissioner of the NSW Rural Fire Service, in assessing the adequacy of the bushfire management planning process at district level, consider the degree to which contingency planning for post-fire restoration work has been included in bushfire management plans.
5. That a review be undertaken by National Parks and Wildlife Service of any research into the impact of massive water bombing on sensitive conservation areas.
6. That the Minister for the Environment explore at Federal level, the viability of the establishment of a funded program similar to that within the US National Fire Plan, and for 'burned area rehabilitation and restoration works'.

Recommendations – Land use decisions and development planning

1. The committee endorses the new and improved Planning Guide, *Planning for Bushfire Protection* now issued jointly by Planning NSW and the NSW Rural Fire Service.
2. The committee proposes that information sessions be conducted by the NSW Rural Fire Service and Planning NSW for local council members and officers dealing with development applications to ensure they are fully aware of the provisions of the Guide and of the provisions of the Amendment Act 2002.
3. The committee supports the implementation of the new statutory provision for s.149 certificates issued by councils to identify properties in bushfire prone areas so that purchasers of such property are aware of the risk.

Recommendations – Responsibilities of property owners

1. The committee acknowledges the work of the NSW Rural Fire Service and the NSW Fire Brigade in community education, and recommends further emphasis be given to educating communities residing in bushfire prone areas about the steps they can take to prepare for bushfires, protect their own property, and prevent loss of life.
2. The committee supports the expansion of the NSW Fire Brigades Community Fire Unit Program and the NSW Rural Fire Service Community Fire Guard Program and the allocation of appropriate resources to this end.
3. The committee acknowledges that fire-awareness and fire-safety education is the responsibility of a range of Government departments and authorities in addition to the land management agencies and the firefighting authorities. The committee recommends a coordinated approach, similar to the Water Safety campaigns, directed at the general community, in addition to specific bushfire protection programs targeted at communities in fire risk areas.
4. The committee recommends that the NSW Rural Fire Service prepare and distribute information about the statutory requirements of the hazard reduction approval process and potential legal and liability issues for

individual land owners in the conduct of hazard reduction burning on their own property.

5. The committee recommends that the legal responsibility of owners and occupiers for any loss or injury arising out of those persons performing hazard reduction in accordance with the Rural Fires Act be referred to the Crown Solicitor for advice. The extent of the cover provided by the usual house and contents policy of insurance for this type of loss or injury should be investigated.
6. The committee recommends that the NSW Rural Fire Service examine and report to the Minister upon the availability of members of the NSW Rural Fire Service or other protected persons, including officers of local councils, to carry out hazard reduction work on behalf of owners and occupiers so as to afford them the protection contained in s.128 of the *Rural Fires Act 1997* or s.731 of the *Local Government Act 1993*.

Recommendations – Equipment

1. That the current strategy of replacement and upgrade of tankers and other equipment continue, with a full review of adequacy of equipment to be undertaken in conjunction with a stocktake in June 2003.
2. That the use of plastics in fire fighting vehicles be reviewed.
3. That there is a continuing focus on ensuring compatibility of all equipment amongst the fire fighting services of the various States of Australia.

Recommendations – Training

1. That appropriate training for firefighters should continue to be provided at all levels.
2. That all active firefighters be encouraged to participate in hazard reduction burning exercises in order to obtain practical experience in fire behaviour.
3. That training related to working effectively and safely with aircraft in fire detection and suppression activities be a mandatory component of advanced fire fighter training.

Recommendations

1. That the Australian Buildings Code Board examine the weaknesses in the Australian Standard identified by the CSIRO, and amend the standard as appropriate.
2. The committee recommends the development of standard training programs for council staff dealing with development applications in bushfire prone areas to ensure the efficient and uniform application of the *Planning for Bushfire Protection* guidelines, and BCA/ AS 3959–1999.
3. That the Minister for Planning examine the apparent conflict between the *Environmental Planning and Assessment Act* and regulations (s.80A and cl.98 respectively) which require as a condition of consent that building work be

carried out in accordance with the Building Codes Australia, and the new s.79BA inserted by the NSW Rural Fires and *Environmental Legislation Amendment Bill 2002* which allows development consent to be granted where it does not comply with Planning for Bushfires Protection 2001 provided there has been consultation with the Commissioner of the NSW Rural Fire Service as to protective measures.

4. That the *Planning for Bushfire Protection Guidelines* continue to be reviewed and updated as new research about fire impact on buildings come to hand, and reissued or affirmed at least every two years.
5. That the Royal Botanic Gardens in conjunction with National Parks and Wildlife Service, State Forests and local councils consider issuing a guide to plants suitable for use in bushfire prone areas, and to develop a nursery labeling system to identify the combustibility of plants.
6. That Planning NSW together with relevant local councils and the NSW Rural Fire Service, give consideration to encouraging homes in bushfire prone areas to install fireproof rainwater storage tanks.
7. That the NSW Rural Fire Service, together with local councils, develop strategies to encourage owners of properties in bushfire prone areas to upgrade and improve the bushfire preparedness of existing buildings.
8. That the Commissioner of the NSW Rural Fire Service undertake discussions with the Insurance industry regarding the introduction of a system of rebates in premiums, or similar incentives, for building insurance to reflect the degree of bushfire preparedness of individual dwellings, in the same way that premiums are adjusted when standard security measures are in place.

Recommendations

1. That aircraft continue to be used during bushfire emergencies as a complementary firefighting tool when and where the need arises as determined by the NSW Rural Fire Service after consultation with the Incident Controller.
2. That the State's firefighting agencies and authorities adopt a Statewide approach be agreed upon to include, but not be limited to: · an agreed interagency protocol for the use of aircraft; good indicators on when to stand down aircraft; and a coordinated approach to the distribution of available aircraft across agencies when conditions deteriorate suddenly.
3. That further consideration be given to safety issues for ground crews and aircraft personnel in relation to aerial firefighting.
4. That a central training program be developed by the NSW Rural Fire Service for all personnel who occupy aircraft management roles in Incident Management Teams, to ensure that they undertake thorough training on the management of aircraft in firefighting.
5. That the Commissioner of the NSW Rural Fire Service continue to explore the usage of military aircraft for firefighting operations.

Recommendations

1. That the government acknowledge the significant operational improvements already evident from the reform and consolidation of command of the firefighting services in NSW, and endorse the continuation of the reform strategy.
2. That the implications of the expanding urban-rural interface for fire prevention and fire suppression activity be investigated by the Fire Services Joint Standing Committee, with reference to Planning NSW and the Department of Local Government.
3. That the issue of community and individual responsibility for protection of their own lives and property through appropriate preparation be addressed through a coordinated Statewide Community Communication Strategy and Information Framework which enables locally specific details to be provided along with more general information.
4. That the NSW Rural Fire Service, through the District Bushfire Management Plan Committees, actively promotes further cooperation amongst all the stakeholders in all phases of bushfire prevention and suppression, including the adoption of a landscape approach to hazard reduction, rather than an individual tenure approach.

Recommendations

1. The Minister for the Environment and the Minister for Emergency Services seek advice from the Crown Solicitor on the legal responsibility of owners and occupiers for any loss or injury arising out of such persons performing hazard reduction in accordance with the Rural Fires Act. The extent of the cover provided by a house and contents policy of insurance for this type of loss or injury should be investigated.
2. The NSW Rural Fire Service examine and report to the Minister upon the availability of members of the NSW Rural Fire Service or other protected persons, including officers of local councils, to carry out hazard reduction work on behalf of owners and occupiers so as to afford them the protection contained in s.128 of the *Rural Fires Act 1997* or s.731 of the *Local Government Act 1993*.

C.11 Report of the Inquiry into the 2002–2003 Victorian Bushfires¹⁰

C.11.1 Setting the scene

The changing Victorian environment

- 2.61 That DSE and CFA as part of their long term planning, and in conjunction with the Commonwealth Bureau of Meteorology, consider ways in which evidence for climate change and El Niño–Southern Oscillation cycle impacts on the likelihood of unplanned fire, can be better incorporated into preparedness and response planning.

Weather conditions before and during the fires of 2002–2003

- 6.38 That DSE institute additional routine data storage and analysis to supplement current climate records with at least daily 3 PM values for the Grassland and Forest Fire Danger Index, and Keetch-Byram Drought Index, for selected high quality stations representing a cross-section of environments throughout Victoria.
- 6.39 That DSE and CFA, recognising that the Bureau of Meteorology does not routinely store all variables required to produce the calculations and indices necessary for research and planning into fire occurrence and behaviour, develop appropriate systems to ensure that such current and historical information is readily available and accessible.

C.11.2 Term of reference one: fire and public land

Fuel management in the high country

- 8.25 That, according to available scientific evidence, a decision regarding cattle grazing in the High Country should not be based on the argument that ‘grazing prevents blazing.’

Fuel management in ‘Mallee’: techniques and approaches

- 9.30 That if ‘link’ burns continue to be used, then on-site weather sequences and fuel conditions marking successful (‘within explicit prescription’) and unsuccessful burns be documented.
- 9.31 That the success of current buffers in terms of assisting suppression operations be continually reviewed, evaluated and documented.
- 9.32 That the creation of buffers by chaining and then burning swaths of mallee be explicitly monitored for:

¹⁰ Esplin, B, Gill, A & Enright, N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne.

- The risk of fire escapes during their establishment;
- Their effectiveness as a barrier to unplanned fire under various weather and fuel conditions; and
- Any adverse environmental effects such as soil mobilisation and loss of biodiversity.

9.33 That, as a result of this monitoring, weather conditions for the safe conduct of burning in such operations should be defined.

Constraints on prescribed burning in forests

10.65 That a review of the fuel management zones be implemented with a view to reducing the number of zones so as to focus clearly on (i) asset protection (especially at the Public/Private land interface), and (ii) ecological burns.

10.66 That an explicit formulation of the interactions between terrain, fuel, ignition pattern, time of day and weather be created to better define those days suited to prescribed burning.

10.67 That evidence of the rekindling or otherwise of spring prescribed burns in forests be assembled and a model constructed and tested to see whether or not some days in spring could be used for prescribed burning in certain circumstances and places, especially in Zone 1.

Measuring the effectiveness of prescribed burning

11.71 That DSE:

- Provide further training and/or field staff for the routine acquisition and reporting of geographic data (maps of fire extent for prescribed and unplanned fires) and fuel-array data (quantity, type, condition and arrangement before and after fire as in the Overall Fuel Hazard Guide).
- Routinely and explicitly report on measures of the effectiveness of the prescribed burning program.
- Measure the total area subject to prescribed burning treatment in each Fire Management Zone each year along with the average proportion of that area successfully burned.
- Develop an explicit, routine system of evaluation, analysis and reporting of the effects of prescribed burning in relation to environmental outcomes such as conservation of flora and fauna and water quality.
- Train more crews, use Project Firefighters more extensively (and CFA members or MFESB firefighters where appropriate), to undertake prescribed burning.

11.72 That DSE undertake a formal study of the level of prescribed burning in south western Australia for its possible application in Victoria by

comparing respective fuel arrays, terrain, weather, ground access, staff, prescribed burning days, areas conducive to prescribed burning and fire response systems.

- 11.73 That DSE and CFA map all unplanned fires greater than four hectares on public and private land in order to further develop an understanding of the risk to rural Victoria from unplanned fires.

C.11.3 Term of reference one: community and agency preparedness

Public awareness and preparedness

Understanding bushfire options: the decision to stay or go?

- 13.23 That CFA further develops the information supporting the decision to stay or go, to incorporate a better understanding of both the likely consequences of leaving home at inappropriate times, and the conditions and emotional impacts likely to be experienced during the passage of the fire front.

Community Education and Information Program

- 13.53 That the three fire agencies (CFA, DSE and MFESB) develop and implement a joint Statewide fire awareness education and information program aimed at encouraging a higher degree of personal and household self-reliance.
- 13.54 That CFA should remain the lead agency in delivering the community education and information program to rural Victoria.
- 13.55 That CFA and MFESB:
- Conduct an annual survey of households to test the level of awareness and acceptance of fire knowledge amongst Victorians; and
 - Regularly measure whether access to information leads to safe behaviours.
- 13.56 That the Co-ordinator-in-Chief of Emergency Management directs that all emergency management agencies review, by June 2004, terminology and language in current communication and public education material to ensure it is clear, easily understood and consistent, particularly with regard to fire.
- 13.57 That CFA and MFESB encourage householders to review their fire safety plan annually.

Community fireguard

- 13.75 That CFA, in conjunction with isolated small communities, develop and promote a suite of appropriate fire readiness and fire management strategies to meet their needs.

- 13.76 That CFA reports to the Minister for Police and Emergency Services on recommended solutions and implementation strategies for isolated small communities by June 2004.
- 13.77 That CFA clarifies and restates the roles and function of existing Community Fireguard Groups (including their relationship to the Municipal Fire Prevention Plan) to members, co-ordinators, Incident Controllers and Municipal Emergency Resource Officers, prior to the 2003-2004 fire season.
- 13.78 That Community Fireguard Group co-ordinators' names are supplied to their local municipality for the 2003-2004 fire season, and are updated annually for use in information exchange should a Municipal Emergency Co-ordination Centre or Incident Control Centre be established.
- 13.79 That CFA provides technical advice to Community Fireguard Groups in the selection and purchase of appropriate equipment and protective clothing for use on their own land.
- 13.80 That CFA, recognising the value of the Community Fireguard Group program, undertake a review by June 2004 to identify opportunities to further develop the program to ensure its continuing appropriateness in preparing communities for fire into the future.

Public Awareness Communication Systems

- 13.93 That the Co-ordinator-in-Chief of Emergency Management directs the Media sub-committee of the State Emergency Response Committee to review the use of the Standard Emergency Warning Signal and its accompanying message.
- 13.97 That Victoria include an agenda item for both the National Emergency Management Committee and the National Meeting of Emergency Services Ministers recommending that the Australian Communications Authority review both the Commercial Radio Codes of Practice and Guidelines, and Community Broadcasting Codes of Practice, to ensure they provide necessary guidance and obligations on radio stations during emergencies and in relation to emergency warnings.

Insurance as a preparedness measure

- 13.103 That CFA, in their education and information packages, encourage appropriate insurance cover, and ensure that insurance becomes a part of the householder's annual checklist.
- 13.104 That Government work with the insurance industry to explore options for incentives such as a reduction in premiums for those who take appropriate self-protection measures on their properties, similar to incentives for anti-theft home security.

Planning for fire – an holistic approach

Municipal Fire Prevention Plan

- 14.46 That, following the review of Forest Industry Brigades, the *Country Fire Authority Act 1958* be amended to ensure that the Forest Industry Brigades,

which are acting in an approved manner, have the same powers and rights as other Brigades when attending fires on public land or interstate.

- 14.47 That CFA should not be given the power to direct Forest Industry Brigades to engage in fire prevention and suppression activities off their land and that decision should remain the responsibility of the plantation company.
- 14.57 That CFA and the Plantation Industry jointly develop and agree on Fire Prevention Guidelines for Plantations by June 2004, to be then promoted and distributed by the Industry.
- 14.58 That Municipal Councils:
- Ensure consistent approaches to planning for fire prevention and protection; and
 - Consider existing rights of neighbours in planning development applications.

A new approach to municipal planning

- 14.91 That Government review legislation for utilities operating within the State to ensure their involvement in regional fire preparedness and mitigation planning.
- 14.92 That the *Country Fire Authority Act 1958* be amended to:
- Replace the current Municipal Fire Prevention Plan and the requirement for a Fire Prevention Committee with a Municipal Fire Management Plan, and Municipal Fire Management Committee; and
 - Bring together all stakeholders with an involvement in fire management for both private and public land within the municipality.
- 14.93 That the Victoria Emergency Management Council establish a sub-committee by June 2004 to ensure an all-agency and appropriate industries' policy framework is developed and agreed in respect to the planning for fire prevention, mitigation and suppression.
- 14.94 That the new Municipal Fire Management Plan is informed by the policy directions of the subcommittee of the Victoria Emergency Management Council.
- 14.95 That the Municipal Fire Management Plan amendment includes appropriate provisions for the audit of the plans including:
- Content;
 - Process of development and implementation; and
 - Compliance reporting to the Victoria Emergency Management Council.
- 14.96 That the Government identifies an appropriate body, or bodies, to undertake the audit of the Municipal Fire Management Plans.

Agency preparedness

External influences on fire agencies prior to the 2002–2003 fire season

- 15.11 That DSE and the Department of Primary Industries formalise an agreement by the 2003-2004 fire season documenting the policies, procedures and financial arrangements relating to the availability of Department of Primary Industries staff to be trained and released for fire prevention and suppression activities on public land.
- 15.12 That DSE investigates whether such agreements should exist with other government Departments and agencies, particularly those with officers located in rural Victoria who may be involved in fire response and support operations in the future, based on their expertise and experience.
- 15.13 That DSE commences discussion with the Victorian Work Cover Authority in respect to employer liability for those staff being released to, and directed, by another agency in fire prevention and suppression activities.

Impact of the drought on water availability for firefighting

- 15.23 That Government in the development of its statewide water policy includes appropriate consideration of access to water for firefighting.
- 15.24 That communities, public land managers, Water Authorities and Catchment Management Authorities jointly identify and implement local and environmentally sound solutions to improve the availability of water for firefighting through the Municipal Fire Management Planning process.
- 15.25 That the fire agencies develop contingency plans in relation to access to water for firefighting, including where appropriate, the use of static, large volume water tanks.

Agency resources

- 15.40 That DSE and CFA review selection and training programs for Incident Controllers and Incident Management Team members to ensure that they include all necessary competencies in recognition that technical skills are only one component of the required attributes.

Agreements and memoranda of understanding

- 15.54 That the Statewide Fire Control Priorities:
- Be developed annually by CFA and DSE;
 - Be endorsed by the Victoria Emergency Management Council;
 - Be incorporated into the co-operative agreement between DSE and CFA; and
 - Inform the Fire Control Priorities in the Municipal Fire Management Plans.
- 15.67 That CFA continues to work with its Brigades to complete the integration of AIIMS-ICS with the Group Structure for full implementation by the 2004-2005 fire season.

- 15.76 That the Victorian fire agencies negotiate with their counterparts in New South Wales and South Australia to put in place agreements for mutual aid and the development of cross border strategy for the management of fires burning in the vicinity of, or across, State borders, and these agreements are reviewed annually.
- 15.77 That any local level agreements developed to address geographically specific risks or issues must be consistent with State-level arrangements.

Information management

- 15.87 That Government supports the immediate development of financial models to analyse and determine the appropriate level of investment in fire management planning, preparedness and suppression on public land.
- 15.88 That the financial models incorporate changes in public land use, particularly 'Our Forests Our Future', and the subsequent changes in fire management priorities.
- 15.89 That the financial arrangements incorporate full cost recovery for prescribed burning to be undertaken over a number of weekends utilising Project Firefighters, CFA volunteers and MFESB members.
- 15.90 That Government reviews the funding for DSE for the 2004-2005 fire season to ensure that appropriate resources are available for fire prevention planning and preparedness.

Roads and access tracks

- 15.105 That DSE assesses the environmental and monetary cost of establishment and rehabilitation of temporary tracks, per 100 km, constructed during firefighting operations, and compare this with the recurrent costs of a program of maintaining existing tracks.
- 15.106 That DSE includes the cost of tracks, as above, in the development of financial models to analyse and determine the appropriate level of investment in fire management planning, preparedness and suppression on public land.
- 15.107 That DSE undertake community consultation on policies relating to roads and access tracks on public land, particularly in respect to fire management

C.11.4 Term of reference two: response and recovery

Initial response to the fires

- 17.51 That an appropriately resourced, national aerial firefighting strategy is urgently required, and that the Victorian Government make representations to the Commonwealth to support the Australasian Fire Authorities Council recommendations.

The state's emergency management arrangements in action

Municipal emergency co-ordination

- 18.12 That Incident Control Centres and Municipal Emergency Co-ordination Centres be collocated, wherever practicable.
- 18.13 That DSE and CFA ensure that:
- When a Municipal Emergency Co-ordination Centre is established in response to a fire, an appropriately experienced, trained and briefed officer of the control agency is appointed as liaison between the Municipal Emergency Co-ordination Centre and the Incident Control Centre; and
 - There are appropriate training regimes in place to provide officers with the skills necessary to perform the role of Emergency Services Liaison Officer in the Municipal Emergency Co-ordination Centre.
- 18.14 That DSE and CFA work in co-operation with the Municipal Emergency Response Co-ordinators to develop and conduct joint exercises that practise the skills and test procedures for operations of the Municipal Emergency Co-ordination Centre, Municipal Recovery Centre and Incident Control Centres.

Evacuation

- 18.21 That Victoria Police ensure all police members understand the Victorian legislation in relation to evacuation, and that any decision to recommend evacuation remains with the Incident Controller.

Divisional emergency co-ordination

- 18.30 That existing DSE and CFA regional co-ordination arrangements be reviewed and any changes, such as the continued use of Integrated Multi-Agency Co-ordination Centres, be reflected in the Victorian emergency management arrangements.
- 18.31 That Victoria Police, CFA and DSE review the relationship between fire service regional co-ordination arrangements and Divisional Emergency Response Plans and that any changes be formalised in the emergency management arrangements.

State level co-ordination of emergency response

- 18.42 That a single state-of-the-art all hazards State Emergency Operations Centre be established for Victoria. This could, if necessary, be implemented in stages, initially incorporating DSE, CFA, FESB and the State Aircraft Unit.
- 18.43 That the options of collocating the State Emergency Response Co-ordination Centre with the new State Emergency Operations Centre be explored.
- 18.44 That the State Emergency Operations Centre develop and maintain strong and close links with the State Emergency Response Co-ordination Centre, if collocation is not possible.

Co-operation between agencies

- 18.52 That the *Emergency Management Act 1986* be amended to require the development of agreements that describe joint operational arrangements between emergency response agencies.
- 18.53 That, wherever possible, Incident Management Team members from DSE, CFA and MFESB who are likely to be deployed together to manage fire, should train and exercise together.

Deployment of Metropolitan Fire and Emergency Service Board personnel

- 18.57 That the MFESB continue to give priority to appropriate bushfire training for its firefighters.

Deployment of Victoria State Emergency Service personnel

- 18.61 That VICSES, with the support of the CFA, includes basic fire safety training as one of the competencies for the VICSES Volunteers.

Did the Incident Control System work?

Regional Emergency co-ordination

- 19.6 That the emergency management arrangements be amended to require Police Divisional Emergency Response Co-ordinators, in consultation with other response agencies, to establish and document procedures and structures at regional level in order to ensure there is:
- Effective monitoring of Incident Management Teams;
 - Effective strategic management of resources;
 - Efficient management of information flow within and between agencies, and between the agencies and the community; and
 - Liaison between the control agency and divisional and municipal emergency response co-ordinators.

Structure of Incident Management Teams

- 19.13 That the practice of appointing Deputy Planning Officer, Deputy Operations Officer and Deputy Logistics Officer in an Incident Management Team be abandoned. This recommendation acknowledges the benefits of retaining a Deputy Incident Controller from the support agency (in accordance with section 4.2.6 of the *Emergency Management Manual Victoria*), to ensure that the command structure of that agency is preserved.

Qualifications for Incident Management Team members

- 19.17 That the person appointed by DSE or CFA as Incident Controller for any incident should have formal qualifications and accreditation in the Incident Control System, be fully aware of the Victorian emergency management arrangements and have access to local fire prevention and response planning, including the Municipal Fire Management Plan.

- 19.18 That CFA and DSE provide media training to all Level 2 and Level 3 Incident Controllers.

