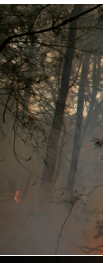
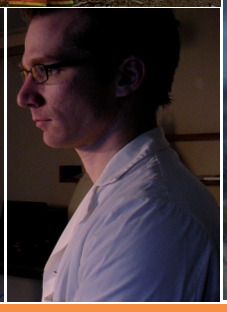
bushfire CRC





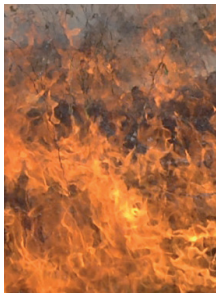



ANNUAL REPORT 2005/2006

Bushfire Cooperative Research Centre







Established and supported under the Australian Government's Cooperative Research Centres Program

October 2006

PHOTO CREDITS:
All photos are from Bushfire CRC research projects and CRC partner agencies.

Cover: Top right: Rebel Talbert, NSW RFS
Top left: DSE Victoria

All others Bushfire Cooperative Research Centre

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EXECUTIVE SUMMARY

At the conclusion of its third year of operation the Bushfire Cooperative Research Centre (CRC) has further consolidated its role as a significant influence in the fire and emergency services and land management sectors. In a year that again involved loss of life and substantial property loss, and ongoing follow up to disastrous fires of recent years, the CRC has become more strongly enmeshed with the fire and land management industry.

Industry is beginning to see the practical value of its investment of cash and in-kind resources, along with the cash support of the Australian Government, in strategic research focussed on industry needs. The CRC has also engaged with other sectors interested in bushfire issues, including water, power, the environment and construction materials.

The Bushfire CRC has also continued to strengthen its role in the national scene as a commentator and adviser on issues related to bushfire research, such as the potential impact of climate change on bushfires. Links with our New Zealand partners strengthened during the year. More broadly and internationally, the CRC has developed its role as key collaborator on fire research.

The quantity, quality and variety of research outputs have increased significantly during the past year across all of the research programs. Take up of the research by the fire and land management agencies has begun. As detailed later, research outputs in areas such as aerial firefighting, prescribed burning, the urban interface, smoke prediction, household smoke alarms, bushfire risk modelling, community aspects of bushfires, volunteerism, arson, safer houses and improved fire fighter safety have begun to impact on the planning, policies and operations of the fire and land management industry. The CRC's research on smoke alarms changed industry policy advice, and research on aerial firefighting influenced future industry planning.

The CRC's work on arson through the Australian Institute of Criminology and the ACT Department of Justice and CRC funded work in the Bureau of Meteorology on fire weather and tools for smoke prediction featured in the Australian Government's Innovation Report 2005-06. The arson project was cited as an example of how the CRC scheme is …"bringing government and industry together to tackle issues facing Australia."

These are clear examples where industry is beginning to act on the new evidence and perspectives provided by the CRC's research and the value of the industry/research collaboration is seen as valuable nationally.

While much of the CRC's efforts are focussed on issues relevant to the most pressing industry issues of fire prevention and suppression, land management and interaction with the communities in southern Australia, important and innovative work continues in northern Australia through partners in the Northern Territory, Western Australia and Queensland. An on-line fire education package developed in Darwin though partners CSIRO and Charles Darwin University and in collaboration with the Tropical Savannas CRC won an award from the Australian Computer Society for its innovative use of online technology. Other good examples of the CRC's engagement in northern Australia include the Indigenous burning studies in Kakadu and the application of CRC research to management of the urban interface in Queensland.

The CRC strengthened linkages with our New Zealand partners when it held its second annual conference in Auckland in October 2005. This was in conjunction with the annual industry based conference of the Australasian Fire Authorities Council (AFAC). The joint conferences attracted more than 900 participants. The CRC also undertook significant field experimentation in New Zealand on the issue of fire behaviour in heath fuels, and organised an international workshop on fire modelling in Christchurch.

Research has accelerated on important aspects of fire in sensitive ecosystems of alpine and sub-alpine areas. Key local stakeholders and the Federal Minister and Member for Eden Monaro the Hon Gary Nairn were briefed on this work at an open day at Snowy Plains south of Cooma where one of the experimental sites is located. More than 80 people travelled to this remote site in the Australian Alps for the occasion.

Against a background of continuing skills shortage in many areas of fire research, the Bushfire CRC continues to invest strongly in an enhanced research capability for the future. The CRC's research programs now employ more than 30 young post-doctoral fellows working with some 150 more experienced researchers on the range of issues addressed by the research portfolio. The CRC's education program has now awarded over 30 scholarships.

The CRC has further strengthened industry engagement through the sharing with AFAC of a strategy implementation manager and the part-time employment of an experienced forester and fire manager on knowledge transfer. As a joint venture with AFAC and the Fire Protection Association of Australia, the CRC became a partner in a new industry journal – Fire Australia. As part of the education, training and communication activities, a series of Fire Notes and Bushfire CRC Fire Updates were produced to inform end users on current research topics of special relevance to the industry.

As part of its enhanced community outreach activity, the CRC has commenced development of The Fire Knowledge Network to act as a national and international focal point for fire knowledge. This will form part of the CRC's knowledge transfer activities.

The CRC maintained a prominent media profile during the year, but especially in relation to major fire events. The CRC's work on fire behaviour, fire weather, arson, volunteerism, decision support, and fencing featured prominently. A short film on lessons learnt from the Tasmanian fires of 1967 produced by the CRC and the Tasmania Fire Service was shown on television and distributed to libraries throughout Tasmania.

International linkages with key international research groups in North America, Europe and South Africa have been further strengthened. Among a number of international visits, the Bushfire CRC was represented at the Third United Nations Conference on Early Warning Systems for Disasters, where it also contributed to a poster on a global early warning system for fire. Several Bushfire CRC researchers were invited to participate in a project in California related to the 2003 California fires and entitled Living with Fire in the Chaparral.

An example of the benefits of the international collaboration was the development of a national Australian seasonal fire potential outlook with the assistance of the Desert Research Institute in Nevada and led by a CRC partner, the Australian Bureau of Meteorology. As a further example the CRC has developed a formal collaborative arrangement with the Fire Research and Outreach Laboratory at the University of California, Berkeley that will link strongly with a range of the CRC's work.

The Governing Board of Bushfire CRC Ltd had one membership change – Gary Morgan resigned due to secondment to a staff position in the CRC shared with AFAC, and was subsequently replaced by Prof John Baird, Rector of the Australian Defence Force Academy campus of the University of New South Wales.

The CRC staff complement had some changes – Ian Wilson joined as Business Manager replacing David Peterson and David Bruce joined as Communications Manager replacing Derek McCormack. Lesley Crombie was appointed to a new position of Manager, Knowledge Networking, Gary Morgan joined part-time as Manager, Strategy Implementation, and Mike Leonard, a highly experienced forestry and fire management professional joined to work part-time on knowledge transfer.

A particular focus for the Governing Board during the year was the need to adjust the strategic direction of the CRC in the light of high expectations for the CRC and pressures for expanded work arising from new priorities. These include issues identified but not yet implemented by inquiries such as the COAG Inquiry on Bushfire Mitigation and Management, as well as research on extreme fires such as the Canberra fire of

2003, research on fire management at the urban interface, and researching the possible impacts of climate change on fire and related aspects of land management, for example water and plantation timber.

The CRC welcomed the decision of the University of New South Wales to increase its cash contribution to the level of a core partner in the CRC, and also welcomed the indicated intentions of the New Zealand Rural Fire Service and the University of Canterbury for a joint core membership, and of the University of Wollongong to join as an Associate partner in the 2006/07 financial year.

The Board decided on balance against bidding for supplementary funding in 2006 because of the strong focus on delivery of the current program, and partly because of uncertainty related to the DEST requirement for private sector involvement in the bid when the Bushfire CRC is primarily a public interest CRC. However, the Board will be addressing the issue of increasing pressure for expanded research, as well as continuation of some projects beyond their originally planned life and how this might be funded.

The Chairman, on behalf of the Board and Stakeholder Council, and the CEO would like to express their warm appreciation of the outstanding work done during the year by the researchers and students, by the Program Leaders and the End User Leaders, by the industry representatives who have engaged with the CRC's work, and by the dedicated, hard working staff in the CRC office. We look forward to an even more stimulating and productive year ahead.

Ian Mac Dougall

Chairman

Kevin O'Loughlin

CEO

GOVERNANCE, STRUCTURE AND MANAGEMENT

The Bushfire CRC operates through an incorporated 'not for profit' company, Bushfire CRC Ltd.

The Company, Bushfire CRC Ltd was registered in March 2003 and began formal CRC operations in July 2003. Participating parties are members of the company which is limited by guarantee.

The Bushfire CRC's Stakeholders' Council consists of representatives of each of the participating agencies.

The Council meets twice a year to review and receive updates on the progress of research, education, communication and other activities, and to provide strategic advice to the Governing Board. The Governing Board, has nine members including two independent members, and meets regularly. The company's constitution allows for participants who contribute cash of $100,000 or more per annum to vote and nominate members to the Governing Board. Both the Stakeholder Council and the Governing Board have the same independent Chairman, Mr Ian Mac Dougall AC AFSM.

The Governing Board has four committees:

- A **Compliance Committee** which oversees corporate governance, audit responsibilities, finance and compliance.
- An **End Users Research Committee** which ensures the research conducted meets the strategic aims of the CRC and the needs of the users.
- A **Human Resources Committee** to advise on and oversee the CRC's personnel matters including selection, remuneration and performance management.
- An **Education Committee** which is responsible for providing strategic advice on the overall development of the CRC's postgraduate program and on new educational initiatives.

GOVERNING BOARD MEMBERS

- Ian Mac Dougall, (Independent Chairman)
- Anne Gardiner, Director, Head of Compliance, Credit Suisse Asset Management (Aust) Ltd (Independent)
- Ray Canterford, Assistant Director, Commonwealth Bureau of Meteorology
- Len Foster, Chief Executive Officer, Australasian Fire Authorities Council
- John Gledhill, Chief Officer, Tasmania Fire Service
- Phil Koperberg, Commissioner, NSW Rural Fire Service
- Gary Morgan, Chief Fire Officer, Department of Sustainability and Environment, Victoria (until 15 August 2005)
- Robyn Owens, Dean, Postgraduate Studies, University of Western Australia
- Tim Vercoe, Director Asset Protection Centre, CSIRO Forestry and Forest Products
- John Baird, Rector, Australian Defence Force Academy, (from 15 June 2006)

THE BUSHFIRE CRC GOVERNING BOARD IN JUNE 2006: FRONT, FROM LEFT, JOHN BAIRD, IAN MACDOUGALL, ROBYN OWENS. AT REAR, FROM LEFT, LEN FOSTER, JOHN GLEDHILL, PHIL KOPERBERG.