Incident Control Centres

- 19.23 That in the review of Incident Control Centre locations, DSE and CFA give due consideration to:

- Existing public infrastructure that may provide suitable facilities; and
- Opportunities for collocation with Municipal Emergency Co-ordination Centres.

- 19.24 That DSE and CFA review their joint planning for Incident Control Centres to ensure that, wherever safe and practicable, those Centres are located close to the fire area.

Transferring control from one Incident Control Centre to another

- 19.29 That DSE and CFA develop an agreed process for the effective transfer of control from one Incident Control Centre to another, including processes for communicating this change to fire ground supervisors and local communities.

Development and implementation of fire control strategies

Application of the Fire Control Priorities to incident action planning

- 20.12 That CFA and DSE include agreed Fire Control Priorities in community awareness and education material provided to the community before each fire season.
- 20.13 That the fire agencies ensure that Incident Action Plans developed by Incident Management Teams are consistent with, and built on, the agreed Fire Control Priorities.

Aggressiveness of firefighting

- 20.26 That DSE and CFA continue to stress firefighter safety as their highest priority for incident managers and fire ground supervisors.
- 20.27 That DSE and CFA ensure that agreed strategy and tactics, and the rationale, be communicated to personnel involved in the fire fight and be included in briefings for fire line personnel.
- 20.28 That personnel assigned the roles of Division Commander, Sector Commander and Strike Team Leader on the fire ground are actively encouraged to provide input into the selection of strategies and tactics.
- 20.29 That personnel assigned the roles of Division Commander, Sector Commander and Strike Team Leader be given flexibility to alter tactics to take advantage of changed conditions on the fire ground.

Consistency of strategy

- 20.38 That when Incident Management Teams implement significant changes to objectives and strategies, these are effectively communicated to firefighters,

fire ground supervisors and affected communities, and are incorporated into the broader organisational planning.

- 20.39 That the 'Incident Objectives' established for any response should reflect the endorsed Statewide 'Fire Control Priorities', and the relevant Municipal Fire Management Plan.
- 20.40 That CFA and DSE jointly develop procedures to ensure that a more consistent strategic approach can be maintained at shift and tour of duty changes.

Use of local knowledge

Recommendation 2 from Interim Report

That in preparation for the coming fire season, the CFA:

- Modifies its operational procedures to ensure that local knowledge is flexibly and appropriately incorporated into tactical and strategic fire management.
- Modifies its operational procedures to allow for more flexible management of strike teams.
- Continues to work with its Brigades to complete the integration of AIIMS-ICS with the group structure.

Recommendation 3 from Interim Report

That DSE reviews procedures to ensure that all Incident Controllers and Incident Management Teams have full access to those Departmental, Parks Victoria or appropriately experienced and qualified community members who can provide local knowledge and expertise in the development of fire suppression strategies and that advice from the fire ground is incorporated into decision making.

Information gathering

- 20.54 That DSE and CFA review methods of gathering and processing fire information to ensure all methods are pursued to greatest effect.

Briefings

- 20.61 That DSE and CFA review the standards and protocols for documentation, including mapping, provided to fire line managers as part of their briefing notes, to ensure these are concise and appropriate.
- 20.62 That operational briefings in multi-agency fires should, wherever possible, be joint briefings of all agencies involved.

'No Go Zones'

- 20.67 That DSE and CFA ensure that:
- A clear process is established for determining whether a specific location is, or is no longer, a 'no go zone' or an area into which it is too

dangerous to deploy resources, and that affected communities are advised as soon as possible of the determination, the reasons for such determination and what actions they should take as a result; and

- Where the Incident Management Team, Division Commander, Sector Commander and/or Strike Team Leader identify an area as a 'no go zone' or an area into which it is too dangerous to deploy resources, the reasons for that designation are recorded by the Incident Management Team in the incident log.

Use of bulldozers

- 20.71 That DSE and CFA work co-operatively to review the management and application of bulldozers in fire suppression operations to ensure that they are used effectively, appropriately and are adequately supervised.
- 20.72 That quality control or performance assessments are routinely completed post fire season, to ensure that contractors who have not performed to an agreed standard are not re-engaged for the consequential rehabilitation works.

Other response issues

Keeping track of firefighting resources

- 21.8 That DSE, CFA, MFESB and VICSES work co-operatively to establish a common system for
- resource tracking during major fires and incidents.

Management of firefighting resources in the field

- 21.14 That DSE and CFA review the management of personnel deployed ensuring that:
- Shift changeovers of fire line personnel and fire line supervisors are conducted in such a way that the fire line is not left inappropriately unattended;
 - Management protocols for Strike Teams are made more flexible; and
 - Strike Team Leaders and Task Force Leaders undertake refresher training in the management of resources under their control

Management of privately-owned firefighting resources

- 21.19 That, as a matter of urgency and in consultation with stakeholders, CFA and DSE develop and communicate clear guidelines on how and when privately owned firefighting equipment should be integrated into the fire response.

Firefighting vehicles

- 21.21 That CFA, having regard to terrain, continue to review the mix of firefighting appliances currently in service. In particular, consideration should be given to the number and distribution of smaller 'slip-on' type equipment.

Communications facilities

- 21.31 That DSE and CFA work with the Bureau of Emergency Services Telecommunications to ensure that rural communication issues are appropriately addressed in the Statewide Integrated Public Safety and Communications Strategy, and that priorities and business cases are agreed for critical issues.
- 21.32 That CFA develop protocols to integrate Ultra High Frequency and Citizen Band radios into their communication structures.

Aircraft operations and the State Aircraft Unit

- 22.60 That the joint agencies introduce a system of performance measures for reporting the effectiveness of aircraft in firefighting operations.
- 22.61 That instances where demand for air support outstrips the supply of State Fleet Aircraft available are recorded.
- 22.62 That after each fire season, measures of the effectiveness of aerial firefighting be collated, analysed and used for the assessment of the State Aircraft Fleet composition and the adequacy of Training and Accreditation programs.
- 22.63 That a systematic performance audit of State Aircraft Fleet contractors be conducted jointly by agency and SAU personnel.
- 22.64 That aviation contractors be required to submit a copy of their annual independent regulatory compliance audit prepared for Civil Aviation Safety Authority to the State Aircraft Unit.
- 22.65 That training and competency programs for Incident Controllers should include aircraft firefighting capability training.
- 22.66 That more emphasis should be given to communication and discussion in regard to State Aircraft Unit's roles, responsibilities, practices and procedures.

Communication with the community

The challenge: maintaining communication with all fire-affected communities

- 23.21 That in relation to the provision of information to communities affected by fires and other emergencies, DSE and CFA ensure that:
- Incident Management Teams understand that one of their primary responsibilities, in cooperation with the Municipal Emergency Response Co-ordinator, is to keep the community informed as to where the fire is and its likely path, what is being done to combat the fire and any preparations the community should undertake;
 - Community Information Units are effectively integrated into the Incident Management Teams; and
 - They continue to develop a joint Internet-based communications tool to provide information and advice to both affected and broader communities during fires.

- 23.22 That the model of community engagement developed by DSE and CFA and applied during the 2002-2003 fires is further developed and refined, particularly in regard to short-duration, rapidly escalating incidents.
- 23.23 That relevant Government agencies including Emergency Communications Victoria, the Bureau of Emergency Services Telecommunications and the Victoria Police Media Unit, evaluate the proposals put forward by the Australian Communications Authority with respect to the hearing impaired.

Radio coverage in rural Victoria

- 23.30 That consideration be given to formalising Australian Broadcasting Corporation Local Radio as the official emergency radio station for Victoria, given it is the only radio station that can cover the whole of the State.
- 23.31 That Victoria Police Media Unit co-ordinate work with the Australian Broadcasting Corporation and the emergency service agencies to implement this arrangement.
- 23.32 That CFA and DSE work with Australian Broadcasting Corporation Local Radio to identify black spots, and explore opportunities to further improve coverage for broadcasting emergency information.
- 23.33 That opportunities be explored to use community radio to complement other methods of communication with isolated communities.
- 23.34 That Interstate Agreements prepared by the fire agencies be reviewed to include protocols for the joint release of consistent and appropriate information relating to fires burning across State borders.

Social, business and environmental recovery

Overview of the recovery process

- 24.29 That Municipal Emergency Resource Officers develop registers of volunteers willing and available to provide assistance and support during the response to, and recovery from, emergency incidents.
- 24.30 That DPI actively promote as widely as possible within the community, the agricultural recovery service available during emergencies to ensure that all farmers are aware of the services provided.
- 24.31 That VicRoads and Municipal Councils review procedures and processes to ensure that the identification and delivery of remedial works on State and Council roads following emergency events are as efficient as possible.
- 24.32 That the Victorian Government recommend to the Commonwealth Government that it reviews eligibility for those without employment who may or may not be engaged in an emergency response, and are unable to access the appropriate infrastructure to register for financial assistance.
- 24.33 That Government funding for Community Development Officers engaged in community support and rebuilding incorporates flexible resources to

enable the purchase of services from a range of providers to ensure choice for those requiring support.

- 24.34 That the *Emergency Management Act 1986* be amended to include a provision that, on the recommendation of the Minister for Police and Emergency Services as Co-ordinator-in-Chief of Emergency Management, or of another Minister, the Premier establish a Ministerial Task Force to oversee recovery in situations of extreme natural disaster or other emergency events.

Response and recovery: two sides of the same coin

- 24.47 That recovery is recognised as commencing at the same time as response and that recovery planning and delivery is an integral part of the operations of the Municipal Emergency Co-ordination Centres.
- 24.48 That all Departments, statutory authorities, utility providers and Local Governments be made aware of the need to develop contingency plans for recovery activities, and that such plans, and the associated public education and information strategies, are included in the Municipal Emergency Management Plans.
- 24.49 That all agencies engaged in recovery participate in community briefings prior to and during emergency events, to ensure recovery issues are reinforced and communities are informed of the processes established to assist individuals – including matters that are not the responsibility of Victoria, such as Centrelink payments.

Relief and recovery – predictable, equitable, consistent

- 24.67 That Government review the emergency relief and financial assistance policy, and develop and communicate a predictable, consistent and equitable policy designed to assist the community to recover from emergencies, including natural disasters.

A case management approach to recovery

- 24.76 That DHS, in conjunction with Local Government, Government departments and the non government sector, modify recovery planning at all levels to include a case management approach supported by an appropriate information system to be activated at the time of an emergency.
- 24.77 That the Privacy Commissioner be asked for advice in the development of this model.
- 24.78 That the State Emergency Recovery Committee explore opportunities to establish a ‘one-stop-shop’ approach wherever practicable following emergencies, including a single telephone number to connect a person to all agencies involved in the recovery process.

Recommendation 4 from Interim Report

That Government initiates a review of the fencing policy for boundary and internal fences damaged as a result of a fire.

Recommendation 5 from Interim Report

That Government develops a consistent policy for the rehabilitation/restoration of private assets damaged or consumed in authorised fire suppression activity.

C.11.5 The way forward

The way forward: planning

The balance between prevention/mitigation and response for public land

- 25.23 That DSE, with adequate resourcing, moves to a 12-month cycle of fire management to establish and maintain a more appropriate and balanced work program of prevention/mitigation and suppression.
- 25.24 When the research into prescribed burning and optimum fire protection described in Chapter 11, and the financial analysis of appropriate funding levels for prevention and suppression recommended in Chapter 15, are completed, DSE should develop a business case with Department of Treasury and Finance for assured funding to an agreed level over a three-year rolling cycle.

Managing information

- 25.37 That all emergency service agencies, CFA and DSE in particular, give greater priority to information management – especially the collection, maintenance and quality control of base data sets necessary for planning, operations and program evaluation.
- 25.38 That Government acknowledge the importance of spatial information as a key element of planning, operations and program evaluation, and support the Geospatial Emergency Information Network as a means of ensuring integrated and co-ordinated information management on a whole-of-Government basis.

Model of fire cover – ‘Fire Safety Victoria’ strategy

- 25.55 That Government confirms that the Model of Fire Cover/Fire Safety Victoria strategy should be a seamless model for the whole of the State and include both private and public land.
- 25.56 That DSE commits appropriate resources to work with OESC in developing the bushfire component of the model.

Planning for emergencies at the local level

- 25.88 That CFA, DSE, MFESB, VICSES, Victoria Police and OESC, in consultation with the Municipal Association of Victoria, consult on the proposal to

combine Municipal Councils' current responsibilities for the development of an emergency management plan/committee, as required by the Emergency Management Act 1986 and a fire prevention plan/committee as required by the Country Fire Authority Act 1958.

- 25.89 That this group reports to the Minister for Police and Emergency Services on proposed legislative amendments to the Emergency Management Act 1986, the Country Fire Authority Act 1958 and any associated legislation by June 2004.
- 25.90 That CFA, DSE and MFESB continue to develop the partnership approach for fire safety with Local Government, industry and communities.

Human resources

- 25.114 That, as a matter of urgency, CFA and DSE:
- Develop strategies to provide adequate and sustainable firefighting resources, suitably trained and experienced; and
 - Advise Government of these strategies.
- 25.115 That all fire agencies include a formal mentoring scheme as part of their workforce development programs; and that consideration be given to the use of suitably competent and experienced individuals (such as retired staff), to act as coaches or mentors with inexperienced Incident Controllers.
- 25.116 That CFA, VICSES and other volunteer-based emergency service organisations develop proposals in support of the strategies for sustainable volunteerism, and that the State Government advocate these initiatives to the Federal Government

The way forward: unified command and control

Response to the CFA proposal

- 26.52 That CFA, DSE, MFESB and Victoria Police jointly develop a unified command and control system that better integrates with the State's emergency management arrangements, and that this be endorsed by the Victoria Emergency Management Council by July 2004.
- 26.53 That this unified system include recommendations for the appointment of one person or agency to be responsible for overall control of fire suppression activity in country Victoria, including for any legislative reform considered necessary.
- 26.54 That a State Emergency Operations Centre be established to replace the existing separate fire agency centres. This could, if necessary, be initially confined to being a State Fire Operations Centre as recommended in Chapter 18, Part D.
- 26.55 That the Review of emergency operations centres by the Departments of Premier and Cabinet and Treasury and Finance and the Office of the Emergency Services Commissioner:

- Explore opportunities to significantly reduce the number of regional emergency operations centres; and
- Evaluate opportunities to pre plan and establish ‘all hazards–all agencies’ emergency operations centres at the regional or district level.

26.56 That in doing so, this Review must consult with the agencies mentioned above, and others such as VICSES and the Departments of Human Services and Primary Industries.

26.57 That the Fire Management Branch of DSE be prescribed as an ‘emergency service agency’ for the purposes of s21C (1)(a) of the Emergency Management Act 1986.

26.58 That the fire agencies develop a program to significantly increase the amount of joint training and exercises undertaken.

Conclusion

26.64 That OESC work with the fire agencies in developing implementation strategies for recommendations agreed by Government.

C.12 Inquiry into the Operational Response to the January 2003 Bushfires in the ACT¹¹

C.12.1 Summary of recommendations

Fuel management

1. The ACT Bushfire Fuel Management Plan should be reviewed in the light of changed circumstances since the January 2003 fires. Increased emphasis should be given to controlled burning as a fuel-reduction strategy.
2. The Victorian Code of Practice for Fire Management on Public Land should be used as a 'best-practice' guide when revising the ACT Bushfire Fuel Management Plan and a similar set of priorities should be developed in relation to zones identified in the Plan.
3. An addendum to the existing 2002–04 Bushfire Fuel Management Plan needs to be prepared prior to the 2003–04 bushfire season, noting the extensive consultation process required under the *Bushfire Act 1936*. This addendum should focus on the area unaffected by the 2003 fires and the buffer zone surrounding Canberra's exposed northern and western perimeter. The addendum should be submitted to government for approval.
4. An annual audit of achievements under the Bushfire Fuel Management Plan should be conducted, with the results reported to government and published.
5. A public information strategy should be prepared to educate the ACT community about the beneficial and protective aspects of fuel-reduction burning and about the degree of inconvenience that will inevitably result for ACT residents during such burning. This should accompany the public launch of the revised Bushfire Fuel Management Plan.
6. The approval process for individual fuel-reduction burns that are consistent with the government-approved Bushfire Fuel Management Plan should be simplified so as to enable the limited time when the weather conditions are right to be used to maximum advantage.

Fire access

7. Clear policy guidelines should be developed and implemented to support the identification of a strategic network of fire tracks and trails and their establishment and maintenance. An audit process should be instituted to ensure that the policy's effectiveness is regularly monitored.
8. A risk assessment should be conducted by ESB to assist in determining access needs across the ACT, linked to interstate requirements, with advice being provided to land managers.

¹¹ McLeod, R 2003, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, ACT Government, Canberra.

9. ESB should coordinate the development of emergency management mapping products such as 'map books' for police, land managers, emergency service crews and incident management teams; these should be produced in both printed and data form.
10. Greater opportunity should be provided for all senior firefighters to become more familiar with remote areas of the ACT.
11. Sufficient funding should be provided for additional crews and plant, so that a program of improved fire access and trail and site maintenance can be implemented.
12. Responsibility for fire access should lie with the land managers: advice and auditing functions should be the province of the fire authorities.

Aerial operations

13. Aerial bombing should remain a capability used in the ACT during bushfires, with particular emphasis on using the aircraft for water bombing as an immediate response – as soon as fires are detected. This should be backed up by the use of ground crews.
14. A small number of ACT firefighters should be trained as air attack supervisors, to provide a capability when the number of aircraft involved requires it.
15. To enhance its initial attack capability as well as to provide it with greater flexibility in the utilisation of aerial assets, the ACT should employ a medium lift helicopter, rather than a dedicated light helicopter, to support its fire suppression operations during the peak of future bushfire seasons. Such an aircraft, coupled with the potential use of the Snowy Hydro Southcare helicopter (when it is not engaged for medivac purposes), would provide greater flexibility and a far more formidable first-strike capability.
16. The ACT Bushfire Service should seek a joint agreement with the NSW Rural Fire Service, for the purpose of providing the ACT with enhanced capacity to draw on the aerial expertise, aircraft availability and efficiencies afforded by a much larger bushfire service.
17. The ACT Bushfire Service should explore conducting a joint trial with the NSW Rural Fire Service to assess the effectiveness of retardant bombing.
18. The ACT should continue to participate in Commonwealth-level discussions that may result in enhanced aerial support for firefighting becoming available on a national basis in the future. The Emergency Service Bureau headquarters facility
19. The ACT Government should take urgent steps to upgrade the Emergency Services Bureau's operational command and control facilities – either by carrying out a major refurbishment of the existing facility at Curtin or, preferably, by locating to a more suitable alternative site, where a more functional, longer term operations centre can be developed.

Incident command and control

20. The ACT Bushfire Service should review the current Incident Control System arrangements, through an inter-agency workshop involving ESB, the ACT Fire Brigade, the Department of Urban Services and ACT Policing, to better clarify the application of the system. In particular, incident controllers should not be expected to operate when separated from their supporting elements; they should function as part of a cohesive, integrated management team.
21. ESB should establish joint ICS teams, made up of ACT Bushfire Service, ACT Fire Brigade and Department of Urban Services personnel, to jointly manage emergency incidents within the ACT, regardless of location or the services' areas of responsibility.
22. Facilities at ESB headquarters should be such as to provide the best opportunity for the ICS to function at a tactical and strategic level in accordance with the Australasian Fire Authorities Council doctrine.

Vehicles and other equipment

23. Four rural pumpers should be added to the fire service fleet, specifically for use in the urban-rural interface.

The Rural Fire Control Manual

24. Work already begun on the review of the *Rural Fire Control Manual* should be resumed with the view to replacing the manual by new publications that cover the following:
 - a document detailing public policy in relation to fire management
 - an operational policy manual for internal use
 - a supporting set of standing operational procedures covering techniques and practices reflected in the Basic Training Modules publications.

Training and development

25. In conjunction with the land management agencies, ESB should undertake a review of training and development needs for personnel involved in fire fighting activities and develop a detailed future plan, identifying any additional funds required to support such a program. The plan should be submitted to government for consideration as soon as possible. It should take account of the comments and recommendations in this report that bear on training and development, including the need for secondments interstate with other fire authorities.
26. The Government should consider the proposals when they are submitted with the view to allocating some additional funding to enable the bushfire authorities to improve the training and professional development opportunities available to paid and volunteer personnel, in the interests of increasing their skill base and experience.

27. An outdoor training complex for all of the emergency service organisations should be provided; ESB should develop a detailed proposal for submission to government for consideration.

Occupational health and safety

28. A procedure should be adopted whereby important operational decisions affecting the safety of firefighters are discussed with a more senior officer before implementation, whenever this approach is feasible.
29. The responsible Minister should clarify the application of the ACT *Occupational Health and Safety Act 1989* to volunteers by issuing a ministerial directive.
30. Upon the Minister's directive coming into force, a legislative amendment should be made to continue the application of the protections against prosecution afforded under the *Bushfire Act 1936*.

Relationship between the fire management and land management agencies

31. The Chief Executives of the Department of Urban Services and the Department of Justice and Community Safety should work together to develop the means by which the public land managers and the ACT Bushfire Service can achieve a stronger, mutually supportive relationship.
32. Operational procedures should be amended once additional land management resources are in place, to reflect the responsibility of land managers to initiate the first response to fires on land that they manage – within the overall operational response of the ACT Bushfire Service.
Commonwealth and interstate contributions
33. An automatic weather station should be located in the Brindabella Range to assist with fire weather forecasting.

Scaling-up

34. The current discussions aimed at developing a possible memorandum of understanding between the ACT Bushfire Service and the NSW Rural Fire Service should proceed as a matter of urgency.
35. The ACT should initiate discussions with New South Wales authorities in relation to ways in which the current relationships could be developed at a regional level, with the aim of strengthening the linkages between kindred agencies and identifying how the resources available in the ACT and the surrounding regions could be more easily mobilised in serious emergency situations – to the advantage of both jurisdictions.
36. The level of resources for the training and operational exercising of volunteer bushfire and emergency service personnel should be increased, to improve current skill and experience levels.
37. Environment ACT and ACT Forests should employ additional summer personnel as firefighters and fire prevention workers to improve the ACT's

firefighting capability, particularly in terms of rapid deployment to fires in remote areas.

38. These staff should provide land management agencies with a capability to be first responders to fires on land they manage.

Public education

39. ESB should be allocated additional resources so that it can upgrade its public education capability to support a stronger, continuing campaign of public education directed at improving the Canberra community's bushfire awareness, its understanding of the nature of the threat, and its knowledge of how people can better protect themselves and their properties. The campaign should draw on the public education experience of interstate bushfire authorities, particularly the Country Fire Authority of Victoria.
40. Initiatives such as fire guard and other forms of direct community support should be introduced to encourage self-help arrangements in the community.
41. The message to the community should include acknowledgment that in major bushfire emergencies:
 - the authorities are unable to guarantee that firefighters will always be available to assist
 - householders generally need to take sensible precautions and be prepared, if that is their choice, to protect their own lives and properties
 - the authorities are committed to doing all they can to help, including advising the community on how best to go about achieving a higher degree of personal and household self-reliance.

Public information

42. The Media Sub-Plan of the ACT Emergency Plan should be reviewed to include a greater focus on the provision of community information.
43. Well-defined, well-practised processes should be developed to support the delivery of information to the public. This includes improving the alert mechanisms for residents prior to an emerging danger period.
44. Media communications systems and facilities at ESB headquarters should be improved.
45. There should be greater coordination of the content of whole-of-government media releases and messages.
46. Back-up power should be available for the Canberra Connect call centre.
47. The Community Information Sub-Plan of the ACT Emergency Plan should be reviewed to reflect needs broader than just media arrangements.