BELOW: GARY MORGAN, RAY CANTERFORD, ANNE GARDINER AND TIM VERCOE.

MEETINGS OF THE BOARD

The Bushfire CRC Board met 7 times during the year ended 30 June 2006.

Number of meetings attended	
Ian D MacDougall	7
Anne B Gardiner	5
Raymond P Canterford	5
Leonard R Foster	6
John B Gledhill	7
Phillip C Koperberg	6
Gary W Morgan (until August 2005)	1
Robyn A Owens	5
Timothy K Vercoe	4
John Baird (from June 2006)	1

GOVERNING BOARD COMMITTEES

Compliance Committee:

- Anne Gardiner (Chair)
- Ray Canterford
- Robyn Owens
- Kevin O'Loughlin (CEO, Ex-Officio)
- David Peterson (Business Manager, Ex-Officio, to 10 October 2005)
- Ian Wilson (Business Manager, Ex-Officio, from 30 January 2006)

Human Resources Committee:

- Ian Mac Dougall (Chair)
- John Gledhill
- Len Foster
- Tim Vercoe
- Phil Koperberg
- Kevin O'Loughlin (CEO, Ex-Officio)

Users Research Committee:

- Phil Koperberg (Chair)
- Gary Morgan (Until 15 August 2005)
- John Gledhill
- Tim Vercoe
- Kevin O'Loughlin (CEO, Ex-Officio)
- Richard Thornton (Research Director, Ex-Officio)

Education Committee

- Len Foster (Chair)
- Robyn Owens
- John Gledhill
- Kevin O'Loughlin (CEO, Ex-Officio)
- Richard Thornton (Research Director, Ex-Officio)
- Mark Adams (Program Leader, Ex-Officio)
- Kellie Watson (Education and Training Manager, Ex-Officio)

CORE PARTNERS

Bureau of Meteorology

Country Fire Authority of Victoria

CSIRO - Divisions of Manufacturing & Infrastructure Technology, Forestry and Forest Products, and Sustainable Ecosystems

Emergency Management Australia

Fire and Emergency Services Authority of Western Australia

University of Melbourne, School of Forestry and Ecosystem Science

Melbourne Metropolitan Fire and Emergency Services Board

New South Wales Fire Brigades

New South Wales National Parks and Wildlife

New South Wales Rural Fire Service

Queensland Fire and Rescue Service

State Forests of New South Wales

Tasmanian Government (Tasmania Fire Service, Forestry Tasmania, Parks and Wildlife Service)

University of Tasmania

University of Western Australia

University of New South Wales

Department of Sustainability and Environment, Victoria

Department of Conservation and Land Management, Western Australia

ASSOCIATE PARTNERS

ACT Department of Justice and Community Safety

Australian National University

ACT Emergency Services Authority

James Cook University

La Trobe University

Scion - New Zealand Forest Research

RMIT University

South Australian Country Fire Service

South Australian Department of Environment and Heritage

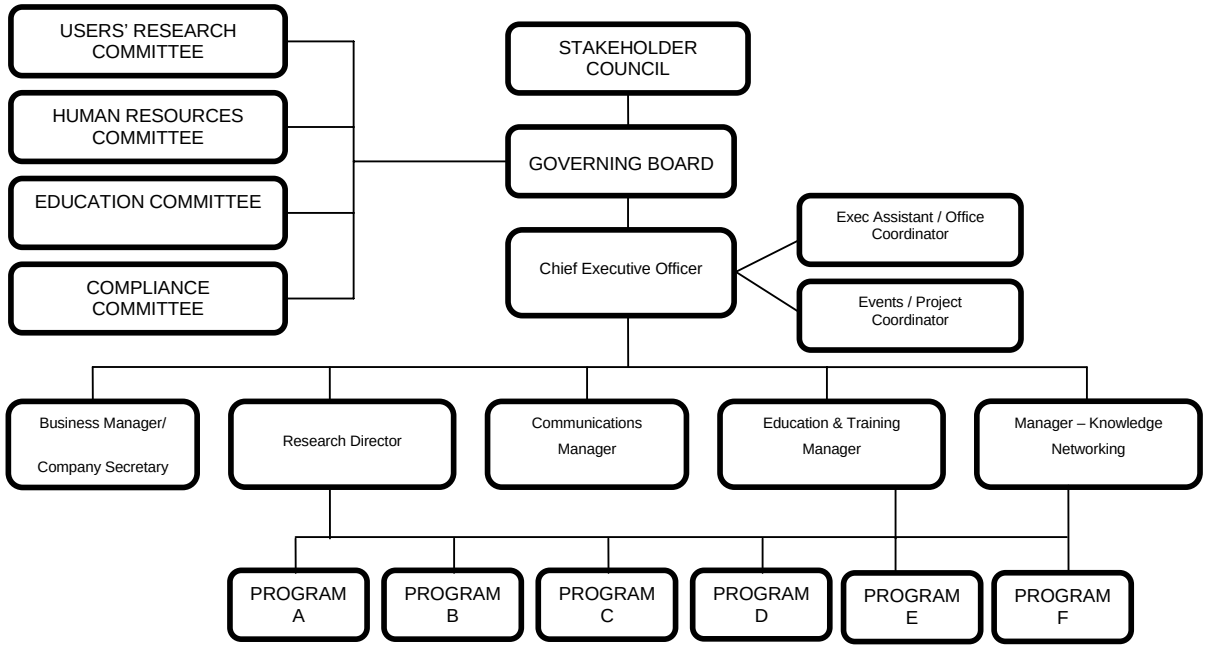
South Australian Metropolitan Fire Service

University of New South Wales

Charles Darwin University

WA Department of Industry and Resources, Chemistry Centre

ORGANISATION CHART



CONTEXT AND MAJOR DEVELOPMENTS

There have been no major changes in the industry in which the Bushfire CRC operates in the last year. There have been slight changes in the importance of various environmental factors which impact on the priorities for the industry.