48. The role Canberra Connect has demonstrated it can play should be included as a part of a revised Media Sub-Plan of the ACT Emergency Plan.
49. Before each bushfire season familiarisation briefing sessions should be held for the media.
50. ESB should have the capacity to engage an experienced media director to be available in an emergency, to coordinate the provision of information to the media and for general public information purposes.

Evacuate or stay?

51. ACT Policing and the Emergency Services Bureau should develop as a matter of urgency – and before the start of the 2003–04 bushfire season – a joint protocol covering their policy on community safety and evacuation during bushfires, having regard to the framework adopted by the Australasian Fire Authorities Council and the evacuation provisions in the Victorian Country Fire Authority Act. The protocol should be promulgated widely as part of future community education and information programs, and it should be incorporated in the training and operational procedures of both services, so that it is followed consistently during future bushfire events.

Forestry settlements

52. A sub-plan of the ACT Emergency Plan should be developed to assist with the design of special arrangements to cater for the needs of ACT residents who live beyond the city bounds. A more unified and independent emergency services organisation
53. The separate organisations that make up the emergency services group that is coordinated by the Emergency Services Bureau, and the associated arrangements, should be replaced by a statutory authority, the ACT

Emergency Services Authority

54. The proposed authority should be headed by a Chief Executive Officer.
55. The position of Chief Executive Officer should be advertised and filled on a contract basis before the enactment of the legislation. In this way the person appointed can contribute to formulating the legislation and the transition process can begin without delay.
56. Upon the abolition of the Emergency Services Bureau, a small policy formulation unit should be established in the department that supports the Minister responsible for emergency management.

The Emergency Management Act

57. The ACT's *Emergency Management Act 1999* should be reviewed with the aim of preparing legislation that provides as follows:

- In a declared state of emergency, the ACT Government should have the capacity to appoint as Territory Controller a person who is considered to be best qualified to take this role, having regard to the nature of the emergency or event giving rise to the declaration.
- The Controller shall have the capacity to delegate to a nominated person any or all of the powers that have been assigned under the instrument of appointment as Controller.
- The chair of the Emergency Management Committee shall be appointed by the Minister responsible for the administration of the Emergency Management Act.
- There should be a capacity for different levels of special powers and the capacity for escalation to be invoked to assist in the management of emergencies, having regard to the differing scales or types of emergencies that may arise or the changing nature of an emergency during its course.

The Bushfire Act and other legislation

58. The *Bushfire Act 1936* should be reviewed and redesigned to reflect contemporary needs, and the ACT Bush Fire Council's role should be re-expressed in the Act to more accurately describe its current activity.

Bushfires and land planning

59. A fire-abatement zone should be defined between the north-west and western perimeter of Canberra and the Murrumbidgee River and the foothills of the Brindabella Range.
60. A set of Bushfire Protection Planning Principles in relation to fire mitigation and suppression should be adopted and applied to future developments in the designated abatement zone.
61. The abatement zone should be declared a bushfire-prone area, and the requirements of the Building Code of Australia – in particular, its standards for bushfire-prone areas – should be applied to all future developments in the zone.

C.13 A Nation Charred: Inquiry into the Recent Australian Bushfires¹²

C.13.1 Recommendations

Land management factors contributing to the severity of recent bushfire damage

Recommendation 1

The Committee recommends that the Bushfire Cooperative Research Centre establish, as part of its program to implement a single fuel classification system, a national database that provides information on current levels and rates of accumulation of fuel loads that takes into account vegetation type and climate across all tenures of land, including private land where data is available.

Recommendation 2

The Committee recommends that the Commonwealth through the Council of Australian Governments ensure that states and territories have adequate controls to ensure that local governments implement required fuel management standards on private property and land under their control.

Recommendation 3

The Committee recommends that the Bushfire Cooperative Research Centre establish, as part of its program to implement a single fuel classification system, standards which take into account local conditions including topography and vegetation type, for determining appropriate dimensions for asset protection zones.

Recommendation 4

The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments resolve when asset protection zones will be located on private land and when on public land and gain assurances that adequate maintenance of zones will be enforced.

Recommendation 5

The Committee recommends that the Bushfire Cooperative Research Centre determine a minimum national standard, taking into account topography and vegetation type, for adequate access to all public lands including wilderness areas of national parks for the purpose of effective fire prevention and suppression.

Recommendation 6

The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments implements to a minimum national standard adequate access to all public lands including wilderness areas of national parks.

¹² House of Representatives Select Committee on the Recent Australian Bushfires 2003, *A Nation Charred: Inquiry into the Recent Australian Bushfires*, HRSCRAB, Canberra.

Recommendation 7

The Committee recommends that the Commonwealth through the National Heritage Trust assist the states and territories in the construction, maintenance and signage of fire trail networks.

Recommendation 8

The Committee recommends that the Bushfire Cooperative Research Centre establish a minimum national standard that is common across all tenures of land for water access and availability for bushfire fighting.

Recommendation 9

The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments resolve to increase water access points for bushfire fighting on public land to the minimum national standard.

Recommendation 10

The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments initiate consideration of the relaxation of restrictions on the movement of fire fighting equipment during declared emergencies.

Recommendation 11

The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments implements arrangements in which greater flexibility is devolved to local brigade captains in the issuing of permits to burn for fuel reduction and other purposes in the context of local fire management plans.

Fuel reduction and fire management

Recommendation 12

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

Recommendation 13

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

Recommendation 14

The Committee recommends that, as part of its study into improving the effectiveness of prescribed burning, the Bushfire Cooperative Research Centre establish a national database that includes areas targeted for fuel reduction, the area of fuel reduction achieved based on a specified standard of on ground

verification and the season in which the reduction was achieved. The Committee also recommends that in developing this database the Cooperative Research Centre develop a national standard of fire mapping, which accurately maps the extent, intensity, spread and overall pattern of prescribed and wildfires in Australia.

Recommendation 15

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

Recommendation 16

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

Recommendation 17

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

Recommendation 18

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

Recommendation 19

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

The approach to the 2003 fires – delays and caution

Recommendation 20

The Committee recommends that the Commonwealth work with the states and territories through the proposed Council of Australian Governments to review the response to bushfires to ensure that principles of fire prevention and rapid and effective initial attack are adopted and implemented by all rural fire authorities and public land managers

Recommendation 21

The Committee recommends that the Commonwealth seeks to ensure that the proposed Council of Australian Governments review of the bushfire management initiate with the states, as a priority, a review of the responsibilities and potential liabilities of fire controllers with a view to developing principles of indemnification for reasonable, responsible and informed decision making. This review should extend to defining responsibility for occupational health and safety requirements in a way which allows practicable compliance where a reasonable degree of risk

taking is urgently required to prevent the loss of life, property and environmental amenity from wildfire

Recommendation 22

The Committee recommends that the Commonwealth Attorney-General engage the Commonwealth, states and territories in a review of occupational health and safety legislation as it affects the proper and effective functioning of bush fire services.

Management and coordination of fire suppression

Recommendation 23

The Committee recommends that the Commonwealth, through the Council of Australian Governments and the Australasian Fire Authorities Council, initiate an overhaul of the incident management systems used by bush fire agencies in Australia to better incorporate local knowledge and expertise and better understanding of the needs and circumstances of local rural communities in the management of major fire events. The Committee also recommends that this overhaul should aim to:

- refine the system to facilitate setting up simple command and control structures, closer to the fire ground, in tune with the ever changing local fire ground conditions and needs of local communities;
- include training of incident management personnel on how to engage and involve local people in planning and management of fires.
- establish national models for community fire planning and provide for the integration of community fire plans into incident management; and
- include national reporting of the success of incident management of fires as a means of auditing the cost effectiveness or incident operations.

Recommendation 24

The Committee recommends that the state and territory bushfire agencies ensure that, on a district basis, communications are addressed within the district operations plans and that the plans are capable of easy adoption to incident action plans.

Recommendation 25

The Committee recommends that the Commonwealth seek to ensure that the Council of Australian Governments seek the adoption by all states and territories of multi-agency protocols and agreements for fire management, similar to those in force in Tasmania.

Recommendation 26

The Committee recommends that Emergency Management Australia initiate a process involving Australasian Fire Authorities Council and the Australian Assembly of Volunteer Fire Brigades Association to review the coordination of cross border fire fighting arrangements and interstate deployment of fire fighting resources. The review should specifically consider training on the full range of equipment and procedures likely to be encountered, standardisation of equipment

and procedures, communication and the provision of information about local characteristics such as access to water.

Fire fighting resources and technology

Recommendation 27

The Committee recommends that

- the Commonwealth implement a program similar to the Army Reservist Employer Support Program for the re-imburement of costs incurred by employers of volunteer fire fighters when attending bush fires for a period exceeding five days in any month; and
- the Commonwealth consult with the states and territories through Council of Australian Governments to develop a range of measures related to local government rates, state government charges and
- insurance costs to provide rebates for registered volunteer firefighters.
- the Commonwealth consider the feasibility of taxation relief on costs incurred by registered fire fighting volunteers in the line of duty.

Recommendation 28

The Committee recommends that the Commonwealth Government work with Australasian Fire Authorities Council to review the insurance cover provided to volunteer fire fighters in all states and territories and ensure that cover is adequate for loss of life or injury and related loss of income and property lost in the line of duty.

Recommendation 29

The Committee recommends that the Commonwealth should commit funding for aerial fire fighting beyond the 2003-04 season on the proviso that the Australasian Fire Authorities Council and the state and territory governments make a commitment to:

- Rapid initial attack of all wildfires during the bush fire season regardless of tenure.
- Deployment on long term contracts of a mix of aircraft, including fixed wing.
- Deployment of aircraft on a nationally coordinated risk analysis basis to be updated as each fire season unfolds.
- Provision of nationally coordinated full ground support.
- Development of training arrangements for air crews, ground support crews, incident management teams and fire fighters to a national standard.
- Development of systems of effective aerial control of fire bombing operations.

Recommendation 30

The Committee recommends that in changing the incident management systems as proposed in recommendation 23 above all bush fire agencies review concerns about difficulties in communicating operational information from the fire front to air operations.

Recommendation 31

The Committee recommends that Geoscience Australia take responsibility, in conjunction with Emergency Management Australia, for developing a national spatial data policy to coordinate the development of data systems, the collection of data and the sharing of data between all the emergency response agencies across Australia, and that both agencies participate in the development and delivery of spatial information systems as part of a national approach to emergency planning and management data. The first priority in policy development and of systems should be related to bushfire hazards.

Recommendation 32

The Committee recommends that Emergency Management Australia be required to participate in the development and delivery of spatial information systems as part of a national approach to emergency planning and management data. The first priority in policy development and of systems should be related to bushfire hazards.

Recommendation 33

The Committee recommends that the 1:100,000 national mapping program be accelerated to achieve an average life of no greater than 10 years with priority given to those areas most susceptible to national disasters.

Recommendation 34

The Committee recommends that Emergency Management Australia and the Australian Communications Authority jointly with the Australasian Fire Authorities Council:

- Initiate an urgent review on a district basis, of the suitability of the current allocated radio spectrum to ensure that as far as possible, fire fighter safety is not being compromised through inadequate communications.
- Commit to the development, in conjunction with representative bodies of all emergency services, to a National Strategic Radio System.
- That the coordination of the deliberations be assigned to Emergency Management Australia.

Recommendation 35

The Committee recommends that:

- As a short term objective, the use of '40' channel UHF CB equipment be adopted for coordination and interoperability of communications at fire ground level.

- As a longer term objective a national communications plan be developed and incorporate the provision of low powered VHF channel allocations for the purpose of ensuring compatible fire ground communications between all agencies on a national basis.
- That the use of UHF CB between units on the fire ground be included in communications planning for intra-state and interstate deployments.

Recommendation 36

The Committee recommends that Emergency Management Australia and the Australian Communications Authority work with state and territory bush fire authorities to ensure that that district communication plans have regard for the amount of radio traffic that may be generated under the most severe conditions.

Recommendation 37

The Committee recommends that Emergency Management Australia work through the Australasian Fire Authorities Council to ensure that:

- A greater emphasis be placed on pre-incident and incident preparation of communication plans as a means of ensuring effective interoperability between agencies at command and tactical levels.
- That the speed of transfer of operational information between agencies at command level be regularly monitored to ensure that operational objectives are not being compromised.

Recommendation 38

The Committee recommends that Emergency Management Australia and the Australian Communications Authority, in conjunction with the respective state and territory governments, ensure the survivability of essential communication installations during fire incidents by strategic fuel management around the assets.

Recommendation 39

The Committee recommends that the Commonwealth investigate, and where necessary, require the urgent enhancement of the provision of emergency power and telecommunications services for the purpose of restoring essential services expeditiously in areas affected by fire or other natural disaster and where necessary to place licence requirements on telecommunication providers to do so.

Recommendation 40

The Committee recommends that, for the purpose of communications for the police, ambulance and fire brigades, any rental costs associated with the use of radio sites under the care, control or management of the Commonwealth, state, territory or local government be waived, other than for the ongoing cost associated with the use of power at the site.

Recommendation 41

The Committee recommends that Emergency Management Australia request the Australasian Fire Authorities Council to:

- Determine protocols and standards on a national basis for the adoption and implementation of mobile data services by all fire fighting agencies with a view to ensuring national compatibility.
- Consider the development of a 'closed user group', utilising satellite telephony, as an interim measure for achieving interoperability between member agencies on a national level.

Fire protection

Recommendation 42

The Committee strongly recommends that the New South Wales, Victorian and Tasmanian Governments abolish the Fire Levy tax they impose on home and business insurance premiums (wherever applicable), making it payable through household rates instead. Any cost savings gained by the insurance industry through relief from collecting Fire Levies should be passed on to policyholders through reduced premiums. At the same time the Committee urges the Insurance Council of Australia to run ongoing education campaigns to increase public awareness on bushfire preparedness, including the need for insurance.

Recommendation 43

The Committee recommends that taxes on insurance premiums be calculated only on the premium in order to eliminate the current cascading cost.

Recommendation 44

The Committee suggests that registered volunteer fire fighters be exempt from paying Fire Levy tax to help offset some of the expense they incur during active duty. The exemption could be for a period of 12 months following each bushfire season in which they are proven to have fought fires.

Recommendation 45

The Committee recommends that the Insurance Council of Australia coordinates a public education campaign aimed at illustrating the importance of asset protection and how this can be achieved (that is, insurance products).

Recommendation 46

The Committee recommends that insurance companies ensure that potential and existing policyholders are aware of the need to regularly review their insurance policies to prevent undervaluing. This could be done through renewal notices and quarterly reminders. This should include a list of bushfire risk reduction measures that policyholders can implement to decrease the cost of their premium.

Recommendation 47

The Committee recommends that Standards Australia incorporate building maintenance into AS3959-1999: Construction of buildings in Bushfire Prone Areas, perhaps renaming it as AS3959-1999: Construction and maintenance of buildings in Bushfire Prone Areas.

Recommendation 48

The Committee recommends that state and territory governments be required to regularly performs risk assessments to the land within their jurisdictions to ensure

that bushfire prone areas are accurately identified and can be appropriately managed. This should include possibly prohibiting, or at least limiting, reticulated development in these areas. If building is effectively prohibited on land previously zoned for residential or commercial building, state and territory governments, in conjunction with local councils, should adequately compensate the affected landholders.

Recommendation 49

The Committee recommends that Standards Australia review the clarity of AS3959-1999: Construction of buildings in Bushfire Prone Areas to ensure that all relevant stakeholders can interpret and apply the Standard in the way it is intended.

Recommendation 50

The Committee recommends that Program D of the Commonwealth Bushfire Cooperative Research Centre examines the (pending) outcome of the ABCB's review of the existing Building Code of Australia bushfire provisions (including Standard AS3959-1999) to determine their adequacy and the ways in which compliance can be better managed. This should include extending its scope to cover existing buildings and those that are not in areas declared as bushfire prone, yet still on the urban rural interface and therefore, potentially at risk.

Recommendation 51

The Committee recommends that (under Programs C and E) the Bushfire Cooperative Research Centre considers the following items as part of a national education program.

- Introducing bushfire skills training to schools and libraries. Training various categories of emergency services personnel on their specific role in the event of a bushfire.
- Ensuring that those in the fields of building, engineering, urban planning, forestry and science have a clear understanding of bushfire risk management including current related regulatory codes and legislation.
- Counselling prospective land developers in bushfire prone areas on the risks and necessary protective planning.
- Running adult education courses on protective planning (including insurance, building design and maintenance and defence techniques) in the context of bushfires.
- Broadcasting protective planning issues through the media, television, Internet, radio and publications.
- Structuring the community into groups and providing them with guidelines for launching an initial attack on a bushfire.
- Enclosing brochures about bushfire protection with rates notices.
- Having a Bushfire Awareness and Preparedness Day (similar to Clean Up Australia Day) where the community is encouraged to undertake risk

reduction with local governments coordinating the disposal of hazardous material.

Recommendation 52

The Committee recommends that the Australasian Fire Authorities Council's suggested evacuation protocol be adopted by all of the Australian States and Territories.

Recommendation 53

The Committee recommends that the Commonwealth Bushfire Cooperative Research Centre's research and recommend property protection products and programs under Program D.

Recommendation 54

Further to recommendation 21 in chapter 4, the Committee recommends that the Commonwealth seeks to ensure that the proposed Council of Australian Governments review of the bushfire management, initiate with the states and territories, as a priority, a review of the duty of care of public and private landowners and their potential liability. This should be done with a view to developing clear and consistent principles that cover (but are not limited to) the following:

- Timely replacement/ repair of loss/damage (including to fences) resulting from fire fighting operations, suppression activities or wildfires.
- The liability of councils that imprudently approve the sale of land.
- The responsibilities and potential liabilities of fire controllers with a view to developing principles of indemnification for reasonable, responsible and informed decision making (including occupational health and safety).

Future directions for the Commonwealth: toward a national bushfire policy

Recommendation 55

The Committee recommends that the functions and administration of Emergency Management Australia be reviewed to develop an organisation that is proactive and involved in the development and implementation of national policy on emergency response.

Recommendation 56

The Committee recommends in acknowledgement of the expertise that the Commonwealth can bring to the Australasian Fire Authorities Council and of funding already supplied to the Council for the development of a National Aerial Firefighting Strategy, that the current status of Emergency Management Australia on AFAC as an associate member be upgraded to full membership and that full membership also be extended to the Department of Defence.

Recommendation 57

The Committee recommends that the Department of Transport and Regional Services review its record keeping practices to show the type of emergency for which assistance is provided through the Natural Disaster Relief Arrangements.

Recommendation 58

The Committee recommends that the Commonwealth require state and territory governments to have in place comprehensive bush fire management plans as a prerequisite for accessing funding from the National Heritage Trust and like programs.

Recommendation 59

The Committee recommends that Program E of the Bushfire Cooperative Centre, which is tasked with the development of the next generation of fire researchers and dissemination of the Centre's work, be tasked further to collect and respond to feedback, particularly from the on ground volunteer levels of fire brigades, on the practicality of its outputs and their future requirements.

Appendix D Fire history in Australia

This appendix summarises the available information on major bushfire events in each state and territory as far back as records allow. There are many inconsistencies and gaps in the available information because there are no nationally agreed criteria for defining a 'significant fire year' or a 'major fire event'. The available information shows the following:

- Major fire events are a periodic feature in all states and territories.
- The areas of land that are affected by fire continue to be significant.
- There have been 59 recorded bushfire events where there has been loss of life, with a positive trend being the significant decline in the loss of life from bushfires in the last 20 years.
- There have been 24 fire events resulting in major stock losses (defined as more than 1000 head).
- There have been 21 fire events resulting in large-scale loss of houses (defined as more than 50 houses).

Table D.1 Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
Northern Territory				
1968–1969		40 000 000		Killarney – Top Springs
1969–1970		45 000 000		Dry River – Victoria River fire
1974–1975		45 000 000		Barkly Tableland, Victoria River district, near Newcastle Waters
2002		38 000 000		
Queensland				
1917	3			Large fires near Hughenden, followed by a fire on Warenda Station
1918 October	2		>100 000 sheep	Fires spread over a huge area from Charleville to Blackall, Barcaldine, Hughenden
1918 October	5			Saltern Creek
1926			Forests, farms, sugar cane, banana plantations and dwellings	South-east corner of Queensland
1940		80 000		Goomeri
1941 July, August		120 000		Julia Creek and Barkly Tableland, Richmond and Cunnamulla
1941 September				Tangorin, Winton, St George, Dalby, Julia Creek, Muttaborra, Longreach
1943		45 000		Dirranbandi
1950 December		49 000	Mostly pasture	Wyandra, Charleville, Adavale, Langlo, Quilpie, Augathella, Cunnamulla, Thargomindah
1951 January, February		2 834 000	40 000 sheep, 550 stock, 650km fencing	Charleville

Table D.1 (cont'd) Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1951–52 season			£2 million (1952 values) in stock and fencing	This was regarded as a bad fire season throughout the state
1954 November	3			Narollah Station, Hughenden area
1964–65 season		92 000	Cypress pine, grazing land, hardwood forest	Roundstone, Dunmore, Fraser Island, Toolara – Tin Can Bay, Badderam Holding
1965 November		97 940		Nara Holding (Croydon district)
1972–73 season		2000	100 cattle	Arcadia Valley
1974 October to 1975 February		7 300 000	95 cattle, 6850 sheep	Thargomindah, Bulloo Shire, Boulia Urandangie, McKinlay Shire
1976 May–December		1 891 600	5km fencing, 5968 sheep, 32 properties, cypress pine forests	Julia Creek, Coalbrook Station, Hughenden, South Burnett, Nanango and Brisbane Valley, Inglewood–Millmerran
1979		421 400	41 000 sheep, 400 cattle	Julia Creek, McKinlay Shire
1990–91 season	3			Two children killed in a fire in Tambo; Bald Knob, Landsborough, Mapleton, Palmwoods (Sunshine Coast hinterland)
1991–92 season	1		3 houses	Mt Tamborine (Gold Coast hinterland)
1992–93 season		40 000	4 houses, several vehicles	Coominya rural residential area near Esk
1994 September–November		5000	Plantation timber (\$35 million)	Beerburrum State Forest
1995 September–November		333 000	9 volunteers severely injured, 23 houses, 93 buildings, fences, livestock	South-east Queensland
1996 October			1 house (Ravensbourne)	South-east Queensland
2000 August			1 volunteer severely burnt, 3 buildings, 3 vehicles	Hundreds of bushfires in south-east (majority deliberately lit)
2001		1 600 000	National park, grazing land	Lawn Hill
2002 October	1	40 000	10 houses, 11 buildings, 30 structures destroyed or damaged	Stanthorpe District, Toowoomba Range, Tara
New South Wales				
1915 November – 1916 January		Not known		Many districts, Holbrook, Howlong
1926 January–February		Not known	Property losses	Junee, Canberra, Albury, Rydal, Wagga Wagga
1926 October – 1927 December	8	>2 000 000		North Coast and Newcastle district, Canberra, Albury, Dubbo, Griffith
1938 December – 1939 January	13	73 000	Many houses, pine plantations	Dubbo, Lugarno, Snowy Mountains, Canberra
1944 November – December	2		150 houses, churches	Blue Mountains, Lochinvar
1951 November – 1952 January	11	>4 000 000		Worst affected district around Wagga Wagga and Pilliga in the north-west
1957 December – 1958	5	>2 000 000	158 houses, many businesses, shops, schools, churches and a hospital	Blue Mountains, Leura
1964–1965 March	5	530 000	Houses, farms, forests	Snowy Mountains, Southern Tablelands, Nowra, Sydney
1968 September – 1969 January	14	> 2 000 000	161 buildings (80 houses)	South Coast (Sept.), much of the coastal and nearby range areas of the state
1969–70	1	280 000		Roto and Riverina areas