These have included:

- The increased focus on the prolonged drought throughout most of south-east and south-west Australia and in the increased fire danger levels this brings;
- An increased recognition of the potential impact of climate change on the fire industry, particularly the frequency and duration of bad fire seasons, the impact on rural community demographics and the ability to protect rural communities;
- The increased importance of water and the role of fire in influencing water quantity and quality.

These new priorities will be captured in the coming year through a strategic review of the research portfolio based upon end-user needs and the CRC's Third Year Review. However, it will be difficult for the CRC to accommodate new work within the existing tightly committed budget.

Apart from the work being undertaken on alpine fire effects, decisions have not yet been taken by government on a number of recommendations arising from national bushfire inquiries that require some work by the Bushfire CRC. Again, this potential new work cannot be accommodated within the existing CRC budget.

MAJOR EQUIPMENT PURCHASES

The CRC purchased a Proton-transfer mass spectrometer during the year in conjunction with the UNSW. The CRC paid for half the cost amounting to $150,000. This purchase had been delayed from earlier years.

The CRC also made substantial investment in the HighFire project on scientific equipment (pictured below) to measure ecological process in high country areas of Australia. Some of this was jointly funded by ACTEW in the ACT.

≺ High Fire

The High Fire Project has placed monitoring equipment in several alpine sites including this carbon and water flux tower on the Bogong High Plains in north-east Victoria.

COMMERCIALISATION AND UTILISATION

The commercialisation plan was submitted and approved by DEST during the last year. A copy can be found on the CRC web site at http://www.bushfirecrc.com/research/index.html

TECHNOLOGY TRANSFER STRATEGY

All end users are exposed to the outcomes of the CRC, and the CRC management has ensured that there are effective mechanisms in place in each of the user groups to encourage the effective transfer of the outcomes.

It is expected that there will be a number of classes of Intellectual Property outcomes that the CRC may produce and these are covered below. The majority of the IP will fall into the category of being specific to the partners of the CRC, with a smaller amount being in the category of public good, and finally, a small component of commercial IP.

The strategies include:

- Open and effective channels of communication between end users and researchers facilitated by a Communications Manager and Education and Training Manager, and supported by the CRC Executive Management and the Governing Board;
- The implementation of an internet based project management system (IMAP) operational from July 2005;
- A strong education and training program targeting current and future fire researchers, bushfire and land managers and the community.
- The implementation of The Fire Knowledge Network;
- Implementation of feedback mechanisms in the overall research strategy allowing continual improvement of:
- Tools (for example, firefighting equipment, building design);
- Modelling of bushfire behaviour and danger (for example, smoke plume modelling, fire weather predictions);
- Fire suppression strategies;
- Management models (for example, planning and management of prescribed burning, bushfire risk management); and
- Establish avenues for legislative change relating to minimisation of fire danger (for example, building code regulations, policy design).

UTILISATION TABLE

Organisation	Represented on Board & Committees	Stakeholder Council	Collaborative Research	Information / Research Exchange
Fire Agencies				
Country Fire Authority Victoria	✓	✓	✓	✓
Fire and Emergency Services Authority of Western Australia		✓	✓	✓
Metropolitan Fire and Emergency Services Board		✓	✓	✓
New South Wales Rural Fire Service	✓	✓	✓	✓
New South Wales Fire Brigades				✓
Queensland Fire and Rescue Service		✓	✓	✓
Tasmania Fire Service	✓	✓	✓	✓
South Australian Country Fire Service		✓	✓	✓
NZ Rural Fire Service			✓	✓
South Australian Metropolitan Fire Service		✓		✓
ACT Emergency Services Authority		✓	✓	✓
Bushfires NT				✓
NT Emergency Services Authority				✓
Land Management Agencies				
New South Wales Department of Conservation and Environment		✓	✓	✓
State Forests of New South Wales		✓	✓	✓
Forestry Tasmania		✓	✓	✓
Department of Sustainability and Environment Victoria	✓	✓	✓	✓
Department of Conservation and Land Management WA (CALM)		✓	✓	✓
Scion - New Zealand Forest Research		✓	✓	✓
South Australian Department of Environment and Heritage		✓	✓	✓
Australian Government agencies				
Australian Institute of Criminology			✓	✓
Department of Environment and Heritage				✓
Department of Transport and Regional Services				✓
Bureau of Meteorology	✓	✓	✓	✓
Emergency Management Australia		✓		✓
Geosciences Australia			✓	✓
Others				
ACT Department of Justice and Community Safety		✓	✓	
Territory Wildlife Park NT			✓	✓
Bluescope Steel			✓	

RESEARCH COLLABORATION

Key research achievement 2005-6	
Change in policy for smoke alarms	AFAC changed its policy relating to a preference for ionisation-based alarms to one preferring photo-electric detection. This was based upon research carried out by the CRC.
Fencing research	The CRC in conjunction with Bluescope Steel published its report on the effectiveness of various fencing construction materials. This has resulted in substantial debate in the community. In particular, in Canberra, where steel fencing was not allowed under planning regulations, the work of the CRC has resulted in the ACT Planning and Land Authority reviewing its planning guidelines.
Establishment of High Fire and increased public interest	HighFire, the CRC project resulting from the extra $3 million supplied by the Federal Government has taken shape during the last year. It now has established research sites in NSW, Victoria, and the ACT. It has attracted additional support from the ACT agency for energy and water (ACTEW) and from local NSW land-owners who have agreed to establish research sites on their land.
Education course developed	The Bushfire CRC in collaboration with the Tropical Savannahs CRC produced an on-line fire ecology education package delivered by Charles Darwin University. This package won an Australasian Society of Computers in Learning in Tertiary Education award.
International workshop of fire modelling	The Bushfire CRC organised hosted an international five day workshop incorporating experts from the USA, Canada, New Zealand and Australia examining the state-of-the-art in computational fire spread modelling. This has established strong linkages between the leading researchers, including those of the CRC.

Reasons for milestones not being reached

In most cases the reason for non-delivery against agreed milestones relate to the same issues that resulted in the formation of the CRC. It has long been recognised that there is a significant skills shortage in the fire research area. This has resulted in delays and in some cases an inability to appoint suitable researchers. The CRC is now attracting more young scientists through the education and training program, which will flow through to replace the retiring scientists. This is a slow process. The industry has recognised this as a major issue and is currently working with the CRC to address it.

Nature of major consultancies and their contribution to the CRC

The CRC has undertaken consultancies for BlueScope Steel, Geosciences Australia, ACTEW and the Australian Fire Authorities Council (AFAC) during the last financial year. These have all enabled the CRC to undertake a broader scope of work than would have been otherwise possible.

BlueScope Steel –BlueScope Steel was interested in understanding the behaviour of various building elements under wildfire conditions. These included fences, water tanks and power poles. The CRC undertook research in conjunction with the NSW Rural Fire Service at its test site at Mogo, NSW. The work compared BlueScope's steel products against other commercially available alternatives. This has enabled the CRC to provide guidance to the CRC's partner agencies on the effectiveness of various products. The results of this research have resulted in quite extensive media coverage and a major community meeting in the ACT.

Geosciences Australia – Geosciences Australia approached the CRC to undertake a review of the current state of the art in bushfire risk modelling in Australia and overseas. This formed part of the national initiative to address reform recommendations from the COAG report into Natural Disasters. This consultancy provided a good underpinning for the work of the CRC and the work of the Australian Government in this area. It also highlights the leading role the CRC has in this area.

ACTEW – ACTEW is the catchment manager for the ACT water supply. It was badly affected by the 2003 fires in Canberra with much of the Cotter catchment burnt out. ACTEW has now joined the HighFire project and has assisted in purchasing capital equipment to study recovery dynamics and fuel load assessment in the Cotter catchment. This will extend the research sites available to the HighFire team.

AFAC – The consultancy with AFAC relates to a literature review on the effectiveness of various types of domestic smoke alarms. This has broadened the base of the CRC in line with the strategic direction of our partners in urban fire. The outcome has resulted in a significant shift in policy by the fire services to change their recommendations to the community. This is a strong example of how the CRC and its industry can make a difference to the community.

Nature of the grants and how they contribute to the CRC

The CRC has not received any grants during this period.

HOW THE RESEARCH HAS CONTRIBUTED TO NATIONAL RESEARCH PRIORITIES

An Environmentally Sustainable Australia

Transforming the way we utilise our land, water, mineral and energy resources through a better understanding of human and environmental systems and the use of new technologies.

The CRC's research is examining how land can be managed through the use of fire to ensure a reduction in risk to the communit.

The focus is on:

- Maintaining and enhancing the quality and quantity of water.
- Maintaining the health of soils ecosystems.
- Maintaining and enhancing the biodiversity
- Examining how climate change will impact on fire regimes, and ecological systems

Promoting and maintaining good health – Promoting good health and well being for all Australians.

The CRC work program includes an element of the impact of fires on the health and safety of communities and fire fighters. It is examining the impact of bushfire smoke on communities and determining ways to better predict where smoke will travel. This is helping to reduce the incidence of conditions such asthma. It is also undertaking research into how to reduce the impact of smoke related problems in fire fighters ensuring better lives in the aging population. It is also conducting research into how fire agencies can provide more productive roles for aging volunteers.

Safeguarding Australia

Safeguarding Australia from terrorism, crime, invasive diseases and pests, strengthening our understanding of Australia's place in the region and the world, and securing our infrastructure, particularly with respect to our digital systems.

Core to the mission of the CRC is reducing the bushfire risk to the community, critical infrastructure, industry and ecosystems. This includes research into effectiveness of incident management systems and the effectiveness of techniques and technologies utilised by the fire and emergency service agencies.