Table D.1 (cont'd) Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1972 December – 1973 January		300 000		Kosciusko National Park, Eden, Queanbeyan, Burrinjuck Dam
1974–75	6	4 500 000	50 000 stock, 10 170km fencing	Bourke to Balranald, Cobar Shire, Moolah–Corinya—most of the Western Division
1976–77		74 000	3 houses	Hornsby, Blue Mountains
1977–78	3	54 000	49 buildings	Blue Mountains
1978–79		> 50 000	5 houses, heavy stock loss	Southern Highlands, south-west slopes
1979–80	13	>1 000 000	14 houses	Mudgee, Warringah and Sutherland Shires, majority of council areas, Goulburn and South Coast
1982–83	3	60 000	\$12 million of pines	Blue Mountains, Sutherland and southern NSW
1984–85	5	3 500 000	40 000 stock, \$40 million damage	Western Division
1986		10 000		Mount Kaputar National Park
1987–88	4	180 000		Bethungra, Warurillah–Yanco, south-eastern part of Kosciuszko National Park, Sutherland, Penrith, Wellington
1990–91		>280 000	8 houses, 176 000 sheep, 200 cattle, hundreds of km of fencing	Local government shires of Hay, Murrumbidgee, Carrathool; Hornsby, Ku-ring-gai, Cessnock, Hawkesbury, Warringah, Wollondilly, Gosford, Wyong
1991–92	2	30 fires	14 houses	Baulkham Hills, Gosford City, Wyong Shire, Lake Macquarie
1993 December – 1994 January	4	>800 000 (>800 fires)	206 houses destroyed, 80 other premises destroyed	North Coast, Hunter, South Coast, Blue Mountains, Baulkham Hills, Sutherland, most of Royal National Park, Blue Mountains, Warringah–Pittwater
1997 November – 1998 January	3	>500 000 (250 fires)	10 houses destroyed	Hunter, Blue Mountains, Shoalhaven, Menai, Coonabarabran, Padstow Heights, South Windsor – Bligh Park
2001 December – 2002 January		744 000 (454 fires)	109 houses destroyed; 6000 head of livestock	Across 44 local government areas in the Greater Sydney, Hunter, North Coast, mid-north coast, Northern Tablelands, Central Tablelands areas
2002 July – 2003 February	3	1 464 000 (459 fires)	86 houses destroyed; 3400 stock; 151 days of severe fire activity	81 local government areas in Greater Sydney, Hunter, North Coast, Northern Tablelands, Northern Rivers, north-west slopes, north-west plains, Central Tablelands, Southern Tablelands, Illawarra, South Coast
Australian Capital Territory				
1938 November – 1939 January		62 500	1100ha of pine forest, 54km of fences	Fires started in NSW, west of ACT. Became a 72km fire front in ACT, affecting, Uriarra, Mt Franklin, Tidbinbilla, Cuppacumbalong, Booroomba and Lanyon
1951 December – 1952 February	2	10 000	2 houses, 40 farm buildings, several Observatory buildings, 450ha of pine, 6 bridges, several hundred kms of fences, 3 vehicles	Molongolo valley, Mt Stromlo, Red Hill, Woden Valley, Tuggeranong, Mugga Hill
1956 December – 1957 January		3125	Primarily pasture and bushland	Ginninderra, Hall, Majura, Black Mountain, Tharwa

Table D.1 (cont'd) Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1979 February		16 500 (ACT, NSW)	2 houses, 3 sheds, machinery, fodder, 5000 sheep, 6 horses, \$200 000 in fencing, fire tanker	Hall, Sutton, Mt Painter, Kambah Pool, Stirling
1982 September, 1983 March		36 000	300ha of pine	Jervis Bay (Sept. 1982), Mt Ainsley, Bullen Range, Gudgenby area
1985 March	1	28 000 (10 000 in ACT)	Total damage of several million dollars, 7000 livestock	Mugga Lane, Red Hill, Mount Majura, Tharwa, Symonstown, Googong – Queanbeyan area of NSW (site of fatality)
2001 December		>1600	500ha of pine forest valued at several million dollars	Coppins Crossing, Yarralumla, Red Hill, Stromlo, Bruce Ridge, Oaks Estate, Wanniasa hills
2003 January	4	>157 000	450 injuries, 488 houses, 100 other structures, Mt Stromlo Observatory, 4000 stock, 16 770ha of pine plantations, 4 bridges, 300 vehicles, total damage >\$350m	Namadgi National Park; Uriarra, Pierces Creek and Stromlo settlements; Cotter, Corin, Tidbinbilla, Mt Stromlo, Duffy, Holder, Chapman, Kamhah, Curtin, Lyons, Murrumbidgee Valley, Coppins Crossing
Victoria				
1851 February (Black Thursday)	Approx. 12	5 000 000; quarter of Victoria	1 million sheep, thousands of cattle	Wimmera, Portland, Gippsland, Plenty Ranges, Westernport, Dandenong district, Heidelberg
1898 February (Red Tuesday)	12	260 000	2000 buildings	South Gippsland
Early 1900s (esp. 1905, 1906, 1912, 1914)		Varied (100 000 in 1914)		Gippsland, Grampians, Otway Ranges
1926	60		Many farms and houses	Noojee, Kinglake, Warburton, Erica, Dandenong Ranges
1932	9			Many districts across Victoria, particularly Gippsland
1938–1939 January (incl. Black Friday)	71	1 520 000	>650 homes and shops, 69 timber mills	Large areas of the north-east and Gippsland, the Otway and Grampian Ranges, and the towns of Rubicon, Woods Point, Warrandyte, Noojee, Omeo, Mansfield, Dromana, Yarra Glen, Warburton, Erica
1942 March	1		100 sheep, 2 farms, >20 homes	Hamilton, South Gippsland – Yarram (burning on a 96km front)
1943 December	10	Thousands		Wangaratta
1944 January	49	>1 000 000	500 homes, huge stock losses	Central and Western Districts
1944 February			Plant works, open-cut mine and buildings	Morwell, Yallourn
1952 February	Several	100 000		Benalla area
1962 January	>8		454 homes	The Basin, Christmas Hills, Kinglake, St Andrews, Hurstbridge, Warrandyte, Mitcham
1965 January	7		6 houses	Longwood
1965 February–March		300 000 forest	>60 homes and shops	Gippsland
		6070 grassland	>4000 stock	
1968 February		1920	64 homes and other buildings	Dandenong Ranges, The Basin, Upwey
1969 January	22	250 000	230 homes, 21 schools/church/hall, >12 000 stock	280 fires broke out, affecting Lara, Daylesford, Bulgana, Yea, Darraweit, Kangaroo Flat, Korongvale

Table D.1 (cont'd) Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1972 December		12 140		Mt Buffalo
1977 February	4	103 000	More than 100 houses and shops, approx. 200 000 stock	Penshurst, Tatyoon, Streatham, Creswick, Pura Pura, Werneth, Cressy, Rokewood, Beeac, Mingay, Lismore, Little River
1978 January	2		1 house; 6500 stock	Bairnsdale
1980 December – 1981 January		119 000		Sunset Country and the Big Desert
1983 January–February	47	461 864	50 houses; >27 000 stock; >2000 homes/shops	Cann River, Mt Macedon, Monivae, Branxholme, Cockatoo, East Trentham, Mt Macedon, Otway Ranges, Belgrave Heights, Warburton, Cudjee, Upper Beaconsfield, Framlingham
1985 January	3	50 800	182 homes, 400 farms, 46 000 stock	Avoca–Maryborough, Little River, Springfield, Melton
1990 December	1		17 homes >12 000 stock	Strathbogie
1995 February		10 000 (mostly forest)		Berringa
1997 January	3	400	41 houses	Dandenong Ranges, Creswick, Heathcote, Teddywaddy, Gough's Bay
1997 December – 1998 January		32 000		Caledonia River area of Alpine National Park, Carey River State Forest
1998 December	5 CFA firefighters	780	1 CFA tanker	Linton
2000 December		29 000		Dadswells Bridge
2002 December		181 400	1 abandoned house	Big Desert
2003 January–March	1 indirectly	1 100 000	41 houses; 9000 livestock	Over 80 fires started by lightning—north-east Victoria, Gippsland
Tasmania				
1897, 1898, 1912				Well-timbered western part of state, north-west coastal region; Huon, Channel, Hobart and New Norfolk districts
1913–14 season			Orchards, buildings, stock	Mt Wellington, Huon
1920				North-west
1921				North-east
1927				South-eastern districts, Tasman Peninsula
1933–34 season				Florentine, Derwent Valley, north-west forests and west coast
1939		9600	Forests, orchards, pastures	Huon, Derwent Valley, west coast, King Island
1940		16 000		Hobart
1945–46 season				Mt Wellington
1951			Hundreds of thousands of metres of marketable timber	Huon
1960–61 season				Parattah, Perth and through Midlands
1963–64 season			Pine plantations	Cambridge, Hobart, Snug, north coast
1966–67 season	62	264 270	>1400 houses, 128 major buildings, 1500 vehicles, 50 000 sheep, 1350 cattle, 1000 pigs, 4800km of fences	South-east, Hobart
1977				Zeehan

Table D.1 (cont'd) Fire history in Australia, by state and territory

Date	No. of deaths	Area of fire (ha)	Losses	Location(s)
1980		40 000		Launceston, Hobart, Zeehan
1981			6 houses	Pelverata, Bonnet Hill
1982	1	>40 000		Launceston, Hobart, Broadmarsh
1998		3000	6 houses	Hobart's southern suburbs
2003		41 000		
South Australia				
1938–39				Adelaide Hills
1943–44				Adelaide Hills
1948–49	1			Bridgewater, Gawler, One Tree Hill, Mt Barker, near Wilmington, Port Lincoln
1950				Mt Lofty and grass fire north of Morgan and east of Burra
1951 December	5 firefighters	450 000	Stock, feed, fencing	Adelaide Hills, Woodside, Stirling, Lenswood, and districts in the south-east
1954–55 January	2 firefighters	>40 000	Houses, timber	Mt Lofty Ranges
1957–58 January	8 firefighters	1370	413ha of pine forest	Mt Gambier
1959	1	104 000	\$1 500 000	Kongorong, Wudinna
1960		114 000	'Lots of damage'	Northern part of Yorke Peninsula, Wirrabara, Tintinara
1961				Wilpena Pound
1968–69		900 000	Feed, stock, fences	West of far north region, Murdinga
1974–75		16 000 000		North-west of state (arid and semi-arid zones)
1980				Adelaide Hills
1983	28	160 000	383 homes, forest plantations, conservation parks, >200 buildings	Mt Osmond, Mt Gambier, South Barwon
1985				Adelaide Hills
2001			Approx. 20 buildings	Tulka
Western Australia				
1925	1			Katanning
1930	1			Northam
1940	1			Katanning
1948		278 fires		Not known
1949		527 fires		Many fires caused by locomotives of the Railways Department and private timber mills
1951		23 000	Forest trees	Dwellingup, Manjimup district, various parts of south-west corner
1960–1961		>1 500 000	132 houses, 2 service stations, 3 shops	Dwellingup (134 000ha), other areas
1974–1975		29 000 000		East and north-east of Kalgoorlie
2003		15 545 000		Cape Arid National Park, Ravensthorpe, Jurien Bay, Cervantes, Walpole Wilderness area, Mt Cooke, Kimberley and Desert Region

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Appendix E State and territory fire services

E.1 The Northern Territory

Bushfire response in the Northern Territory is the responsibility of the Bushfires Council of the Northern Territory and the Northern Territory Fire and Rescue Service. Land use planning is the responsibility of the Department of Infrastructure, Planning and Environment.

E.1.1 The Bushfires Council of the Northern Territory

The Bushfires Council of the Northern Territory is a statutory body established by the *Bushfires Act*.¹ It is organisationally part of the Department of Infrastructure, Planning and Environment, which is responsible for land use planning and control functions across the Territory.

The Council is responsible for advising the Minister for Parks and Wildlife on bushfire prevention and control. Its stated mission is to 'to protect life, property and the environment from the threat of wildfire'.

E.1.2 The Northern Territory Fire and Rescue Service

The Northern Territory Fire and Rescue Service², part of the Northern Territory Police, Fire and Emergency Services, is responsible to the Minister for Police, Fire and Emergency Services through the Director Fire and Emergency Services and the Commissioner of Police, who is also the CEO Fire and Emergency Services. The Fire and Rescue Service has nine stations based in the major centres of the Northern Territory, with 165 permanent staff, 54 part-time auxiliaries and 250 volunteers.

There are five volunteer brigades in the Darwin area and a further 10 volunteer units throughout the Territory. In addition to fire, rescue and chemical incidents, volunteer brigades are responsible for the maintenance of fire hydrants, issuing permits to burn, and fire safety and educational awareness campaigns.

E.2 Queensland

Queensland Fire and Emergency Services is responsible to the Minister for Emergency Services through the Department of Emergency Services. These services, together with forestry staff of the Department of Primary Industries and staff of the Queensland Parks and Wildlife Service, are responsible for fire response and mitigation.

¹ Bushfires Council of the Northern Territory, viewed 15 March 2004, <www.nt.gov.au/ipe/bfc/fire>.

² Northern Territory Fire and Rescue Service, viewed 15 March 2004, <www.nt.gov.au/pfes/fire>.

E.2.1 The Department of Emergency Services

In addition to a wide range of other roles covering all phases of emergency and disaster management, the Department of Emergency Services is responsible, under the *Emergency Services Amendment Act 2002* and the *Fire and Rescue Services Act 1990*, for hazard mitigation, community education, fire prevention, hazardous materials management, and firefighting.³

E.2.2 The Queensland Fire and Rescue Service

The Queensland Fire and Rescue Service comes within the Department of Emergency Services.⁴ It provides bushfire response and mitigation services through two components:

- an urban component that consists of seven regions, 240 stations and 4000 full-time and part-time staff, with each region providing a range of mitigation and response activities
- the Rural Fire Service⁵, which provides fire services to 93 per cent of Queensland through two regions, 15 districts and 1653 brigades, with 36 uniformed officers and approximately 44 000 volunteers, including 2460 fire wardens.

E.2.3 The Queensland Parks and Wildlife Service

The Queensland Parks and Wildlife Service is a division of the Environmental Protection Agency and is responsible for approximately 12 million hectares of land, about half of which is in remote low-impact locations.⁶

The Service has a trained and equipped fire management capability, which is used mainly for prescribed burning but is also available for bushfire response, both in national parks and elsewhere in the state.

E.2.4 The Department of Primary Industries

Through its Forestry Division, the Queensland Department of Primary Industries provides a hazard-reduction and fire-response capability for the forests under its management.⁷

E.3 New South Wales

In New South Wales ministerial responsibility for bushfire response lies with the Minister for Emergency Services, to whom both the New South Wales Rural Fire Service and the New South Wales Fire Brigades are responsible. The Office for

³ Department of Emergency Services, viewed 15 March 2004, <www.emergency.qld.gov.au>.

⁴ Queensland Fire and Rescue Service, viewed 15 March 2004, <www.qrfs.qld.gov.au>.

⁵ Rural Fire Service, viewed 15 March 2004, <www.ruralfire.qld.gov.au>.

⁶ Queensland Parks and Wildlife Service, viewed 15 March 2004, <www.qpws.qld.gov.au>.

⁷ Department of Primary Industries, viewed 16 March 2004, <www.dpi.qld.gov.au>.

Emergency Services provides strategic coordination, support and independent advice to the Minister for Emergency Services and to portfolio agencies.⁸

E.3.1 The New South Wales Rural Fire Service

The New South Wales Rural Fire Service was established under the *Rural Fires Act 1997*, as the successor to the Bush Fire Brigades Organisation. The Service is responsible for providing fire protection in 90 per cent of the state; it works closely with the New South Wales Fire Brigades, the National Parks and Wildlife Service, and State Forests.⁹

The Service has over 2200 brigades and about 69 000 volunteers. Six hundred staff provide services from head office, four regional offices and fire control centres located at district or local government level. The Rural Fire Service is responsible for structural firefighting in more than 1200 towns and villages.

The Commissioner of the Rural Fire Service has the responsibility of ensuring the coordination of all agencies during serious bushfire situations that are declared under s. 44 of the *Rural Fires Act 1997*.

E.3.2 The New South Wales Fire Brigades

The New South Wales Fire Brigades is responsible for protecting 90 per cent of the state's population from emergencies involving fire, motor vehicle accidents and other dangerous situations, as well as having statewide responsibility for hazardous material emergencies and building collapse.

In 2002–03 the Fire Brigades had a membership of 3214 permanent and 3249 retained firefighters, working from 338 fire stations and supported by 225 community fire units with some 3500 members.¹⁰

E.3.3 The National Parks and Wildlife Service

The National Parks and Wildlife is responsible for the management of more than 7 per cent of the land area of the state. The Service is defined as both a 'firefighting authority' and a 'public authority' in the *Rural Fires Act 1997*.

E.3.4 State Forests of New South Wales

State Forests has statutory obligations for fire management arising from the *Forestry Act 1916* and the *Rural Fires Act 1997*. It is responsible for protecting life and property from bushfires, minimising the spread of bushfires from state forests, and protecting state forests and their environmental values from the damaging effects of bushfires.

⁸ *New South Wales Government Directory*, viewed 16 March 2004, <www.directory.nsw.gov.au>.

⁹ *New South Wales Rural Fire Service*, viewed 16 March 2004, <www.rfs.nsw.gov.au>.

¹⁰ *New South Wales Fire Brigade, 2002–03 Annual Report*, viewed 16 March 2004, <www.nswfb.nsw.gov.au>.

E.4 The Australian Capital Territory

The ACT Emergency Services Bureau is the agency responsible for emergency management, providing emergency services and other support arrangements in the Territory. The Bureau has four operational services – the ACT Ambulance Service, the ACT Bushfire Service, the ACT Emergency Service, and the ACT Fire Brigade.

The Bushfire Service and Emergency Service have joint administrative and reporting arrangements and a common management. The Bushfire Service also relies on some departmental officers from the Department of Urban Services during bushfire responses.¹¹

E.4.1 The ACT Bush Fire Service

The ACT Bush Fire Service is primarily responsible for the suppression of bushfires, pursuant to the provisions of the *Bushfire Act 1936*. The Australian Capital Territory is a single fire control district comprising 450 volunteers within 11 brigades, six of which are joint bushfire – emergency services units.

E.4.2 The ACT Fire Brigade

The ACT Fire Brigade, with a membership of 283 firefighters, is primarily responsible for the suppression of fires in the Territory, pursuant to the provisions of the *Fire Brigade Act 1957*.

E.4.3 The ACT Emergency Services Authority

Following the Inquiry into the Operational Response to the January 2003 Bushfires in the ACT, the Government announced the formation of the ACT Emergency Services Authority to replace the Emergency Services Bureau.

E.5 Victoria

In Victoria both the Country Fire Service and the Metropolitan Fire Brigade report to the Minister for Police and Emergency Services.

The Office of the Emergency Services Commissioner provides independent, objective and strategic policy advice on emergency services to the Minister for Police and Emergency Services and the Department of Justice Executive.¹²

E.5.1 The Country Fire Authority

The Country Fire Authority was constituted under the Country Fire Authority Act. The Authority is the formal link between the community, the State Government, CFA members and volunteer associations. It has a state headquarters and nine area

¹¹ Department of Justice and Community Safety 2003, *2002/03 Annual Report*, viewed 23 March 2004, <www.jcs.act.gov.au/eLibrary/AnnualReports/2002_2003>.

¹² Viewed 26 March 2004, <www.justice.vic.gov.au>.

headquarters across the state. Within these areas are 20 CFA regions. As at November 2003, there were 60 311 members of the Authority – made up of 59 136 volunteers, 425 career firefighters, and 750 career support and administrative staff.¹³

The CFA responds to a variety of fire and emergency incidents – wildfires, structure fires, transport-related fires, and other emergency activities, including flood assistance.

CFA brigades are involved in a range of other activities – fire safety building inspections; delivering community awareness, education and safety programs; post-incident analysis and fire investigation; and fire prevention planning and land use planning at the municipal level.

E.5.2 The Metropolitan Fire Brigade

The Metropolitan Fire Brigade has 1511 firefighters staffing 47 strategically located fire stations and specialist departments in the Melbourne metropolitan area. It is constituted under the *Metropolitan Fire Brigades Act 1958*.

E.5.3 The Department of Sustainability and Environment

The Department of Sustainability and Environment is responsible for managing public land and other natural resources in Victoria.¹⁴ Responsibility for fire prevention and suppression on public land in Victoria rests with the Department, whose legislative responsibility is prescribed in s. 62(2) of the *Forests Act 1958*.

E.6 Tasmania

Tasmanian firefighters have served the Tasmanian community since the early 1800s and have had a legislated responsibility since 1883. The *Fire Service Act 1979* established the current Tasmania Fire Service, which today is an innovative and efficient statewide service that takes pride in its long and proud history.

The Service has over 230 fire brigades across Tasmania. These brigades consist of about 250 career firefighters and about 4800 volunteer firefighters.¹⁵ Volunteers and career staff work as an integrated team.

Revenue for meeting operational costs and for capital is provided from a fire service contribution collected by councils, a motor vehicle fire levy, a fire levy on prescribed classes of insurance, and a contribution from the State Government.

E.6.1 The Parks and Wildlife Service

The Parks and Wildlife Service manages 384 reserves, containing areas of all the types of vegetation found in the state and covering 2.45 million hectares, or about 39 per cent of Tasmania.

¹³ Viewed 30 March 2004, <www.cfa.vic.gov.au/publications>.

¹⁴ Viewed 30 March 2004, <www.dse.vic.gov.au>.

¹⁵ Viewed 30 March 2004, <www.fire.tas.gov.au>.

The Service has about 100 employees, who regularly participate in firefighting activities in one capacity or another, from firefighter to incident management team participant and administrative support. Staff are located around the state in the field centres and in head office.

The Service has close and cooperative operating arrangements with both the Tasmania Fire Service and Forestry Tasmania.

E.6.2 Forestry Tasmania

Forestry Tasmania has authority under the *Fire Services Act 1979* for fire management of approximately 1.6 million hectares of state forest. It develops policies and procedures covering fire management activities.

E.7 South Australia

The Minister for Emergency Services is responsible for bushfire response through the Country Fire Service and the Metropolitan Fire Service.

E.7.1 The Country Fire Service

The South Australian Country Fire Service is a statutory authority reporting to the Minister for Emergency Services. It consists of over 16 000 volunteers and 70 staff, providing a range of fire and emergency services to all communities in over 430 locations.

The Service attends about 7000 incidents each year. These incidents bushfires; fire protection and rescue at road accidents, hazardous materials spills, and structure fires.

E.7.2 The Metropolitan Fire Service

The South Australian Metropolitan Fire Service is a statutory authority, comprising 782 permanent and 236 retained firefighters. It is one of the oldest government-funded fire services in the world. In 1882 the Fire Brigades Act was passed and the Fire Brigades Board was commissioned, made up of insurance company and council representatives. The Service is funded by the Emergency Services Levy introduced in 2000.

E.7.3 The Department of Environment and Heritage

The Department of Environment and Heritage has direct responsibility for on-ground management of 331 reserves, covering 21.7 per cent of South Australia.¹⁶ The *National Parks and Wildlife Act 1972* requires the Department protect life, property and biodiversity values. The Department supports the Country Fire Service in minimising the risk associated with fire in natural bushland.¹⁷

¹⁶ South Australian Government submission.

¹⁷ *ibid.*

E.7.4 Forestry SA

Forestry SA manages state-owned forest resources in the state. It primarily provides softwood logs to the South Australian saw-milling industry and supplies forest products to other industries.¹⁸

E.7.5 The Fire and Emergencies Commission

In 2003 the South Australian Government announced the formation of the South Australian Fire and Emergency Services Commission, comprising the Country Fire Service, the Metropolitan Fire Service and the State Emergency Service. The Commission is yet to be established.

E.8 Western Australia

The Fire and Emergency Services Authority of Western Australia was established in 1999 from the Fire and Rescue Service, the State Emergency Service, the Bush Fire Service, Emergency Management Services and Volunteer Marine Rescue Services. FESA has more than 29 000 volunteers and 850 career firefighters around the state.

FESA volunteers and career firefighters respond to a range of hazards – bush and structural fires, incidents involving hazardous materials (chemical, biological, radiological), floods, storms, cyclones and earthquakes. Emergency services personnel also undertake search and rescue on land and at sea.

The Authority facilitates the development and maintenance of emergency management arrangements for the state and provides advice and support on emergency management issues to key stakeholders at the local, state and national levels.¹⁹

E.8.1 The Department of Conservation and Land Management

The Department of Conservation and Land Management has the lead responsibility for conserving the state's rich diversity of native plants, animals and natural ecosystems and many of its unique landscapes. It manages more than 24 million hectares, which is more than 9 per cent of Western Australia's land area – national parks, marine parks, conservation parks, regional parks, state forests and timber reserves, nature reserves, and marine nature reserves.

The Department manages lands and waters for the conservation of biodiversity at ecosystem, species and genetic levels, including management for the renewable resources they provide and for the recreation and visitor services they can sustainably support.

¹⁸ Viewed 25 March 2004, <<http://www.forestry.sa.gov.au>>.

¹⁹ Viewed 22 February 2004, <<http://www.fesa.wa.gov.au/>>.

Appendix F Bushfire-related Cooperative Research Centres

The Cooperative Research Centres Program was established in 1990 to improve the effectiveness of Australia's research and development effort.¹ The Program's objective is 'to enhance Australia's industrial, commercial and economic growth through the development of sustained, user-driven, cooperative public-private research centres that achieve high levels of outcomes in adoption and commercialisation'.

Cooperative Research Centres bring together researchers and research users from universities, government research organisations such as CSIRO and the Bureau of Meteorology, and private business. The Centres focus on long-term collaborative research and development ventures that contribute to national objectives and are funded for an initial period of seven years. The Centres' programs emphasise the importance of collaborative arrangements to maximise the benefits of research through an enhanced process of utilisation, commercialisation and technology transfer. The CRC approach also has a strong education component, with a focus on producing graduates with skills relevant to industry needs.

There are four Cooperative Research Centres with specific programs and projects directed towards aspects of bushfire research:

- the Bushfire Cooperative Research Centre
- the Desert Knowledge Cooperative Research Centre
- the Tropical Savannas Cooperative Research Centre
- the Spatial Information Cooperative Research Centre.

F.1 The Bushfire Cooperative Research Centre

The Bushfire Cooperative Research Centre began operations in July 2003 and was officially launched on 10 December 2003 by the Federal Minister for Science, the Hon. Peter McGauran MP.²

F.1.1 Objective

The objective of the Bushfire CRC is to increase scientific understanding of bushfires and their social and economic impacts through a coordinated, multi-disciplinary research program involving Australasian fire and land management agencies and government and university research agencies. The program is designed to improve agency and community capability to manage bushfires in an economically and ecologically sustainable manner, to increase the number of

¹ See the CRC Program website for more information <<https://www.crc.gov.au/information/Default.aspx>>.

² See the Bushfire CRC website for more information <<http://www.bushfirecrc.com/>>.

researchers working in the field, and to foster international research collaboration relating to bushfires.

F.1.2 Organisation

The Bushfire CRC operates under an agreement between the Australian Government and the Bushfire CRC partners. It is an incorporated entity with 17 core partners and 10 associate partners – six universities (one core and five associate), three Commonwealth agencies (all core), 15 state and territory government fire and land management agencies (11 core and four associate), and three research organisations, one of them Australian Government and one state (both core) and one New Zealand (New Zealand Forest Research, an associate partner).

The governing board of the Bushfire CRC has nine members – an independent chairman and eight skills-based members, the majority of whom represent stakeholder interests. The Centre also has a stakeholder council made up of representatives of all the core and associate partners.

The research program and associated activities are coordinated through the Centre's office, which is co-located with the Australasian Fire Authorities Council in East Melbourne, and through a national network consisting of program research leaders and user leaders for each of the five research programs and a project leader for each project.

F.1.3 Budget

The total budget for the Bushfire CRC, including cash and in-kind contributions, for the initial seven-year research period is approximately \$100 million. The Australian Government's direct contribution is approximately \$25 million; this is additional to the contributions of Australian Government agency participants.

F.1.4 Research

Program A: Safe Prevention, Preparation and Suppression

Research leader	Mr Jim Gould, CSIRO Forestry and Forest Products
User leader	Mr Phil Koperberg, Commissioner, New South Wales Rural Fire Service
Agreed budget	\$23 million

Objective

The objective of the Safe Prevention, Preparation and Suppression Program is to develop technologies to increase understanding of bushfire behaviour and the ability to manage bushfires in order to reduce the risks to firefighters and the general public. The program plans to assess the relative efficiency and effectiveness of a number of risk treatments involving combinations of prevention, preparation and suppression.

Planned outcomes

The program has 10 planned outcomes:

- more efficient use of suppression resources by adjusting the mix of techniques to suit the conditions
- greater understanding of the interaction of fuel, fire, weather and topography across Australia
- a single fuel classification system reflecting plant species and fuel age, structure and quantity
- improved overall management of fire through the use of a comprehensive and integrated risk management model
- a guide for fire researchers, to provide a common basis for planning, execution, measurement and observation of experimental fires, supporting a common national data set
- improvement to the operational utility of fire weather forecasts and seasonal outlooks, which will allow communities and fire authorities to be better prepared for bushfires
- an overall bushfire risk-management model of fire mitigation, predictability and social, environmental and economic factors for use by communities, town planners and agencies
- guidance on both aerial and ground suppression resource selection, efficiency, allocation and deployment
- simulation modelling to predict the development of a fire in real-time emergencies and in the training environment for agencies
- a range of decision-support tools for end users.

Projects

There are seven projects under the program³:

- Fire Behaviour Modelling
- Fuel Assessment and Availability
- Fire Observers Handbook
- Fire Weather/Fire Danger
- Fire Management Business Model
- Evaluation of Suppression Techniques and Guidelines (Aerial and Ground Resources)
- Bushfire Spread Simulation Modelling.

³ Not all projects have been finalised.

Program B: Management of Fire in the Landscape

Research leader	Dr Mark Adams, Forest Science Centre, Victoria
User leader	Mr Gary Morgan, Chief Fire Officer, Department of Sustainability and Environment, Victoria
Agreed budget	\$20.4 million

Objective

The objective of the Management of Fire in the Landscape Program is to develop tools for effective, safe and ecologically sound planning and use of prescribed fire and fire regimes.

Planned outcomes

The program has 13 planned outcomes:

- healthier communities and firefighters
- better managed prescribed burning, especially at the urban–rural interface and incorporating general principles for ecological sustainability
- more effective, safe and ecologically sound management of prescribed burning
- requirements for planning and management of prescribed burning
- consolidated information on current tools and strategies for prescribed burning
- assessment of the composition of smoke and the characteristics, impact and behaviour of smoke plumes
- expansion of knowledge about the impacts of fire regimes on biodiversity
- adding value to existing prescribed-fire research sites and programs throughout Australia
- improved ability to predict the behaviour of smoke plumes and hazes
- establishment of regimes of prescribed fire that maintain ecological values such as biodiversity and ecosystem processes whilst helping prevent wildfire
- consolidation and synthesis of the body of data relating to the effects of prescribed fires and fuel-reduction burns in forests and related ecosystems for better management of biodiversity
- smoke management and fire management strategies, including their incorporation in improved tools and strategies for prescribed burning. Bringing a quantitative approach to the study of the composition of bushfire smoke, including those elements that are risks to human health and those that are of environmental benefit or harm
- improved effectiveness of prescribed fire as a tool for prevention and mitigation of the effects of bushfires at the landscape scale.

Projects

There are eight projects under the program⁴:

- Managing Fires in Forested Landscapes in South Western Australia
- Fire Regimes and Sustainable Landscape Risk Management across Varying Ecosystems
- Behaviour of Smoke Plumes and Hazes from Rural or Urban Fires
- Smoke Composition from Prescribed and Wild Fires and its Impact on Human Health and Ecosystems
- Impacts of Fire on Ecological Processes and Biodiversity
- Prescribed Fire and Biodiversity in Tropical Savannas
- Predictive Model for Prescribed Burning Based on Synthesis and Integration of all National Experiments
- Multi-scale Patterns in Ecological Processes and Fire Regime Impacts.

Program C: Community Self-sufficiency for Fire Safety

Research leader Professor John Handmer, Royal Melbourne Institute of Technology

User leader Mr John Gledhill, Chief Officer, Tasmania Fire Service

Agreed budget \$13 million

Objective

The objective of the Community Self-sufficiency for Fire Safety Program is to coordinate research in Australia to increase the self-sufficiency of communities in managing the risk from bushfires. Community needs will be defined with the aim of increasing the community's capacity to manage bushfire risk through development of new knowledge and tools for building and improving 'community self-sufficiency', which is defined as the ability of the community to prepare for, withstand and recover from bushfire events.

Planned outcomes

The program has nine planned outcomes:

- a community that has sufficient capacity to deal with bushfire risk
- fire agencies with improved understanding of community needs
- the community and agencies being provided with effective risk communication and warnings before, during and after bushfire emergencies
- individuals and communities who are well informed about the nature and progress of bushfires

⁴ Not all projects have been finalised.

- effective implementation of risk treatments as a result of improved communication between communities and fire management agencies
- assessment of the total economic, social and environmental costs of bushfires and the benefits of mitigation
- evaluation of the effectiveness of bushfire programs against an agreed range of criteria
- reduction in human-initiated bushfire ignitions as a result of greater understanding of such behaviours
- validation of the benefits and viability of the 'stay or go' policy.

Projects

There are five projects under the program⁵:

- Understanding Community Needs, Perceptions and Attitudes
- Strategies for Reducing Bushfire Arson
- Effective Risk Communication with Communities and Other End Users
- Methodology Development for Economic Assessment of Bushfire Costs
- Evaluation of the Current 'Stay or Go' Policy and its Implementation in Bushfire Response.

Program D: Protection of People and Property

Research leader	Dr Bob Leicester, CSIRO Manufacturing and Infrastructure Technologies
User leader	Mr Neil Bibby, Chief Executive Officer, Country Fire Authority, Victoria
Agreed budget	\$30 million

Objective

The objectives of the Protection of People and Property Program are to reduce the loss of buildings and the injuries to occupants, to increase the safety and wellbeing of firefighters, and to increase the availability and retention of essential volunteers. These will be achieved through implementation of research results relating to bushfire attack, human behaviours on the fire ground, assessment and control of firefighter exposure to toxic air pollutants, and the motivations and needs of volunteers in response to demographic trends.

Planned outcomes

The program has five planned outcomes:

- proposed revisions to building codes, town planning regulations and emergency response practices for householders

⁵ Not all projects have been finalised.

- improved fire safety and wellbeing at fire-ground sites in relation to ergonomic, physiological and behavioural factors. Identification of ways of determining firefighters' ability to complete assigned fire-ground tasks safely and adequately
- guidelines for directing fire-ground operations under high-stress conditions and for vehicles and equipment with increased fire safety
- strategies for managing firefighters' exposure to smoke toxins
- guidelines for policy and program development to increase levels of recruitment and retention of volunteers for fire services.

Projects

The are seven projects under the program⁶:

- risk-based model of factors influencing the results of bushfire attack on buildings and occupants
- optimum design for glazing and timber decking
- literature review and pilot field studies of occupational health and safety issues on the fireground
- literature review and field sampling of smoke toxicity
- enhanced safety behaviour and decision making for fire fighters
- safe, cost-effective equipment for reduced fireground risks to fire fighters
- national profile of the demographics and needs of rural fire service volunteers.

Program E: Education and Training Program

Research leader Dr Mark Adams, Forest Science Centre

User leader Mr Len Foster, Chief Executive Officer, Australasian Fire
Authorities Council

Agreed budget \$8 million

Objective

The objective of the Education and Training Program is to develop the next cohort of qualified fire researchers, improve the use of Australian intellectual and research resources and keep Australia at the forefront of international bushfire research.

⁶ Not all projects have been finalised.

Planned outcomes

The program has three planned outcomes:

- establishment of a well-qualified, well-integrated (with end users) and self-renewing fire research community that meets national and international standards
- facilitation of conferences, publications and networking in order to ensure that Australia is recognised as one of the three leading nations in bushfire research
- ensuring that fire services and communities are aware of and trained in elements relevant to their roles in the management of bushfire risks.

F.2 The Desert Knowledge Cooperative Research Centre

The Desert Knowledge Cooperative Research Centre was established in mid-2003 and launched in September 2003.⁷

F.2.1 Objective

The mission of the Desert Knowledge CRC is to develop and disseminate knowledge about sustainable living in remote desert environments, delivering enduring regional economies and livelihoods based on desert knowledge and creating the networks to market this knowledge to other desert lands. The CRC aims to meet the needs of all desert Australians, Indigenous and non-Indigenous, and recognises the special features of desert social, natural, economic and cultural environments. The CRC's objective is to deliver the following outcomes:

- sustainable livelihoods for desert people based on new natural resource and service enterprise opportunities that are environmentally and socially appropriate
- more viable remote desert communities to support the presence of desert people as a result of facilitating access to more attractive services that are delivered more efficiently
- thriving desert economies that are based on unique desert knowledge and are more self-sufficient
- increased social capital of desert people, their communities and service agencies.

These outcomes will be achieved for and with the CRC's five primary client groups, through six key result areas that together are critical to creating thriving desert knowledge economies. The client groups are small businesses, Indigenous people, local community groups and local government, large corporations, and state and territory government agencies. The key result areas are new desert land uses and management options; new service-based enterprises and demand-based delivery systems; capacity building and training (including links to local

⁷ For more information see the Desert Knowledge CRC website <http://www.desertknowledge.com.au/crc_main.html>.

knowledge); better local, national and international networks (a multi-faceted DesertNet) for knowledge and business; adaptive approaches to policy and management; and appropriate institutions and integrated investment.

F.2.2 Organisation

The Desert Knowledge CRC is an unincorporated joint venture involving 15 centre partners and 13 associate partners. The Centre's governing board of eight is intended to be non-representational and professional; four board members are Indigenous Australians.

The agreements establishing the Desert Knowledge CRC and its management company, Ninti One Ltd, were endorsed in January 2004. Ninti One Ltd holds intellectual property in trust for the partners and will carry out various services for the Centre. Representatives of all centre partners form the Participants Forum, which has a number of roles, including selection of board members and dealing with partnership problems. The board will appoint a desert advisory forum to work with the management team to advise the board on strategic matters. Each Desert Knowledge CRC theme will have a variety of arrangements for capturing stakeholder inputs to research priorities and for the performance of research projects, especially the transfer of outputs to users.

F.2.3 Budget

The total budget for the Desert Knowledge CRC, including cash and in-kind contributions, is \$90.5 million for the initial seven years. The Australian Government contribution to the Centre is \$20.7 million.

F.2.4 Research

The Desert Knowledge CRC has four research themes, which deliver in an integrated way to the six key result areas and the Centre's mission. The themes are not independent, and theme leaders take on cross-theme roles. There is continual assessment of linkages across the themes, which are as follows:

- Natural Resource Management for Better Livelihoods
- Technical Services for Improved Community Viability
- Governance, Management and Leadership for Sustainable Futures
- Integrated Systems for Desert Livelihoods.

In addition, the Centre has a number of central functions – education coordination; communications and networking; commercialisation and utilisation; and Centre administration.

The main focus of bushfire-related research is in the first theme, although as a consequence of the integrated nature of the CRC's program and activities bushfire management will benefit from initiatives and outcomes generated in other themes.

Theme 1: Natural Resource Management for Better Livelihoods

Theme leader	Dr Craig James, CSIRO Sustainable Ecosystems
Agreed budget	Over the next six years \$925 000 will be invested in bushfire-related projects and about four times that amount in in-kind contributions.

Objective

The Natural Resource Management for Better Livelihoods theme aims to ensure that the management of desert natural resources provides for long-term rewarding and fulfilling livelihoods, for the people of desert Australia and the nation as a whole. Within this theme there is a focus on understanding and monitoring regional-scale processes that affect enterprises and the maintenance of biodiversity. The theme consists of three sub-themes, which cover information and knowledge management, enterprise development, and landscape management; comes into two of the sub-themes:

- Knowledge baselines, capture and exchange
- Enterprise development and opportunities

Planned outcomes and outputs

There are two outcomes and five outputs for the sub-themes:

- inhabitants sharing land management information across desert Australia
 - documentation of the knowledge and aspirations of pastoral, Indigenous and conservation interests in connection with fire in desert landscapes – part of the Natural Resource Management Theme
- resource managers using landscape-scale techniques from western science and Indigenous knowledge to maintain ecosystem function and biodiversity
 - knowledge of the combined effects of weeds and fire on biodiversity and the economic potential of enterprises
 - review of the historical patterns of fire and their effects on biota
 - implementation of long-term projects examining the effects of different fire regimes on biodiversity and production in remote desert areas
 - evaluation of preliminary data from projects examining the effects of fire on biodiversity.

F.3 The Tropical Savannas Cooperative Research Centre

The Tropical Savannas Cooperative Research Centre began operating in August 1995, as the Cooperative Research Centre for the Sustainable Development of Tropical Savannas. It was funded for a second seven-year term in 2001. The Centre has a particular focus on strengthening stakeholder engagement and a number of natural resource management matters associated with the tropical savannas.⁸

F.3.1 Objective

The goal of the Tropical Savannas CRC is to ensure that the savannas are healthy and managed to provide long-term benefits – economic, aesthetic, social and cultural – to those who use them and to sustain the biodiversity and habitat endemic to those lands.

F.3.2 Organisation

The Centre is an unincorporated joint venture with 16 core partners – the Australian Government; universities involved in tropical savannas research; CSIRO; government land management agencies from Western Australia, the Northern Territory and Queensland; and representatives of the pastoral industry and Aboriginal land managers. The Centre’s governing board has 13 members, including an independent chairman. Represented on the board are state and partner agencies, the tourism, conservation, pastoral and mining sectors, and Indigenous Australians.

Members of the Savanna Advisory Committee (formerly the Consultative Committee) represent social and enterprise groups across the savannas and are a major reference group for stakeholder values. The Advisory Committee monitors the relevance of the Centre’s research, communication and education programs and advises the board about stakeholders’ needs.

Research is organised around four integrated themes, rather than in discrete discipline- or sector-based programs. The Centre focuses on four key result areas, to which all research projects contribute. The key result areas help ensure that research outcomes are relevant to the needs and aspirations of people living and working in the savannas; they are as follows:

- healthy landscapes – ecological, economic and social
 - indicators and attributes of savanna health
 - predictive models of landscape function and the impact of interventions
- sustainable management systems
 - landscape-monitoring systems and associated management tools and packages

⁸ See the Tropical Savannas CRC website for more information <<http://savanna.ntu.edu.au>>.

- management strategies for fire, grazing, tree clearing and restoration and decision-support tools and packages
- environmental management systems and codes of practice
- viable and socially desirable regions
 - policy and management options for regional planning and development and associated guidelines and tools
 - regional strategies for multiple land use, restructuring and re-invigoration
- productive and capable people
 - communication strategies and processes
 - learning packages and education strategies
 - knowledgeable and employable postgraduate researchers
 - staff who are more skilled and knowledgeable and can work in multi-disciplinary teams using participative processes.

Delivery of these outputs occurs through the research themes.

F.3.3 Budget

The total budget for the Tropical Savannas CRC, including cash and in-kind contributions, is approximately \$58 million for the current seven-year period. The Australian Government contribution is \$20.68 million.

F.3.4 Research

The Tropical Savannas CRC has four research themes, which are described as tools for integration rather than isolated programs:

- Landscape Ecology and Health
- Industry and Community Natural Resource Management
- Regional Planning and Management
- Human Capability Development

Fire research comes within the second theme.

Theme 2: Industry and Community Natural Resource Management

Theme leader	Dr Jill Landsberg, James Cook University
Agreed budget	Direct funding for fire-related research is between \$100 000 and \$200 000 a year, with substantially greater inputs from external sources such as the Natural Heritage Trust, R&D corporations, state and territory governments and private sector organisations.

Objective

The thrust of the theme is achieving sustainable economic, social and environmental outcomes for the savanna communities in northern Australia. The theme focuses on development and validation of models of adaptive systems that will assist in achieving triple-bottom-line outcomes. Also included are Indigenous land management systems and systems for multiple land use. Current fire management research is centred on the FIREPLAN project.

The FIREPLAN project aims to contribute to sustainable fire management practices on savanna lands under all tenures, particularly in northern Australia but also in Southeast Asia.⁹ The project leader is Dr Jeremy Russell-Smith, and the project seeks to engage the wider community in cross-cultural, cross-sectoral activities that have the potential to result in lasting social benefits. There is a strong focus on regional studies and practical fire management strategies, which are developed by researchers working in collaboration with land managers and communities in seven regions:

- Cape York
- Arnhem Land
- Victoria River Downs and the Sturt Plateau
- the Kimberley
- the Gulf region of north-west Queensland
- the Barkly Tableland
- eastern Indonesia.

The following are planned activities for FIREPLAN:

- *Developing, implementing and evaluating fire management in woody vegetation in Queensland's northern Gulf region.* Major project funding is being contributed by Meat & Livestock Australia.
 - Strategic use of fire has the potential to reduce woody vegetation cover and facilitate pasture production.

⁹ For more information see the FIREPLAN website
<<http://savanna.ntu.edu.au/research/projects/fireplan.html>>.