PROPOSED CHANGES TO FUTURE DIRECTIONS

The CRC will be undertaking a strategic review of its research portfolio in the first half of 2006/07. This is to ensure that research priorities remain aligned with the requirements of our end-user community. This will be informed by the current Third Year Review of the CRC. This may result in some changes to the Commonwealth Agreement milestones. Some indications are given in the tables on the following pages. Some deliverables will be removed and others added.

BUSHFIRE CRC MILESTONES 2005 / 2006

Program A: Safe Prevention, Preparation and Suppression

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities in 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones that have not been met
OUTCOME 1: IMPROVED FIRE FIGHTER AND COMMUNITY BUSHFIRE SAFETY FROM BETTER UNDERSTANDING OF FIRE BEHAVIOUR RELATING TO FUEL, WEATHER AND TOPOGRAPHY FACTORS ACROSS AUSTRALIA					
Output 1.1 Improved Fire Danger Rating System					
Milestones 1.1.1	Current fire danger rating systems assessed (June 2005).	50%		First stage of assessing the current fire danger rating systems was the development of spatial fire danger rating products i.e. Keetch and Byram Drought index, Soil Dryness Index and Drought Factors as national gridded spatial products by the Bureau of Meteorology. This has been completed.	Continuation the development of the National Fire Behaviour Prediction Systems (Output 1.2) is required to incorporate fire behaviour, suppression difficulties and fire weather to improve the existing fire danger rating systems for different major fuel types i.e. Grassland, Forests and Shrubland (proposed new rating system).
Output 1.2 Implementation of a National Fire Behaviour Prediction System					
Milestones 1.2.1	Bushfire behaviour observation handbook available (June 2004)	No		This has been discontinued as it is no longer seen as a priority for the end-users.	It is intended that an alternative proposal will be developed under the fire knowledge network of a fire behaviour knowledge base.

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities in 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones that have not been met
Milestones 1.2.2	Validation of the revised fire behaviour prediction systems in different forest types of both fuel structure and age in the eastern states forests (June 2006).	No		Experiments currently underway in The Ngarkat Park in SA and in heath lands in NZ. A completed burning experiment was also carried out at Tumbarumba. These experiments have been impacted by poor weather and wildfire investigations for state coroner inquiries and delays in recruiting staff.	Staffing strengthened via recruitment in the last autumn season has seen some experimental burns completed in Ngarkat which will form the basis for this milestone. Two more experimental burning programs are scheduled under different fire weather conditions.
Output 1.3 Prescribed Burning Guidelines for the major south-eastern fuel types.					
Milestones 1.3.1	Guidelines available for Sydney region with fuels, moisture and heat transfer incorporated into fire behaviour models (June 2006).	No		Analysis undertaken as part of a Phd project are almost completed following extensive experimentation in the Royal National Park.	
Output 1.4 A single Fuel Classification System based on plant species and on fuel age, structure, quantity and weather factors					
Milestones 1.4.1 (a)	Review of pasture fuel models and databases (June 2004).	No		This was not an initial priority for the research delivery, and work focussed on the development of sampling techniques. This is now being incorporated into a PhD study	PhD proposal approved with University of Tasmania; we are seeking a suitable candidate.
Milestones 1.4.1 (b)	A draft classification framework available	Yes	Draft of framework completed. Testing with some end users undertaken: Forest: NSW RFS		

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities in 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones that have not been met
			Heath and shrubland SA DHE Also tested in CRC project A1.1 in fire behaviour project in NZ shrubland.		
Milestones 1.4.2	Fuel availability and combustion rate models for different fuel strata (June 2005)	No		PhD advertised and candidates sought for 18 months without success	Reviewing program to convert PhD into project for a Research Officer.
OUTCOME 2: IMPROVED USEFULNESS OF FIRE WEATHER FORECASTS FOR COMMUNITY AND FIRE SERVICES MANAGEMENT OF BUSHFIRE RISKS					
Output 2.1 Improved forecasts of Wind Changes and Conditions					
Milestones 2.1.2	Value of more frequent running of mesoscale weather forecast model demonstrated (June 2005).	Yes	Several examples of the impacts of more frequent running of forecast models were documented on internal Bureau web pages, and used to justify the operational running of such a system. This work was completed in early 2005, and the operational trialling is being established by the Bureau's National Meteorology and Oceanography Centre during the first half of 2006.		

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities in 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones that have not been met
OUTCOME 3: IMPROVED UNDERSTANDING AND SELECTION OF SUPPRESSION STRATEGIES					
Output 3.1 Evaluation of the relative effectiveness of suppression techniques including aircraft, burning and water additives.					
Milestones 3.1.1	Review of current suppression tactics, evaluation of selected aircraft in different fuel types and fire intensities and the results of pilot field trials available (June 2006).	Yes	Report delivered to National Aerial Firefighting Centre. Further research plan being developed.		
OUTCOME 5: SIMULATION, MODELLING AND ANIMATION TOOLS FOR REAL TIME PREDICTION OF FIRE DEVELOPMENT AND FOR TRAINING					
Output 5.1 Simulation and Animation Tools for fire development					
Milestones 5.1.2	Prototype computer-aided model and simulator developed (Dec 2005)	Yes	Continuing development		
Output 5.2 Simulation and Animation Tools refined for use in real-time Options Analysis and in Training					
Milestones 5.2.1	Prototype simulator demonstrated in training environment (June 2005).	Yes	Demonstrated to end users. Further development underway following feedback.		

Program B: Prescribed Fire in the Landscape

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress in 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome 7: Reduced Impact of Smoke from Prescribed Fuel Reduction Burns and Wildfire on Community Health and Safety					
Output 7.2: Tools to quantify the effects of Prescribed and Wild Fires on human health and the environment					
Milestones 7.2.1	Literature review results and a smoke sampling / analytical protocol available (Dec 2004).	Yes	Presented at international conference. To form basis of a book chapter.		
Outcome 8: Improved Understanding of the Impacts of Fire and Vegetation on Biodiversity in arrange of ecosystems					
Output 8.1 Information on fire impacts in eastern Australia ecosystems as a science-base for land management strategies.					
Milestones 8.1.1	Report available on literature review of role of invertebrates and fungi in ecosystem processes (June 2004).	No		Delayed by serious illness of key researcher	Researcher is now back at work in a reduced capacity. The CRC has brought forward the appointment of an additional research fellow to aid with the catch-up
Milestones 8.1.2	Consolidation of database at five existing experimental sites completed (June 2005).	No		Delayed by serious illness of key researcher	Researcher is now back at work in a reduced capacity. The CRC has brought forward the appointment of an additional research fellow to aid with the catch-up
Output 8.2 Improved understanding of the impact of fire management options on Biodiversity and Carbon Sequestration in northern tropical savannas.					
Milestones 8.2.2	Results available of seed and seedling dynamics experiments (June 2006).	70% completed		Seedling work has been going for 2 yrs. In year 1 seedlings were transplanted into all TWP plots, both inside and outside the herbivore exclusions. Monitoring now finished.	In year two, seeds were sowed of the three dominant eucalypts into the plots last summer, have been monitoring seedling growth and survival since. Plan to continue monitoring next year.

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress in 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome 9: Predictive models for the impacts of prescribed burning based on integration and scale up of national experiments					
Output 9.1Practical overall Prescribed Burning Tool for Land Managers based on results of all Program B trials and models.					
Milestones 9.1.1	Data sets collated from the existing trial sites and gaps in biodiversity and ecosystem processes defined (June 2004).	No		This work was refocussed by the end users to take the form of a book on Prescribed Burning. This first draft of this book is almost complete and will be submitted to a publisher in the first quarter of the 2006 FY	This work is redirected, and a modification of the Commonwealth agreement milestones will be sought.
Milestones 9.1.2	Gap filling experimentation completed (June 2006).	No		This work was refocussed by the end users to take the form of a book on Prescribed Burning. This first draft of this book is almost complete and will be submitted to a publisher in the first quarter of the 2006 FY	This work is redirected, and a modification of the Commonwealth agreement milestones will be sought.
Outcome 20: Management of Fire regimes in the alpine ecosystems for optimum human and infrastructure protection, water catchment, carbon flux and biodiversity outcomes					
Output 20.1 National fire related and GIS-interpretable database on litter and biomass for the Australian high country					
Milestone 20.1.1	Negotiation of data exchange contracts with state agencies (April 2005)	Yes	Agreement with Victorian Agencies about access to data and photos. No resolution about the requirement for a contract		
Milestone 20.1.2	Modeller to gather data and create the database (July 2005)	Yes	Appointed January 2006		
Milestone 20.1.3	Completed database (October 2005)	No		Delayed due to prolonged negotiations with state agencies	Most issues with state agencies are now resolved and the agencies are actively helping this project.

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress in 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Output 20.2 Definition of fire prevention and suppression activities and strategies to achieve a desired range of management objectives These strategies will largely be based on evidence from the 2002/2003 fires.					
Milestone 20.2.1	Analysis of the relationships between the distribution of fire severity classes of the 2002/2003 alpine fires and geographic information (December 2005)	Yes	Used to determine location of research sites.		
Output 20.3 Identification of sensitivity of shrub abundance to land-use management					
Milestone 20.3.1	Development of a research plan based on the current state of knowledge (June 2005)	Yes	Research now underway.		
Milestone 20.3.2	Selection of study sites (May2005)	Yes	Research now underway.		
Milestone 20.3.3	Implementation of experiments (July 2005)	Yes	Research now underway.		
Output 20.5 Co-operation and integrated management strategies among state agencies					
Milestone 20.5.1	Organise inter-agency working groups (May 2005)	Yes	Steering groups now established across states.		
Milestone 20.5.2	Define agency objectives (July 2005)	Yes	Steering groups now established across states.		
Output 20.6 Comprehensive systems of monitoring for outcomes, adaptive management					
Milestone 20.6.1	Review state of knowledge (September 2005)	Yes	Review being prepared for publication.		
Milestone 20.6.2	Employ staff (May 2005)	Yes	Research continues.		
Milestone 20.6.3	Purchase field and laboratory equipment (May 2005)	Yes	Research continues.		
Milestone 20.6.4	Establish monitoring systems within LTER (June 2005)	No		Delayed due to protracted negotiations with various state agencies, which were not part of the CRC. Could not be	Although the original part of the project was delayed it is now moving along at the expected rate. A number of