- The project will develop and test recommendations for the use of fire for management of woody vegetation in the Gulf savannas through a collaborative effort between landholders and woodland ecologists.
- *Investigating prescribed burning and wildfire control – training and skills development for on-ground property-level fire management in the Kimberley.* This project is being undertaken in partnership with the Kimberley Regional Fire Management Project, with major funding to date from the Natural Heritage Trust.
 - There is a lack of fire management skills and knowhow in many parts of the Kimberley, particularly among younger Indigenous people.
 - The project proposes to develop community-based fire-control teams based on the model of the ranger-training program in the Northern Territory.
- *Evaluating fire management on conservation reserves, in partnership particularly with the Queensland Parks and Wildlife Service.*
 - Despite the availability of tools and systems for use by conservation managers, uptake is variable and results on the ground have not been quantified.
 - The project aims to test fire planning against performance and to formally review the adaptive management process as it relates to fire management.
 - The project will provide an examination of best practice in fire management on conservation reserves, review performance, elucidate factors for success and failure, and be valuable for future planning and policy setting.
 - Impediments to the application of desirable fire management on reserves will also be identified, along with actions designed to remove them.
- *Fire management planning associated with energy supply in north-west Queensland.* This is a PhD research project with major funding from Ergon Energy.
 - The project aims to develop ecologically sustainable fire management (through better understanding of fuel dynamics and fuel reduction in association with the development of an environmental management system) associated with more than 300 kilometres of power lines that are critical to the delivery of electricity at three big mine sites.
- *Impacts of fire and its use for sustainable land and forest management in Indonesia and northern Australia.* This project is being conducted in partnership with a range of Indonesian and Australian institutions and the Center for International Forestry Research. Major funding is being provided by the Australian Centre for International Agricultural Research. The aims are as follows:
 - to determine current and past patterns of fire in a range of strategically located sites
 - to review national, state and regional policy frameworks relating to fire management and the past and current impacts of these policies

- to determine the positive and negative impacts of a range of fire management strategies, particularly for forestry
 - to develop fire management strategies and identify enabling policies for different land use objectives through participatory planning methods
 - to augment the land and forest management capacity of stakeholders and associated institutions through technology transfer, training and education.
- *Fire information products for the savanna community.* FIREPLAN will continue to develop and disseminate fire management information products to the savanna community and support continental-scale fire map and information products from the Western Australia Department of Land Information, which is part of a direct service to savanna land managers and institutions and helps maintain historical fire map resources for research applications.
 - *The Arnhem Land Fire Abatement Project.* In a partnership with Indigenous communities, the Bushfires Council of the Northern Territory, the Australian Greenhouse Office and the Natural Heritage Trust, this project had its genesis in submissions (in 2000 and 2001) to the Australian Greenhouse Office's Greenhouse Gas Abatement Program. The main premises of those submissions were as follows:
 - Through a process of strategic fire management, the annual extent of uncontrolled, late dry season burning in the Arnhem Land region could be substantially reduced, thereby reducing emissions of nitrous oxide and methane as well as carbon dioxide.
 - Emissions abatement could be reliably accounted, following the development of monitoring protocols.
 - Such a program would offer important environmental, social and economic outcomes, as well as greenhouse benefits.

These proposals were recommended for funding by the Australian Greenhouse Office, but the recommendation was not supported by the appointed Cabinet ministerial council. A further proposal has been submitted for funding under Round 3 of the Greenhouse Gas Abatement Program, this time in association with a major business partner involved in the energy sector. The current project, the Arnhem Land Fire Abatement project, is being funded mostly through the Natural Heritage Trust, the Northern Territory Government and community resources. It has the following aims:

- delivering a strategic fire management program for western Arnhem Land
- involving local Indigenous communities and their representative organisations in delivery of the program
- developing and applying scientifically based research to greenhouse emissions accounting
- developing an economically and ecologically sustainable fire management program with direct employment outcomes for local Indigenous communities.

The expected project outcomes are engagement with the savanna community; promotion of applied fire management research in savanna landscapes; development of fire management capacity in regional communities, institutions and sectors; dissemination of research findings and information to land managers and organisations; and provision of opportunities for postgraduate training.

F.4 The Cooperative Research Centre for Spatial Information

The Cooperative Research Centre for Spatial Information began operations in July 2003 and was contractually formalised in January 2004. It is fully staffed and is starting work on its R&D projects.¹⁰

F.4.1 Objective

The vision for the Cooperative Research Centre for Spatial Information is a collaborative R&D centre that is responsive to the needs of users and provides competitive advantage through merging strengths in positioning and geographic information with information and communication technologies – a single entry point to expertise in spatial information, modelling and visualisation tools.

The Centre's mission is to unite research and commercial innovation in spatial information. It will harness and nurture Australia's recognised research and commercialisation strengths in spatial information technologies to create new opportunities and increase economic growth. The Centre has the following aims:

- to promote the seamless exchange of spatial information between all information users in Australia through new products, thereby enhancing commercial, environmental and social management activities
- to increase commerce in spatial information and the transfer of spatial data technology from researchers to users
- to create a long-term partnership with users – from community groups, small and medium-sized enterprises to local, state, federal and international governments and the education sector
- to enhance interoperability between the diverse but complementary spatial information collection, processing and delivery systems – namely, satellite positioning, geodesy and kinematic mapping, satellite earth observation, metric information retrieval, socio-economic and commercial inventory and accounting, geographic information systems, and web-based decision-support services
- to become a top-three player in the international spatial information community, in relation to both technology development and commercial innovation.

¹⁰ For more information contact Mike Ridout <admrcrsi@unimelb.edu.au>. The Centre's website is at:
<<http://spatialinfocrc.org/index.html>>

F.4.2 Organisation

The Centre is an unincorporated joint venture with nine core partners who are leading innovators and technology users in Australia – 43 Pty Ltd (a consortium of small and medium-sized enterprises); Geoscience Australia; government land information management agencies from Victoria, New South Wales and Western Australia; the Western Australian Department of Agriculture; and Melbourne, New South Wales and Curtin Universities. In addition, there are five supporting participants from industry, universities and government agencies.

The governing board of the Centre has 11 members, including an independent chairman. An intellectual property holding company has been incorporated, and board research, commercial and finance committees established.

F.4.3 Budget

The total budget for the CRC for Spatial Information, including cash and in-kind contributions, is approximately \$78 million for the initial seven years. The Australian Government's contribution is approximately \$13.3 million.

F.4.4 Research

The Centre currently has five integrated core research programs:

- Integrated Positioning and Mapping Systems
- Metric Imagery as a Spatial Information Sources
- Spatial Information System Design and Spatial Data Infrastructures
- Earth Observation for Renewable Natural Resource Management
- Modelling and Visualisation for Spatial Decision Support.

A component of the technology transfer strategy of the CRC is the use of demonstrator projects that showcase research and development and provide to the researchers feedback on new areas to be examined. They will also be used for training and education purposes. Of greatest relevance to bushfire are program 4 and program 6 (the demonstrator projects), which provide an applied focus for the development work.

Program 4: Earth Observation for Renewable Natural Resource Management

Program leader Professor Tony Milne, University of New South Wales
Agreed budget Substantial

Objectives

Program 4 has the following objectives:

- in the context of emergency response, providing timely spatial information to users, thus enabling appropriate remedial action to be taken

- better modelling of spatial and temporal variability so that multi-platform, multi-sensor data can be integrated effectively
- better validation of remotely sensed products
- improved classification and land use categorisation, as well as enhanced application of remote sensing technology for rural management and monitoring of treaty and protocol compliance.

Projects

The projects with greatest relevance to bushfire are as follows:

Near-real time satellite image processing and distribution. This project seeks to develop a near-real-time spatial information service allowing remote-sensing users timely access to earth-observed data. This will facilitate prompt remedial action. At present the EOS-MODIS, ERS-ATRS-2 and NOAA-AVHRR satellite systems allow for free downloading of data within two to three hours of the satellite overpass. The vision is that the data will be processed and distributed to users in these critical 'golden hours'. For example, new maps overlaid on existing databases could be used to highlight changes caused by bushfires, rainfall or pollution – in a manner similar to that used in weather-forecasting information today. This information will enhance the application of spatial decision-support systems for resource managers and policy makers. An important contribution to this project will come from Geoscience Australia's ACRES centre in Canberra. The project will have close links to programs 2 and 5.

Multi-scale, multi-spectral and multi-temporal image analysis for environmental and natural resource monitoring. Renewable natural resource projects typically employ large and diverse data sets often combining imagery of differing resolutions. This project will focus on the resulting data-fusion and -integration issues of scaling and spatial variance, spectral mixing and directional effects, and multi-temporal data sets. It will also develop validation techniques and in situ observation processes that enable better use of spatial information pertaining to agricultural and environmental assessment. Increasingly, treaty compliance monitoring and predictive modelling of biophysical processes necessitate the creation of time series of seasonal or phenological data sets. Components of the project will be common with projects in programs 2 and 5.

Land cover classification and the monitoring and assessment of land use change, with an initial focus on biomass estimation and carbon cycling and on bushfire applications. Classification is perhaps the most over-used and least understood of all image-processing techniques. Improvements in the construction and use of classification systems will improve our ability to understand the dynamics of land use and land cover change. Focusing initially on the problem of land classifications for bushfire management, the project will develop protocols for mapping and monitoring fuel loads and curing (dryness), fire weather, and ways of communicating fire danger to emergency services. The project will have synergistic links to programs 1, 3 and 5.

Program 6: The demonstrator projects

Program manager Peter Woodgate, CEO, Cooperative Research Centre for Spatial Information

Project 6.1, led by Mark Carniello, from the Western Australian Department of Land Information, aims to demonstrate how advanced spatial information technology can support emergency management activities in both government and private organisations at varying scales. This will be achieved by developing requirements with user organisations, building prototypes based on those requirements, and testing the prototypes with users. Alignment with existing systems will be sought through the various participants, which include agencies in Western Australia, Victoria and New South Wales.

Although the project will focus on regional areas initially, many of the principles are also relevant to urban scenarios. The project will demonstrate how emergency managers can acquire and use critical map-based information quickly.

While many of the components being developed and demonstrated in the project will be applicable to a wide range of scenarios, the project will initially focus on two specific areas:

- *Area 1: on- and off-shore incident management system.* This system will help companies or emergency agencies conducting searches or planning resource deployment to incident areas. Users will receive immediate, accurate, detailed, consistent access to maps, with tools designed to support critical decisions.
- *Area 2: bushfire management system.* This system will focus on the provision of tools for bushfire management. It will make near-real-time information on fires available to users and will provide automatic generation of burnt-area data from satellite data and the generation of fire history information. Automatic notification for threatened critical infrastructure will also be included. The system will build on the work that has been done in the Western Australian FireWatch program and the Sentinel service. It is anticipated that activities associated with this sub-project might be undertaken in collaboration with the Bushfire Cooperative Research Centre.

Tools will be provided to users so that they can make use of the information generated. The tools will give users direct access to a range of local, state and federal data sets, demonstrating the interoperability vision of the CRC for Spatial Information. The demonstrator projects will show how the various state and federal programs assessing the use of interoperability standards and the various E-GIF initiatives can be used. Near-real-time inputs from applications that automatically detect and extract spatial information about emergency situations from existing advanced sensors will also be accessible.

Users of the system will have the ability to combine near-real-time information with other relevant local, state and federal data sets in a user-friendly interface. Among the innovations to be considered are vehicle tracking, condition monitoring, proximity monitoring, online collaboration, live integration of multiple data sets from various sources, and fax, SMS and email notification. User requirements and alignment with other initiatives will determine which innovations receive more focus in the project.

Appendix G Bushfire and land management terminology

A broad range of terms is used in relation to bushfire mitigation and management.

There is considerable confusion about terminology relating to bushfire. The Inquiry considered that there is a need for a standardised glossary that has broad agreement. This compilation draws together, from a number of sources, some of the most frequently used terms.

The Inquiry considers that these definitions could be used as the basis of a more thorough glossary.

The sources used are listed below. Where two or more sources use the same word and meaning, we have attempted to identify where the term was originally listed. Where two or more sources use the same words but different meanings, we list both meanings. In some instances we use less than the full explanation provided in the reference; in these cases we indicate an abbreviation. The sources are as follows:

- Australasian Fire Authorities Council 2004, *The Australian Inter-service Incident Management System*, 3rd edn, Version 1 (draft) – depicted as AFAC
- Emergency Management Australia's *Australian Emergency Management Glossary* – depicted as EMA
- NSW Rural Fire Service 1999, *Operational Glossary of Terms* – depicted as NSW RFS
- Esplin, B, Gill, AM & Enright N 2003, *Report of the Inquiry into the 2002–2003 Victorian Bushfires*, State Government of Victoria, Melbourne – depicted as Vic report
- submission by The Bushfire Front, Western Australia – depicted as WA BF
- Standards Association Australia 1999, AS/NZS 4360:1999 Risk Management – depicted as AS/NZS.

Acceptable risk	That level of risk that is sufficiently low that society is comfortable with it. Society does not generally consider expenditure in further reducing such risks justifiable. <i>EMA</i>
Aerial detection	An aircraft flight to locate, confirm and report on a fire location. <i>Vic report</i>
Aerial fuel	The standing and supporting combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, bark and creepers. <i>EMA</i>
Aerial ignition	The igniting of fuels by dropping incendiary devices from aircraft for the purposes of fuel management, fire suppression, ecosystem management and forest regeneration. <i>Vic report</i>
Aerial reconnaissance	In a fire context, a flight conducted in response to a known or suspected fire, to observe fire behaviour, threat to values, control activity, and other critical factors to facilitate command decisions on strategies needed for suppression. <i>Vic report</i>
AFAC	The Australasian Fire Authorities Council is the national body representing urban, rural and land management agencies within Australia and New Zealand with a responsibility for the protection of life and property from fire and other emergencies. <i>AFAC</i>
Agency representative	An individual allocated to an incident from an assisting agency who has been delegated full authority to make decisions on all matters affecting that agency's participation at the incident. <i>AFAC</i>
AIIMS structure	The combination of facilities, equipment, personnel, procedures, and communications operating within a common organisational structure with responsibility for the management of allocated resources to effectively accomplish stated objectives relating to an incident. <i>AFAC</i>
AIIMS – ICS	Australian Inter-service Incident Management System – Incident Control System. <i>AFAC</i>
Air attack	The act of using aviation resources to suppress wildfire. <i>Vic report</i>
Air attack supervisor (AAS)	The air attack supervisor position in the ICS is responsible for the safe and efficient tactical coordination and direction of aircraft operating at a fire. <i>NSW RFS</i>

Air base communications	Personnel who are trained in aviation communications procedures with facilities, which are optimised for aviation use. <i>NSW RFS</i>
Air base crew	Trained personnel who perform the mixing of suppressants and retardant, the loading of aircraft, aircraft marshalling and refuelling. <i>NSW RFS</i>
Air base manager	An experienced, trained aircraft officer who is appointed to manage all the functions and personnel on an air base or helicopter base. <i>NSW RFS</i>
Air observer	The primary role of the air observer is to aerially obtain intelligence to assist the planning of fire suppression operations. <i>NSW RFS</i>
Air operations	The use of aircraft in support of an incident. <i>NSW RFS</i>
Air operations manager	The air operations manager position in the ICS is responsible for overall coordination of air and air support activities and for ensuring that the air operation properly services the fire suppression strategy. This position would normally only be necessary at larger fires. <i>NSW RFS</i>
Airborne systems operator	A trained person responsible for the operation of mapping and remote sensing systems in an aircraft. <i>NSW RFS</i>
Aircraft officer	The aircraft officer position in the ICS is responsible for ground operations and overall provision of support, enabling a safe and efficient air operation to be conducted. <i>NSW RFS</i>
Allocated resources	Resources working at an incident. <i>AFAC</i>
Anchor point	An advantageous location, generally of mineral earth standard or equivalent, from which a fire control line can be constructed. It is used to minimise the possibility of being outflanked by a fire while the line is being constructed. <i>Vic report</i>
Appliance	A firefighting vehicle, usually equipped with a pump and water supply. <i>Vic report</i>
Area of origin	General location where the fire started. <i>Vic report</i>
Arson	A deliberately lit fire, where the intent of the person responsible was to cause harm or destruction to life or property. <i>Vic report</i>
Aspect	The direction towards which a slope faces. <i>NSW RFS</i>

Assembly area	An area where resources are organised and prepared for deployment. It includes the provision of welfare and equipment maintenance. Situated enroute from the control facility to the fire. These may be managed at either operations or divisional level. <i>NSW RFS</i>
Assessment	The process of determining if an individual has the prescribed skills, knowledge and experience needed to acquire a specific capability. <i>Vic report</i>
Atmospheric stability	The degree to which the atmosphere resists turbulence and vertical motion. <i>NSW RFS</i>
Automatic weather station	Equipment that provides real-time weather data. <i>Vic report</i>
Available fuel	The portion of the total fuel that would actually burn under various specified weather conditions. <i>Vic report</i>
Available resources	Resources at an incident and available for allocation at short notice. <i>AFAC</i>
Back burn (sometimes written 'backburn')	A deliberately lit fire to remove the fuel in front of an advancing bushfire or grass fire so that the advancing fire will have reduced levels of fuel and will therefore be more easily controlled. A back burn is generally lit into the wind and thus can be a dangerous manoeuvre. It should only be carried out by experienced fire fighters who understand the risks and the weather. Not to be confused with 'prescribed burn'. <i>WA BF</i>
Back burning	The act of conducting a back burn. <i>NSW RFS</i>
Barometer	A meteorological instrument used to measure atmospheric air pressure, expressed in hectopascals. <i>NSW RFS</i>
Base camp	A location where personnel are accommodated and fed for a period of time. A base camp usually contains catering, ablution and accommodation facilities, a water supply and a lighting system., and may include other facilities such as car parking, maintenance and servicing. <i>AFAC</i>
Biodiversity	Short for 'biological diversity'. The variety of nature, including the number of species and the amount of genetic variation present in an area of interest; the range of native plants and animals found at a particular site. (abbreviated) <i>WA BF</i>

Blacking out	The process of extinguishing or removing burning material along or near the fire control line, felling stags, trenching logs to prevent rolling, and the like, in order to make the fire safe. See also <i>Mopping up</i> . <i>Vic report</i>
Blow up	A sudden increase in fire intensity and rate of spread, sufficient to preclude immediate control or to upset existing suppression plans. It is often accompanied by powerful convection. <i>NSW RFS</i>
Buffer	<ol style="list-style-type: none"> 1. A protective margin of vegetation abutting a stream, spring, wetland, body of standing water, swampy ground or an area of rainforest, which protects it from potentially detrimental disturbances in the surrounding forest. Buffer width is defined as horizontal distance from which various operations are excluded. 2. A protective margin of vegetation around the edge of an area that shields or protects the surrounding vegetation from the effects of a fire or timber harvesting activities, etc. 3. A strip or block of land identified as providing a zone of defined activity or activity limits surrounding a specified area. 4. A fuelbreak. <i>Vic report</i>
Burn over	A section of fire that overruns personnel and/or equipment. <i>Vic report</i>
Burning brands	Lofted burning material such as bark, usually flaming. <i>Vic report</i>
Burning out	Intentionally lit fires to consume items of unburnt fuel inside the fire perimeter. <i>NSW RFS</i>
Burning program	A program that sets out a number of prescribed burns and schedules these for a designated area over a nominated time, normally looking ahead over one fire season (for the coming spring to the following autumn), but can also look ahead five years or more. <i>WA BF</i>
Burning rotation	The period between re-burning of a prescribed area for management purposes. <i>Vic report</i>
Burning unit or block	A specified land area for which prescribed burning is planned. <i>Vic report</i>
Burns 'slash' and 'regeneration'	Prescribed fires to reduce forest debris levels following logging. Used to prepare the site for revegetation. <i>Vic report</i>

Bush	A general term for forest or woodland but normally used to describe indigenous forest. <i>NSW RFS</i>
Bushfire	Used synonymously with wildfire to describe an unplanned fire (burning in predominantly native vegetation). <i>Vic report</i>
Bush fire	A general term used to describe a fire in vegetation. <i>NSW RFS</i>
Bushfire (sometimes written 'bush fire')	An unplanned fire in bush. This is a general term, uniquely used by Australians, and includes grass fires, forest fires and scrub fires – that is, any fire outside the built-up urban environment. Also sometimes known as a wildfire. In the United States it is called a wildfire and sometimes a 'wildland fire'; in Europe and Asia it is usually called a 'forest fire'. <i>WA BF</i>
Bushfire danger period	A period of the year, either established by legislation or declared by the relevant agency, when restrictions are placed on the use of fire due to dry vegetation and the existence of conditions conducive to the spread of fire. <i>EMA</i>
Bushfire management	All those activities directed to prevention, detection, damage mitigation and suppression of bushfires. Includes bushfire legislation, policy, administration, law enforcement, community education, training of firefighters, planning, communications systems, equipment, research, and the multitude of field operations undertaken by land managers and emergency services personnel relating to bushfire control. (abbreviated) <i>WA BF</i>
Bushfire threat	A term used to describe and analyse the danger that a bushfire poses in a particular place, or to specified values. There are four aspects: (i) the risk of a fire starting, and of it becoming uncontrollable; (ii) the values which will be lost or damaged if a bushfire starts and gets away; (iii) the extent of damage which could be caused; and (iv) the resources which can be brought to bear on a fire and their efficiency and effectiveness. (abbreviated) <i>WA BF</i>
CAD	Computer-aided (call taking and) dispatch system. <i>Vic report</i>
Campaign fire	A fire of a size and/or complexity that requires substantial firefighting resources, generally requiring several days or possibly weeks, to suppress. <i>Vic report</i>

Candle	A tree (or small clump of trees) is said to 'candle' when its foliage ignites and flares up, usually from the bottom to the top. <i>NSW RFS</i>
Canopy	The crown of a tree. <i>Vic report</i>
Chaining	The process of flattening vegetation (usually mallee or scrub) by dragging a heavy chain or cable between two large tractors or bulldozers. <i>Vic report</i>
Climate	The atmospheric conditions of a place over an extended period of time. <i>Vic report</i>
Cloud cover	The amount of sky covered or obscured by cloud, expressed in eights. Eight eights is complete cloud cover. <i>NSW RFS</i>
Coarse fuel	Dead fuel of diameter greater than 6mm, such as logs and large branchwood. <i>Vic report</i>
Combat agency	The agency identified as being primarily responsible for responding to a particular emergency; synonymous with 'combating agency', 'combating authority', 'lead combat agency', and 'lead combat authority'. <i>EMA</i>
Combatant agency/authority	The agency, service, organisation or authority with the legislative authority for the control of the incident. <i>NSW RFS</i>
Command	The direction of members and resources of an agency in the performance of the agency's role and tasks. Authority to command is established in legislation or by agreement within an agency. Command relates to agencies and operates vertically within an agency. <i>NSW RFS</i>
Communications plan	Details the methods and systems for people to communicate with each other; the incident management structure, including the actual radio channels/mobile phone numbers. <i>AFAC</i>
Communications unit	A forward facility used for supporting communications at any operational level. <i>NSW RFS</i>
Competency	Skills and knowledge and their application within an occupation to the standard of performance required in the workplace. <i>Vic report</i>
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event. <i>AS/NZS</i>

Contained (incident status)	see <i>Fire status 'contained'. Vic report</i>
Control	Control refers to the overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation or in an emergency plan and carries with it the responsibility for tasking other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations. <i>AFAC</i>
Control – deputy incident controller	A person nominated to deputise for the incident controller. For an incident management team, the person would usually act as IC on another shift. If the situation is large enough, a deputy might support the IC on the same shift. <i>NSW RFS</i>
Control – incident controller	The individual responsible for the management of all incident operations. <i>NSW RFS</i>
Control – liaison officer/agency representative	Note: Under AIIMS, the liaison officers are called agency representatives, although the term 'agency representative' is not commonly used. The Rural Fire Service needs to firm up on one term or the other. <i>NSW RFS</i>
Control – management support officer	Under the incident controller, manages the information flow, documentation and filing for the incident. <i>NSW RFS</i>
Control – media liaison	Deals directly with the media regarding the incident. Works closely with the information officer and may liaise directly with the incident controller. <i>NSW RFS</i>
Control authority	The agency, service, organisation or authority with legislative responsibility for control of the incident. (Also referred to as the responsible authority or agency.) <i>AFAC</i>
Control line	See <i>Fire control line. Vic report</i>
Control point	The area used as a location for administration and command by the personnel managing the control, operations, planning and logistics of a type one incident. <i>Vic report</i>
Convection column	The rising column of smoke, ash, embers and other matter generated by a fire. <i>Vic report</i>

Coordination	Coordination refers to the bringing together of organisations and other resources to support an emergency management response. It involves the systematic acquisition and application of resources (organisational, human and equipment) in an emergency situation. <i>AFAC</i>
Crew	The basic unit of a bush fire suppression force. It normally consists of five to 10 personnel. <i>NSW RFS</i>
Crew leader	Person responsible for the safety and proficiency of crew members when carrying out allocated tasks. <i>Vic report</i>
Critical incident stress	Unusually strong emotional reaction to an abnormal situation, which may have the potential to interfere with the ability of personnel to function, either at the scene or later. <i>Vic report</i>
Crown fire	A fire burning in the crowns of trees. (abbreviated) <i>Vic report</i>
Crown land	Land that is, or is deemed to be, unalienated land of the Crown. It includes: <ul style="list-style-type: none"> • land of the Crown reserved permanently or temporarily or set aside by or under an Act; • land of the Crown occupied by a person under a lease, licence or other right. <i>Vic report</i>
Crown scorch	Browning of the needles or leaves in the crown of a tree or shrub caused by heat from a fire. <i>NSW RFS</i>
Dead fuels	Fuels having no living tissue. Their moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), air temperature and solar radiation. <i>Vic report</i>
Defence assistance to the civil community (DACC)	Assistance to the community provided by Department of Defence personnel in the event of natural disaster or civil emergency. <i>EMA</i>
Defensive strategy	A firefighting strategy used where a fire is too intense to be safely or effectively attacked or extinguished and the protection of lives and assets is the priority. <i>Vic report</i>

Deliberate fire	A fire resulting from a person placing burning material to cause ignition. The intent of the person may have been to cause harm or destruction to life or property (arson – criminal offence) or to modify fuels and/or vegetation for land management purposes (summary offence). See also <i>Arson. Vic report</i>
Detection	The discovery of a fire, usually by individuals, fire towers, aircraft and automatic devices. <i>Vic report</i>
Dew	The moisture which collects in small droplets on the surface of substances and vegetation by atmospheric condensation, chiefly at night. <i>NSW RFS</i>
Direct attack	A method of fire attack where wet or dry fire fighting techniques are used. It involves suppression action right on the fire edge, which then becomes the fire line. <i>NSW RFS</i>
Dispatch	The act of ordering attack crews and or support units to respond to a fire or from one place to another. <i>NSW RFS</i>
Division	That organisational level having responsibility for operations within a defined geographic area or with a functional responsibility. <i>AFAC</i>
Division command point	Location at an incident from which the division commander of that division operates. <i>AFAC</i>
Division commander	Person responsible for implementing the Incident Action Plan appropriate to the division. <i>Vic report</i>
Drought factor	A broad measure of fuel availability as determined by drought index and recent rainfall. <i>Vic report</i>
Drought index	A numerical value, such as the Keetch–Byram Drought Index, reflecting the dryness of soils, deep forest litter, logs and living vegetation. <i>Vic report</i>
Dry firefighting	The suppression of a fire without the use of water. This is normally achieved by removing the fuel by the use of hand tools or machinery. <i>NSW RFS</i>
Duff	The mat of undecomposed or partly decomposed vegetation matter on the forest floor, the original vegetative structures still being recognisable. <i>NSW RFS</i>
Ecological burning	A form of prescribed burning. Treatment with fire of vegetation in nominated areas to achieve specified ecological objectives. <i>Vic report</i>

Ecology	Ecology is the branch of the natural sciences devoted to the study of the interactions between plants, animals and their environment. (abbreviated) <i>WA BF</i>
Ecosystem	An assemblage of plants and animals in a particular physical environment A terrestrial ecosystem encompasses a particular biota, the soil, rock outcrops, wetlands and waterways and the atmosphere. Different ecosystems may respond differently to external pressures, for example, a bushfire, a frost, a flood or prolonged drought. The principal focus of the science of ecology is to understand different responses to imposed or natural events, and the many interactions between species and the environment. <i>WA BF</i>
Elevated dead fuel	Dead fuel forming part of, or being suspended in, the shrub layer. <i>NSW RFS</i>
Elevated fuel	Combustible material that is erect or suspended above the ground surface, and often comprises shrub, heath and suspended material. <i>Vic report</i>
Embers	Glowing particles cast from the fire (as 'showers' or 'storms'). <i>Vic report</i>
En route resources	Resources despatched to an incident that have not yet checked in. <i>AFAC</i>
ENSO	El-Nino - Southern Oscillation phenomenon. Condition when central Pacific Ocean is warmer than average, eastern Australia experiences dry air masses resulting in drought. <i>Vic report</i>
Entrapment	A situation in which individuals are exposed to life threatening or potentially life threatening conditions from which they cannot safely remove themselves. <i>Vic report</i>
Equipment	All material supplied to an incident excluding personnel and vehicles. <i>AFAC</i>
Escape route	A pre-planned route away from a fire should it become unsafe to remain at or near the fire or prescribed burn. <i>Vic report</i>
Evacuation	The temporary relocation of persons from dangerous or potentially dangerous areas to safer areas. <i>Vic report</i>

Extreme (bushfire) conditions	Extreme bushfire conditions occur when the fuel load is high, the temperature is high, the wind strength is high, the drought index is high, the relative humidity is low, and the fuel moisture is low. These conditions can occur every summer in southern Australia. A bushfire occurring under extreme conditions moves rapidly and generates intense heat and is very difficult or impossible to suppress. <i>WA BF</i>
Extreme fire behaviour	<p>A level of wildfire behaviour characteristics that ordinarily precludes methods of direct suppression action. One or more of the following is usually involved:</p> <ul style="list-style-type: none"> • high rates of spread • prolific crowning and/or spotting • presence of fire whirls • a strong convection column <p>Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously. <i>NSW RFS</i></p>
Extreme fire danger	The highest fire danger classification. <i>NSW RFS</i>
Facilities	Permanent and temporary facilities where personnel sleep, cook, maintain and repair equipment. <i>AFAC</i>
Fall-back control line	Any control line which is at a distance from the fire perimeter and is the second control line at which the fire perimeter may be stopped should it cross the first fire control line. <i>NSW RFS</i>
Fine fuel	Fuels such as grass, leaves, and fine twigs that ignite readily and are burnt rapidly when dry. They are usually defined as less than 6 millimetres in thickness. <i>Vic report</i>
Fingers	Long and narrow slivers of fire which extend beyond the head or flanks. <i>Vic report</i>
Fire access road/track	A track constructed and/or maintained for fire management purposes, which is generally of a standard adequate for all-weather use by two-wheel-drive vehicles. <i>Vic report</i>
Fire behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography. Common measures of fire behaviour are rate of spread, flame height, fire spotting distance and intensity. <i>Vic report</i>

fire brand	A piece of burning material, commonly bark from eucalypts. Often windborne and capable of igniting fires. <i>Vic report</i>
Fire break	Any natural or constructed discontinuity in a fuel bed that may be used to segregate, stop and control the spread of a fire, or to provide a fire control line from which to suppress a fire. See also <i>Fire control line</i> and <i>Fuel break</i> . <i>Vic report</i>
Fire control line	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit/prevent the spread of fire. See also <i>Fire break</i> and <i>Fuel break</i> . <i>Vic report</i>
Fire crew	Two or more firefighters organised to work as a unit with a nominated crew leader. <i>Vic report</i>
Fire danger	The resultant of all the factors, which determine whether fires start, spread and do damage, and whether and to what extent they can be controlled. <i>Vic report</i>
Fire danger	An index which combines all the factors that determine the likelihood of a bushfire starting, spreading and causing damage to identified values, and the difficulty of control. Used for daily preparedness planning by land managers and on signs warning the public of the daily fire danger on a scale from low to extreme. <i>WA BF</i>
Fire Danger Index (FDI)	A relative number (1 to 100) denoting an evaluation of rate of spread or suppression difficulty for specific combinations of fuel, fuel moisture and wind speed. <i>NSW RFS</i>
Fire danger rating (FDR)	A relative phrase (low, moderate, high, very high, extreme) denoting an evaluation of rate of spread or suppression difficulty for specific combinations of fuel, fuel moisture and wind speed. <i>NSW RFS</i>
Fire edge	Any part of the boundary of a fire at a given time. The entire boundary is termed the Fire Perimeter. <i>Vic report</i>
Fire effects	The physical, biological and ecological impact of fire on the environment. <i>NSW RFS</i>

Fire ground	The area in the vicinity of the wildfire and fire suppression operations, and the area immediately threatened by the fire. It includes burning and burnt areas; constructed and proposed fire control lines; the area where firefighters, vehicles, machinery and equipment are located when deployed; roads and access points under traffic management control; tracks and facilities in the area surrounding the actual fire; and may extend to adjoining area directly threatened by the fire. <i>Vic report</i>
Fire hazard	Any fuel which if ignited may be difficult to extinguish. <i>NSW RFS</i>
Fire hazardous area	An area where the combination of vegetation, topography, weather and the threat of fire to life and property, create difficult and dangerous problems. <i>NSW RFS</i>
Fire incident	An incident reported as a fire to a fire agency and requiring a response. <i>Vic report</i>
Fire intensity (kW/m)	<ol style="list-style-type: none"> 1. The rate of energy release for a given unit of fire perimeter. 2. The heat (kilowatts) released per metre of fire perimeter; classified as low (<500 kWm⁻¹), moderate (500–3000 kWm⁻¹), high (3000–7000 kWm⁻¹) or very high (7000–70 000 kWm⁻¹). <i>Vic report</i>
Fire line (also known as a fire control line or a firebreak)	A natural or constructed barrier such as a graded track or ploughed soil, or treated fire edge free from flammable vegetation, used in both fire suppression and prescribed burning to limit the spread of fire or to provide access for firefighters. <i>WA BF</i>
Fire management	All activities associated with the management of land, including the use and exclusion of fire to meet resource management goals and objectives. <i>Vic report</i>
Fire management	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives. <i>EMA</i>
Fire perimeter	The entire outer boundary of a fire area. <i>Vic report</i>
Fire preparedness	Activities undertaken in advance of wildfire occurrence to ensure effective fire suppression. <i>Vic report</i>
Fire prevention	All activities associated with minimising the incidence and severity of unplanned fire, particularly those of human origin. <i>Vic report</i>

Fire prevention	All pre-fire activities designed to reduce fuel quantities, remove known hazards, and prepare properties for the possibility of fires occurring so that the fire development and spread is minimised and property damage is mitigated. <i>EMA</i>
Fire progress map	A map providing information on a fire, detailing the location of its perimeter, deployment of suppression forces and the progress of suppression activities. <i>NSW RFS</i>
Fire protection	All activities designed to protect an area including human life, property, assets and values) from damage by fire. <i>Vic report</i>
Fire protection	Provisions made to detect, suppress or limit the spread of fires and particularly design features of buildings aimed at limiting the spread of fire from the area of origin. <i>EMA</i>
Fire regime	The season, intensity, frequency and type of fires (peat or above ground) in a given location over a period of time, representing a number of successive fire events at that location. <i>Vic report</i>
Fire regime	Fire regime describes a series of fires at the same locality. A regime has many variables, for example the fire frequency (or interval between fires), intensity, season and distribution across the landscape, or patchiness. (abbreviated) <i>WA BF</i>
Fire regime	The history of fire use in a particular vegetation type or area including the frequency, intensity and season of burning. It may also include proposals for the use of fire in a given area. <i>NSW RFS</i>
Fire retardant	A chemical generally mixed with water designed to retard combustion. It is applied as slurry from the ground or air. <i>NSW RFS</i>
Fire risk	The probability of a fire starting. <i>Vic report</i>
Fire run	A rapid advance of a fire front. It is characterised by a marked transition in intensity and rate of spread. <i>Vic report</i>
Fire safety measures	Any measures to improve personal fire safety. <i>Vic report</i>

Fire scar	<ol style="list-style-type: none"> 1. A healing or healed-over injury caused or aggravated by fire on a woody plant. 2. Fire footprint: area burned by a fire particularly as seen in an aerial photograph or on satellite imagery. <i>Vic report</i>
Fire status 'being controlled'	Effective strategies are in operation or planned for the entire perimeter. <i>NSW RFS</i>
Fire status 'contained'	The whole of the fire perimeter is behind identifiable control lines. Active firefighting and/or mop-up are proceeding. Active fire may be located inside the perimeter. <i>NSW RFS</i>
Fire status 'going'	Indicates any fire that is spreading on one or more flanks. Effective control strategies are not in place for the entire perimeter. <i>NSW RFS</i>
Fire status 'out'	The fire is at a state that allows its removal from the list of current fires. <i>NSW RFS</i>
Fire status 'patrol'	The fire is at a stage where firefighting resources are only required for patrol purposes and major reignition is unlikely. <i>NSW RFS</i>
Fire storm	Violent convection caused by a large continuous area of intense fire. Often characterised by destructively violent surface indrafts, a towering convection column, long distance spotting, and sometimes by tornado like whirlwinds. <i>Vic report</i>
Fire suppression	The activities connected with restricting the spread of wildfire, following its detection and making it safe. See also <i>Response</i> . <i>Vic report</i>
Fire Suppression organisation	The management structure, usually shown in the form of an organisation chart, of the personnel collectively assigned to the suppression of a fire. <i>NSW RFS</i>
Fire threat	The impact a fire will have on the community. <i>NSW RFS</i>
Fire tower	Lookout tower strategically located and manned to detect and report the occurrence and location of fires. <i>Vic report</i>
Fire trap	Any location or situation in which it is highly dangerous to implement fire suppression activities. <i>NSW RFS</i>

Fire triangle	Diagrammatic expression of the three elements that are necessary for a fire to occur: FUEL – HEAT – OXYGEN. The removal of any one of these will extinguish a fire. <i>WA BF</i>
Fire whirl	A spinning column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris and flame. Fire whirls range in size from less than a metre in diameter to small tornados in intensity. <i>NSW RFS</i>
Fire wind	The inflow of air at the fire source caused by the action of convection. It is not to be confused with a prevailing wind. <i>NSW RFS</i>
Firebombing	The technique of dropping a suppressant or retardant from specialist aircraft to suppress a fire. <i>Vic report</i>
Firefighter	Any employee, volunteer or agent from any fire agency who occupies or is designated to undertake a role for the purpose of fire suppression. <i>Vic report</i>
Firefighting operations	Any work or activity directly associated with control of fire. <i>Vic report</i>
First attack	The suppression work undertaken in the initial response to an incident. <i>Vic report</i>
Flame angle	The angle of the flame in relation to the ground, caused by wind direction or the effect of a slope. <i>NSW RFS</i>
Flame height	The vertical distance between the tip of the flame and ground level, excluding higher flame flashes. <i>NSW RFS</i>
Flammability	The ease with which a substance is set on fire. <i>NSW RFS</i>
Flank attack	Obtaining control of a fire by attacking its side/s (flank). <i>NSW RFS</i>
Flanks	Those parts of a fire's perimeter that are roughly parallel to the main direction of spread. <i>NSW RFS</i>
Flare up	Any sudden acceleration of fire spread or intensification of fire or a part of a fire. A flare up is of relatively short duration and does not radically change existing control plans. <i>NSW RFS</i>
Flash fire	A fast-moving fire, consuming most of the fine fuels available. <i>NSW RFS</i>

Forest	<ol style="list-style-type: none"> 1. An area, incorporating all living and non-living components, that is dominated by trees with an existing or potential stand height exceeding 5 metres, and with existing or potential projective foliage cover of overstorey strata of at least 30 per cent. This definition includes Australia's diverse native forests and plantations, regardless of age. 2. Woody vegetation with a potential top height greater than five metres and with a crown cover projection greater than 10 per cent. <i>Vic report</i>
Forest Fire Danger Index (FFDI)	The index related to the chances of a fire starting, its rate of spread, intensity and difficulty of suppression according to various combinations of temperature, relative humidity, wind speed and both long and short term drought effects in a forest. See also <i>Fire Danger Index</i> . Readings are normally taken at 3 pm. <i>Vic report</i>
Forward looking infra red unit (FLIR)	Specialised equipment designed to detect and record thermal energy instead of visible light. For fire control purposes, as thermal energy is able to pass through smoke, FLIR units are effectively able to 'see' through smoke. <i>Vic report</i>
Forward rate of spread	The linear rate of advance of the head fire, usually expressed in kilometres per hour or metres per second. <i>Vic report</i>
Fuel	<p><i>Fire fuel.</i> Any material such as grass, leaf litter, twigs, bark, logs and live vegetation that can be ignited and sustain a fire. Measured in tonnes per hectare.</p> <p><i>Fuel type.</i> An association of fuel characteristics such as species, form, size, and arrangement that will cause a predictable rate of spread, or difficulty of suppression, under specified weather conditions.</p> <ul style="list-style-type: none"> • <i>Heavy fuel.</i> Dead woody material in contact with the soil surface, greater than 25 millimetres in diameter. Also called 'coarse fuel'. • <i>Litter fuel.</i> The top layer of the forest floor composed of loose dead sticks, branches, twigs and recently fallen leaves little altered by decomposition. • <i>Surface fuel.</i> The loose surface litter on the forest floor. Can consist of fallen leaves, twigs, bark, small branches, grasses, shrubs, tree saplings less than a metre high, heavier branches, fallen logs, stumps, seedlings and small plants. • <i>Trash.</i> The component of surface fuel above the leaf

litter layer made up of dead twigs, branches and scrub debris of at least 10 millimetres diameter.

- *Fine fuel.* Dead leaves, twigs and bark in the litter layer less than 6 millimetres thick as well as the green leaves and twigs of shrubs and grasses less than 2 millimetres in diameter, and all less than 1 metre above the ground.
- *Elevated fuel.* Fuels that are suspended above the ground, such as shrubs, bark, seedlings.
- *Available fuel.* The amount or weight of fuel that will be consumed under prevailing weather conditions during a prescribed burn or a bushfire. Available fuel can be less than total fuel, where part of the fuel profile is still damp from previous rain. Measured in tonnes per hectare.
- *Total fuel.* The sum of the fuel quantity of litter, trash, scrub and fuels that are available to burn under extreme wildfire conditions. Measured in tonnes per hectare.
- *Fuel age.* The period of time elapsed since fuel was last burnt, usually expressed in years.
- *Fuel load.* The oven-dry weight of fuel per unit area. Also known as fuel quantity. Expressed as tonnes per hectare. *WA BF*

Fuel array	The totality of fuels displayed in a location: fine and coarse, live and dead. <i>Vic report</i>
Fuel moisture content	The moisture content of fuel expressed as a percent of the oven dry weight of the fuel. <i>NSW RFS</i>
Fuel reduction burn	A prescribed burn carried out with the intention of reducing the fire fuel so as to minimise the intensity of any subsequent bushfire and to ensure the bushfire is easier and safer to suppress. <i>WA BF</i>
Fuel break	A strip of land (not including areas subject to broad area prescribed burning) where vegetation has been removed. See also <i>Fire break</i> and <i>Fire control line</i> . <i>Vic report</i>
Function	There are four functions incorporated into the AIIMS system – Control, Planning, Operations and Logistics. <i>AFAC</i>
Going (incident status)	See <i>Fire status 'going'</i> . <i>Vic report</i>

Grassfire	An unplanned fire burning in predominantly grassy fuels. <i>Vic report</i>
Grassland curing	A proportion of dead material in grasslands – usually increases over summer as tillers die off and dry out, increasing the risk of grassland fire. <i>Vic report</i>
Hand crew	A fire suppression crew trained and equipped to fight fire with hand tools. <i>NSW RFS</i>
Hand line	A fire line constructed with hand tools. Normally it is a narrow line constructed through country too rough or environmentally sensitive for the use of machines. <i>NSW RFS</i>
Hazard	A source of potential harm, or a situation with a potential to cause loss. <i>AS/NZS</i>
Hazard management	The processes and programs directed towards effective minimisation of fire hazards. <i>Vic report</i>
Head fire	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind and/or upslope. <i>NSW RFS</i>
Heli torch	A machine slung underneath a helicopter that drips ignited, gelled petroleum and is used to ignite burns. <i>NSW RFS</i>
Hot refueller	A trained person responsible for the operation of the equipment for the ‘hot’ refuelling of helicopters. <i>NSW RFS</i>
Hot spot	A particularly active part of a fire. <i>NSW RFS</i>
Incident	Any unplanned event requiring emergency intervention. <i>AFAC</i>
Incident action plan	Is the plan used to describe the incident objectives, strategies, resources and other information relevant to the control of an incident. <i>AFAC</i>
Incident control centre	The location where the incident controller and various members of the incident management team provide overall direction of response activities. <i>Vic report</i>
Incident control point	Field location from which the incident controller operates. <i>AFAC</i>

Incident Control System (ICS)	Incident Control System is a command structure set up under AIIMS to systematically and logically manage emergency incidents, including wildfires, from small simple incidents to large difficult or multiple situations. It is designed to expand to ensure effective span of control at all levels. <i>Vic report</i>
Incident controller	Person responsible for the overall management of all fire activities, including the development and implementation of strategy, and the ordering and release of resources. <i>Vic report</i>
Incident controller	The individual responsible for the management of all incident control activities across a whole incident. <i>AFAC</i>
Incident management team (IMT)	The group of incident management personnel comprised of the incident controller, and the personnel appointed to be responsible for the functions of Planning, Operations and Logistics. <i>AFAC</i>
Incident objective	An incident objective is a goal statement indicating the desired outcome of the incident. Incident objectives guide the development of the Incident Action Plan and must reflect the policies and needs of the control authority supporting agencies. All factors affecting the incident and its potential impact must be considered before determining the objective. <i>AFAC</i>
Incident strategies	The incident strategies will be developed from the incident objectives and will describe how the incident management team plan to resolve the incident. There is a requirement for strategies to be developed throughout the incident and they should be reviewed for each operational period. <i>AFAC</i>
Indirect attack	A fire suppression method where the fire is intended to be brought under control a considerable distance away from its current position, but within a defined area, bounded by existing or planned fire control lines. Backburning is a common method of achieving this. <i>Vic report</i>
Initial attack	The first suppression work on a fire. <i>NSW RFS</i>
Interface area	Area where residences and forest are adjacent. Area where public and private land meet. <i>Vic report</i>
Inversion	A layer of the atmosphere in which temperature increases with increasing altitude. A condition of strong atmospheric stability. <i>Vic report</i>

Island	An unburnt area within a fire perimeter. <i>NSW RFS</i>
Junction zone	An area of greatly increased fire intensity caused by two fire fronts (or flanks) burning towards one another. <i>NSW RFS</i>
Keetch–Byram Drought Index (KBDI)	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation and expressed as a scale from 0 to 200. <i>NSW RFS</i>
Knock down	The rapid application and concentration of water or foam, intended to reduce fire intensity prior to manual follow up action. <i>NSW RFS</i>
Lighting pattern	The lighting pattern adopted by firefighters during prescribed burning operations, or indirect attack. <i>NSW RFS</i>
Lightning fire	Fire started by lightning striking. (abbreviated) <i>WA BF</i>
Likelihood	Used as a qualitative description of probability or frequency. <i>AS/NZS</i>
Litter	The top layer of the forest floor composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves and needles. <i>Vic report</i>
Loss	Any negative consequence, financial or otherwise. <i>AS/NZS</i>
Management by objectives	Is a process of consultative management where the incident management team determines the desired outcomes of the incident. These outcomes or incident objectives are then communicated to the commander and crews involved in the operation. <i>AFAC</i>
Microburst	A strong downdraught associated with a storm or shower and having a relatively small size and short duration. It may be associated with rainshafts or high-based precipitating clouds. <i>NSW RFS</i>
Mild conditions	Conditions of weather and fuel such that if a fire starts it will behave mildly and can be easily suppressed. For example: <ul style="list-style-type: none"> • wind – less than 15 kilometres per hour • temperature – less than 25°C • relative humidity – greater than 50 per cent • moisture content of fuel 2 to 20 per cent • tonnes per hectare of fuel – up to 8 tonnes per hectare. <i>WA BF</i>

Mineral earth	A non-flammable soil surface, either natural or prepared. <i>Vic report</i>
Mopping up	Making a fire safe after it has been controlled, by extinguishing or removing burning material along or near the fireline, felling stags, trenching logs to prevent rolling and the like. <i>NSW RFS</i>
Multi-agency incident	A situation that occurs when more than one agency have suppression responsibilities or when both agencies' areas of responsibility are threatened or included within the operational area of a fire incident. <i>Vic report</i>
Objective	A goal statement of what is to be achieved. <i>Vic report</i>
Offensive strategy	A firefighting strategy used in wildfire situations where the fire can safely and effectively be attacked or extinguished. <i>Vic report</i>
OH&S	Occupational health and safety. <i>Vic report</i>
Operational period	The period of time scheduled for execution of the incident action plan. <i>AFAC</i>
Parallel attack	A method of suppression in which fireline is constructed approximately parallel to and just far enough from the fire edge to enable firefighters and equipment to work effectively. The line may be shortened by cutting across unburnt fingers. The intervening strip of unburnt fuel is normally burnt out as the control line proceeds, but may be allowed to burn out unassisted where this occurs without undue delay or threat to the line. <i>NSW RFS</i>
Patrol	<ol style="list-style-type: none"> 1. To travel over a given route to prevent, detect and suppress a fire. 2. To go back and forth vigilantly over the length of a control line during and/or after construction, to prevent breakaways, control spot fires and extinguish overlooked hot spots. <i>Vic report</i>
Planning meeting	A meeting to prepare the incident action plan, attended by the incident management team and others and held as required. <i>AFAC</i>
Plantation	A forest established by the planting of trees of either native or exotic species. Can also comprise dense plantings of commercial shrub species, for example oil mallees or tea tree plantations, or horticultural crops such as sugar cane. <i>WA BF</i>

Point of origin	The location where the fire started. <i>Vic report</i>
Pre-planned dispatch	The pre-planned dispatch of designated suppression forces to fires in predetermined zones. It is usually dependent on the location of the fire and the forecast fire danger. <i>NSW RFS</i>
Prepared community	<p>A community that has developed effective emergency management arrangements at the local level, resulting in:</p> <ul style="list-style-type: none"> • an alert, informed and active community that supports its voluntary organisations • an active and involved local government • agreed and coordinated arrangements for prevention, preparedness, response and recovery. <i>EMA</i>
Preparedness	All activities undertaken at any time in advance of a wildfire occurrence to decrease wildfire area and severity and to ensure more effective suppression. <i>Vic report</i>
Prescribed burn	The controlled application of fire to a defined area of land conducted in accordance with an approved burn plan to meet specified management objectives. <i>Vic report</i>
Prescribed burn	<p>A general term indicating the planned application of fire to achieve specific land management objectives. 'Prescribed burn' replaces the old term 'controlled burn' and is preferred to 'pre-emptive burn' because it more accurately describes the process and the objectives.</p> <p>The prescribed burn is carried out under predetermined (or 'prescribed') environmental conditions within defined geographical boundaries, and at the time, intensity and rate of spread required to achieve the specific land management objectives. Before a prescribed burn is commenced a 'burn prescription' is prepared. The prescription details the objectives of the burn, the conditions under which it will be carried out, the precise location, and deals with any specific considerations for the particular burn. It is desirable that burning prescriptions are drawn up a year or more in advance, to ensure all key factors are checked and put in place. (abbreviated) <i>WA BF</i></p>

Prescribed burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity and rate of spread required to attain planned resource management objectives. (Includes fuel reduction burning, ecological burning and regeneration burning.) <i>Vic report</i>
Prescribed burning	The deliberate and controlled burning of vegetation growing close to, or on the ground to minimise the fuel supply for future bush or forest fires. <i>EMA</i>
Prescription	A written statement defining the objectives to be attained during prescribed burning. This statement considers the condition of temperature, humidity, wind direction and speed, fuel moisture, and soil moisture under which the fire will be allowed to burn. This is generally described within acceptable ranges of the various indices, and the limit of the geographic area to be covered. <i>EMA</i>
Probability	The likelihood of a specific event or outcome measured by the ratio of specific events or outcomes to the total number of possible events or outcomes. Probability is expressed as a number between 0 and 1, with 0 indicating an impossible event or outcome and 1 indicating an event or outcome is certain. <i>AS/NZS</i>
Pumper	A firefighting vehicle equipped with a large capacity pump, small water tank and hose. Generally intended to be operated when stationary, from reticulated or static water supplies. <i>Vic report</i>
Quick-fill pump	A high-volume water pump used for filling water-holding apparatus. <i>Vic report</i>
RAFT	Remote area firefighting team. <i>NSW RFS</i>
Rappel dispatcher	The rappel dispatcher is responsible for the pre-flight preparation of the helicopter for a rappel operation and the safe dispatch of rappellers and equipment from the helicopter to the ground. <i>NSW RFS</i>
Rate of spread	The forward progress per time unit of the head fire or another specified part of the fire perimeter. The key variables affecting rate of spread are the type, arrangement and quantity of fuel, the dead fuel moisture content, wind speed at the fire front, the width of the fire and the slope of the ground. <i>Vic report</i>
Rate of spread	The forward progress per unit time of the head fire or another specified part of the fire perimeter. <i>NSW RFS</i>

Rate of spread (ROS)	<p>The rate at which a fire advances. It is measured in metres per hour. Mild fires used for prescribed burning in forests have rates of spread generally below 40 metres per hour.</p> <p>A bushfire spreads in four directions – the headfire (which burns downwind or with the wind behind it), the flank fires (which spread sideways) and the tailfire (where the back of the fire burns slowly into the wind). A fire is usually elliptical in shape, since the headfire rate of spread is always at least double the flankfire rate of spread. Intense bushfires can have a headfire rate of spread that exceeds 3000 metres an hour. The rate of spread depends mainly on wind strength, vegetation type, fuel quantity and slope. (abbreviated) <i>WA BF</i></p>
Readiness and response plan	<p>A plan outlining desirable levels of readiness of personnel, systems and equipment and their locations and availability for the detection and control of wildfire. <i>Vic report</i></p>
Rear	<p>The section of the perimeter opposite to and generally upwind (or downslope) from the head of the fire. <i>NSW RFS</i></p>
Re-burn	<p>Burning of an area over which a fire has previously passed but left fuel that can be ignited. <i>NSW RFS</i></p>
Reconnaissance	<p>Inspection of a fire area to obtain information about current and probable fire behaviour and suppression. <i>Vic report</i></p>
Recovery	<p>The post-fire phase where damaged assets are salvaged, repaired or replaced; sites disturbed by fire suppression operations are rehabilitated; the natural response of the ecosystem is monitored, and managed if necessary; health and safety issues arising from the fire suppression operation are addressed; and new information learned from the incident is incorporated into the planning for future wildfire events. <i>Vic report</i></p>
Recovery	<p>The coordinated process of supporting emergency-affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing. <i>EMA</i></p>

Regeneration burn	A burn lit under prescribed conditions for the purpose of achieving regeneration of a particular vegetation type. In forestry the aim is usually to regenerate seedlings of adjacent trees with viable seed in their crowns, but the same burn will also regenerate understorey species present in the forest. In wildlife management, a regeneration burn may be used to create a particular habitat for some selected species of fauna, or to favour a particular plant. <i>WA BF</i>
Re-ignition	A return to the previous state of combustion or chemical change. <i>Vic report</i>
Relative humidity	The amount of water vapour in a given volume of air, expressed as a percentage of the maximum amount of water vapour the air can hold at that temperature. <i>Vic report</i>
Residual risk	The level of risk remaining after risk treatment measures have been taken. <i>Vic report</i>
Residual risk	The remaining level of risk after risk treatment measures have been taken. <i>AS/NZS</i>
Resources	All personnel, vehicles, plant and equipment available, or potentially available, for incident tasks. <i>AFAC</i>
Response	Term used in disaster management to describe the processes, procedures and actions taken to combat the disaster. <i>Vic report</i>
Response time	The time taken between the report of a fire or incident and arrival at the scene. It includes both reaction time and travel time. <i>NSW RFS</i>
Retardant	A fire retardant is a chemical applied to a fire to reduce combustion rates. Retardant is sometimes delivered by fixed wing aircraft or helicopter, or is applied in the form of foam from a fire truck. Aerial retardant dropping is usually regarded by firefighters as a 'holding action' that is, it helps to keep fire intensity and fire spread down until ground firefighters can reach the fire. Most land managers prefer to drop water rather than fire retardant chemicals into native forests and conservation reserves because of uncertainty about after-effects. <i>WA BF</i>
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood. <i>AS/NZS</i>

Risk analysis	A systematic use of available information to determine how often specified events may occur and the magnitude of their consequences. <i>AS/NZS</i>
Risk assessment	The overall process of risk analysis and risk evaluation. <i>AS/NZS</i>
Risk avoidance	An informed decision not to become involved in a risk situation. <i>AS/NZS</i>
Risk evaluation	The process used to determine risk management priorities by comparing the level of risk against predetermined standards, target risk level or other criteria. <i>AS/NZS</i>
Risk management	The culture, processes and structures that are directed towards the effective management of potential opportunities and adverse effects. <i>AS/NZS</i>
Risk-management process	The systematic application of management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risk. <i>AS/NZS</i>
Risk reduction	A selective application of appropriate techniques and management principles to reduce either likelihood of an occurrence, its consequences, or both. <i>AS/NZS</i>
Risk transfer	Shifting the responsibility or burden for loss to another party through legislation, contract, insurance or other means. Risk transfer can also refer to shifting a physical risk or part thereof elsewhere. <i>AS/NZS</i>
Risk treatment	Selection and implementation of appropriate options for dealing with risk. <i>AS/NZS</i>
Safety zone	An area cleared of flammable materials used for escape if the line is outflanked or in case a spot fire outside the control line renders the line unsafe. In fire operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuelbreaks. They are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity. <i>Vic report</i>

Scorch height	The maximum height above the ground to which the leaves of trees or shrubs are browned by a fire. Generally about four times the flame height. In Australia, eucalyptus tree crowns that are merely scorched by a fire tend to recover, whereas trees that are defoliated can take several years to recover or may never recover. (abbreviated) <i>WA BF</i>
Scrub	Vegetation, such as heath and shrubs, that grows either as an understorey or by itself in the absence of a tree canopy. The components of scrub are usually called shrubs. In coastal areas, scrub is often referred to as 'heath' or 'heathland'. <i>WA BF</i>
Section	That organisational level having responsibility for the functional segments of incident management – Planning, Operations and Logistics. <i>AFAC</i>
Sector	A specific area of a fire which is under the control of a sector commander who is supervising a number of crews. <i>NSW RFS</i>
Sector command point	Location within a sector from which the sector commander of that sector operates. <i>AFAC</i>
Sector commander	Person responsible for implementing the wildfire control plan for a specific portion of the fire perimeter. Includes the allocation of resources within the sector, reporting on progress of command operations, status of resources and management of all personnel on that sector. <i>Vic report</i>
SEWS	Standard Emergency Warning Signal. <i>Vic report</i>
Shift	A single period of time that a person is deployed to a fire task, including meal times, rest breaks and shower time. <i>Vic report</i>
Sleeper	A fire that starts up again after appearing to have been extinguished. <i>NSW RFS</i>
Slip-on unit	A tank, a live hose reel or tray, a small capacity pump, and an engine combined into a single one-piece assembly that can be slipped onto a truck bed or trailer and used for spraying water and/or foam on wildfires. <i>Vic report</i>

Smoke management	<p>Used by land managers and meteorologists planning a prescribed burn, to ensure that smoke does not cause problems downwind of the burn. Bushfire smoke can reduce visibility, and is believed to interact with air pollutants such as vehicle exhausts, and this can irritate some humans. Smoke management involves prediction of surface and upper wind direction and strength for the day of the burn and subsequent days until a smoke plume has dissipated.</p> <p>Smoke is also produced by wildfires, but in this situation smoke management is not a priority concern. <i>WA BF</i></p>
Smoke plume	The column of smoke that rises from a fire. Smoke plumes can be classified into types based on their characteristics. <i>Vic report</i>
Smoker	An isolated small burning item such as a log, stump or tree, in an area of fire otherwise mopped up. <i>NSW RFS</i>
SOI	The Southern Oscillation Index, which compares surface air pressure differences between Tahiti and Darwin and shows a strong correlation with rainfall. (See also <i>ENSO</i>). <i>Vic report</i>
Span of control	A concept that relates to the number of groups or individuals which one person can successfully supervise. Up to five reporting groups or individuals is considered desirable, as this maintains a supervisor's ability to effectively task, monitor and evaluate performance. <i>AFAC</i>
Spot fire	A new fire occurring downwind of a headfire (up to 10 kilometres has been observed), usually started by a piece of burning bark. Compare with 'hop over' which is a new fire that has started immediately across a fireline and not necessarily at the headfire. <i>WA BF</i>
Spotting	Behaviour of a fire producing sparks or embers that are carried by the wind or convective activity and start new fires beyond the zone of direct ignition by the main fire. <i>Vic report</i>
Stag	A large, old tree either dead or with significant dead upper branches. Often hollow with an opening at ground level. Once alight, a stag represents a major hazard. <i>NSW RFS</i>

Staging areas	<p>AIIMS defines two types of staging areas – tactical and strategic.</p> <p><i>Tactical staging area.</i> A location close to the incident where prepared personnel and equipment are available for direct deployment onto the incident ground.</p> <p><i>Strategic staging area.</i> An area where resources are mustered and prepared for allocation to an incident. It may include the provision of welfare and equipment maintenance facilities and maybe located some distance from the incident. <i>AFAC</i></p>
Standard Emergency Warning Signal (SEWS)	A sound designed to alert the community to the need to listen to an announcement concerning an actual or imminent emergency. <i>EMA</i>
Standards of fire cover	Refers to the overall level of services that fire agencies provide. <i>Vic report</i>
Strategy	A statement detailing how an objective is to be achieved. <i>Vic report</i>
Strike teams	A set number of resources of the same type that have an established minimum number of personnel. Strike teams always have a leader (usually in a separate vehicle) and have a common communications system. Strike teams are usually made up of five resources of the same type, such as vehicles, crews, and earth-moving machinery. <i>AFAC</i>
Structure fire	A fire burning part or all of any building, shelter or other construction. <i>NSW RFS</i>
Supporting agency	An agency, service, organisation or authority providing assistance to the controlling authority. <i>AFAC</i>
Surface fire	A fire that travels just above ground surface in grass, low shrub, leaves and litter. <i>NSW RFS</i>
Surface moisture content	The moisture content of the fine fuels in the top 5–10 millimetres of the litter bed. It is expressed as a percentage of oven dry weight of those fine fuels. <i>WA BF</i>
Tactics	The tasking of personnel and resources to implement the incident strategies. Incident control tactics are accomplished in accordance with appropriate agency procedures and safety directives. Tactics are normally determined at division/sector level with a corresponding allocation of resources and personnel. <i>AFAC</i>

Tanker	A mobile firefighting vehicle equipped with a water tank, pump and equipment for spraying water and/or foam on wildfires. <i>Vic report</i>
Task force	Is a combination of resources that can be assembled for a specific purpose. Task forces always have a leader (usually in a separate vehicle), and have a common communications system. Task forces are established to meet tactical needs and may incorporate a mixture of different resource types. <i>AFAC</i>
Technical advisers	Are advisers with special skills needed to support incident activities/functions. <i>AFAC</i>
Thermal imagery	A display or print out from an infrared scanning device. <i>NSW RFS</i>
Topography	The nature of the land surface in terms of slope, steepness, aspect, elevation and landscape pattern. Terms such as mountainous, hilly, undulating, and flat describe the general topography. <i>Vic report</i>
Total fire ban	Total fire ban (day); declared for days of very high fire risk in regions of the state; prohibits the lighting of any fires in the open air. <i>Vic report</i>
Unit	A small cell of people working within one of the sections undertaking a designated set of activities. <i>AFAC</i>
Urban–rural interface	The line, area or zone where structures and other human development adjoin or overlap with undeveloped bushland. <i>NSW RFS</i>
Values at risk	The natural resources or improvements that may be jeopardised if a fire occurs. <i>NSW RFS</i>
Water bombing	The dropping of water onto a bushfire from an aeroplane or helicopter. Waterbombing is most useful to help protect houses threatened by a bushfire. In forest situations it is usually regarded as a holding action, giving time for ground firefighters to get to a fire. <i>WA BF</i>
Water point	Any natural or constructed supply of water that is readily available for fire control operations. <i>NSW RFS</i>

Wilderness	A remote area where the hand of humans is absent or not obvious. Therefore without roads or tracks and so suitable for self reliant recreation activities such as walking, canoeing or climbing. In heavy forest, the lack of vehicle access in a wilderness area can make prescribed burning for fuel reduction, and the suppression of wildfires dangerous, difficult or impossible, especially if water bombing is not permitted. <i>WA BF</i>
Wildfire	An American term used to describe an unplanned fire started by lightning strike, arson or accident. A generic term that may include forest fires, scrub fires and grass fires. Usually referred to in Australia as a bushfire. <i>WA BF</i>
Woodland	Large tract of land covered by trees but more open than a forest and often with a grassy understorey. <i>WA BF</i>

Appendix H The Australasian Fire Authorities Council

H.1 Role

Established in 1993, the Australasian Fire Authorities Council is the representative body for fire and emergency services in the Australasian region. Providing a range of forums through which member agencies can share knowledge, experience and resources, the Council has achieved an unprecedented level of cooperation and coordination within the Australasian fire and emergency services sector.¹

The Australasian Fire Authorities Council seeks to:

- set or influence national standards and positions in the areas of fire and emergency management
- deliver best-practice leadership in fire and emergency-related policy development
- provide advocacy and representation to government and industry in relation to aspects of fire and emergency management.

H.2 Mission

The Council's mission is to create a safer environment by:

- promoting community fire prevention and education
- enhancing the operational performance and accountability of fire and emergency service agencies
- influencing national fire policy, product and performance standards, and fire management practices
- promoting change within the fire industry in a planned and controlled way
- coordinating education and training policies and strategies
- providing a learning environment for members' employees
- obtaining and sharing knowledge on matters affecting members and facilitating discussion and debate on those matters
- facilitating research and development in areas of common interest
- effectively representing its members in Australasian and international forums.

¹ Australasian Fire Authorities Council, viewed 24 March 2004, <www.afac.com.au/about/aboutafac.html>.

H.3 Services

The Council provides a range of services, among them the following:

- best-practice policy development on fire and emergency management issues
- advocacy and representation in state, federal and international arenas
- learning and development programs ranging from a competency-based training system to an executive development program and exchange opportunities
- human resource management initiatives that support the efficient and effective performance of member agencies
- national data management strategies to meet internal and government reporting requirements
- coordination of national research and development strategies
- development of Australian and ISO standards that relate to firefighting
- management of commercial initiatives such as group buying and the development and sale of a core range of products for the benefit of member agencies.

H.4 Membership

The membership of the Australasian Fire Authorities Council is drawn from agencies operating in urban, rural and wildland environments. Member agencies manage workforces comprising approximately 30 000 paid firefighters and 250 000 volunteers. Membership of the Council is as follows.

H.4.1 The Northern Territory

Bushfires Council of Northern Territory
Northern Territory Fire and Rescue Service

H.4.2 Queensland

Department of Primary Industries Queensland
Queensland Fire and Rescue Service
National Parks and Wildlife Service

H.4.3 New South Wales

New South Wales Fire Brigades
New South Wales National Parks and Wildlife Service
New South Wales Rural Fire Service
State Forests of New South Wales

H.4.4 The Australian Capital Territory

ACT Emergency Services Bureau

H.4.5 Victoria

Country Fire Authority
Department of Sustainability and Environment
Metropolitan Fire and Emergency Services Board

H.4.6 Tasmania

Forestry Tasmania
Parks and Wildlife Service Tasmania
Tasmania Fire Service

H.4.7 South Australia

Country Fire Service
Department of Environment, Heritage and Aboriginal Affairs
South Australian Metropolitan Fire Service

H.4.8 Western Australia

Department of Conservation and Land Management
Fire and Emergency Services Authority of Western Australia

H.4.9 Australian Government

Air Services Australia
Emergency Management Australia

H.4.10 New Zealand

New Zealand Fire Service

H.4.11 Affiliate members

Army Fire Service
ACT Bush Fire Council
ACT Fire Brigade
Australian Council of State Emergency Services
Brisbane City Council
Bureau of Meteorology
CSIRO Forestry and Forest Products
Department of Conservation New Zealand
Fire and Rescue and Emergency Services East Timor Public Administration
Fire Health and Safety Directorate, Office of the Deputy Prime Minister, United Kingdom
Fire Services Department, Mauritius
Hong Kong Fire Services
Office of the Emergency Services Commissioner, Victoria
Papua New Guinea Fire Service
Singapore Civil Defence Force

Appendix I The Forest Fire Management Group

The Forest Fire Management Group reports directly to the Forestry and Forest Products Committee, which is a committee of the Primary Industries Standing Committee and the Primary Industries Ministerial Council.

The purpose of the Group is to provide a forum for discussion and a centre of expertise on forest fire management and control and particularly to:

- provide high-level technical and policy advice on fire control matters to the Forestry and Forest Products Committee
- facilitate interstate and international liaison and consultation between fire controllers and managers
- assist in the development of effective fire management and control philosophy and proficiency.¹

The Forestry and Forest Products Committee provides policy and strategic advice to support sustainable national and regional development by optimising the full range of goods and services from forests and related industries. Among the Committee's priorities is the role of forests in sustainable landscapes. The Committee may also report on some matters to the Natural Resources Management Standing Committee and Ministerial Council.

Membership of the Forest Fire Management Group consists of officials from the following agencies²:

- Commonwealth – CSIRO Forestry and Forest Products
- New South Wales – State Forests of NSW and the National Parks and Wildlife Service
- Victoria – the Department of Sustainability and Environment and Parks Victoria
- Queensland – the Department of Primary Industries – Forestry
- South Australia – Forestry South Australia and the Department for Environment and Heritage
- Western Australia – the Department of Conservation and Land Management
- Tasmania – Forestry Tasmania and the Parks and Wildlife Service Tasmania
- Australian Capital Territory – ACT Forests

¹ Forestry and Forest Products Committee 2003, *Handbook of the Forestry and Forest Products Committee*, Agriculture, Fisheries and Forestry – Australia, Canberra.

² *ibid.*, pp. 72-3.

- Northern Territory – the Bushfires Council of the Northern Territory
- New Zealand – the National Rural Fire Authority and the Department of Conservation
- ex-officio member – Chair, Research Working Group 6 (Fire Management)
- non-government member – Department of Forestry, Institute of Land and Food Resources, University of Melbourne.

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