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress in 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
				resolved until the grazing review had been competed in Victoria. This then meant the CRC missed the opportunity to establish the experimental sites before the snow cover in the winter	additional partners have also joined the projects which should enable some catch-up. This project will always be restricted in its ability to catch-up due to weather impacts in the winter months.
Output 20.7 Build long-term ecological research (LTER) sites and add value to existing experiments.					
Milestone 20.7.1	Catalogue research sites in the Australian high country (March 2005)	Yes	Further discussions with land management agencies.		
Milestone 20.7.2	Select site locations (May 2005)	Yes	Research now underway.		
Milestone 20.7.3	Establish LTER sites for the high country project (May 2006)	No		See comments for Milestone 20.6.4	See comments for Milestone 20.6.4
Output 20.8 One-stop shop for high country fire science and the influence of climate change on fire regimes in the alpine ecosystems.					
Milestone 20.8.1	Catalogue institutional directories, studies, publications and state of knowledge (November 2005)	Yes	Initial catalogue completed, helped to select research sites.		
Milestone 20.8.2	Establish a web-based information broker (June 2006)	No		This is being now considered as part of the Fire Knowledge Network. Focus has instead been on local engagement in the agencies and in communities	
Output 20.9 Long-term and iterative data base on plant growth rates and rates of litter accumulation and responses to temperature					
Milestone 220.9.1	Establish study sites (May 2005)	Yes	Research now underway.		
Output 20.10 Models of water yield following fire at sub-catchment level					
Milestone 20.10.1	Establish study sites (May 2005)	No		See comments for Milestone 20.6.04.	Estimated that sites will be established during July 2006.

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress in 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Milestone 20.10.2	Instrumentation and analysis systems installed (May 2005)	No		See comments for Milestone 20.6.04.	Estimated that sites will be established during July 2006.
Output 20.11 Models of greenhouse gas emissions stratified by temperature and by fire					
Milestone 20.11.1	Establish study sites (May 2005)	Yes	Sites being instrumented.		
Milestone 20.11.2	Instrumentation and analysis systems installed (June 2005)	No		See comments for Milestone 20.6.4	See comments for Milestone 20.6.4

Program C: Community Self Sufficiency for Fire Safety

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome 10: Understanding of Community Needs, Perceptions and Attitudes to Bushfire Risk Management					
Output 10.1Framework and methodology for definition of Community Needs and Attitudes toward Bushfire Risk Management					
Milestones 10.1.1	Systematic classification available of bushfire areas and potentially affected communities. (June 2004).	Yes	Classification available in various Qld municipalities.		
Milestones10.1.3	Draft guidelines available for assessing agency expectations of communities (June 2005).	Yes	Extensive work with Qld agencies in understanding community expectations.		
Output 10.2Validation and implementation of methodology with Selected Communities and Agencies					
Milestones 10.2.1	Results of surveys / interviews using the draft tools above available (June 2006).	No		Deleyed MSc thesis.	Being completed as part of MSc thesis in latter half of 2006.
Outcome 11: Approached Defined for Effective Community Engagement *This outcome area was not funding at the request of the end-users. It is not a major priority area when compared with other areas. Also the research providers were not capable of delivering against the work.*					
Output 11.1 Documentation and assessment of current approaches to community engagement in fire and other sectors					
Milestones 11.1.1	Identification and documentation of current practices (June 2006)	No		Was not funded	Will modify the Commonwealth Agreement to replace these deliverables with others
Milestones 11.1.2	Draft evaluation framework defined and field tested (June 2006)	No		Was not funded	Will modify the Commonwealth Agreement to replace these deliverables with others

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome 13: Improved Safety for People at Risk and Reduction in Losses through Improved Risk Communication and Warnings					
Output 13.1 Best practice procedures and parameters for effective Bushfire Warnings defined					
Milestones 13.1.1	Community information needs identified for periods before, during and after a bushfire emergency (June 2005).	Yes	Continued research.		
Milestones 13.1.2	Collection, review and analysis of current practices completed (June 2005).	No		The late entry of University of Tasmania into the Bushfire CRC meant that work on this task did not commence until mid-2005.	This task will be completed following an evaluation study of a bushfire public education exercise being conducted by Tasmania Fire Service in mid 2006. This will provide an evidence-based evaluation to quantify current practice. The PhD and Postdoc projects will also include reviews of current practice across schools, organization and communities.
Outcome 14: Reliable Assessment Methods for the Total Costs of Bushfires and the Benefits of Mitigation					
Output 14.1 Comprehensive estimates of the social, economic and environmental Costs of Bushfires					
Milestones 14.1.1	Economic data collection and assessment complete (June 2005).	Yes	Ongoing collection in place based upon the refinement of the methodology		
Milestones 14.1.2	Methodology for assessing social and environmental losses defined (June 2006)	Yes			
Outcome 16: Evaluation of the Effectiveness of Bushfire Risk Management Policies, Programs and Strategies for Community Safety					
Output 16.2 Analysis of the success of past and current Bushfire Community Safety Approaches					
Milestones 16.2.1	Initial assessment of current practices across Australia available (June 2006).	Yes	A number of case studies have been completed.		

Program D: Protection of People and Property

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome 17: Reduced Building Losses and Injuries to Occupants due to Bushfires					
Output 17.3 Information package on methods for reducing the risk of Building Ignition					
Milestones 17.3.1	Information packages will be published on individual factors throughout the program covering ember attack, decks, glazing, retardants, vegetation, fencing, sprinklers, shutters, gas bottles, site layout and others. (One per year).	Yes	These are now placed on the CRC website and are helping inform industry policy.		
Outcome 18: Increased Fire Fighter Health, Safety and Well-Being					
Output 18.1 Management guidelines for improved fire fighter safety on the bushfire ground.					
Milestones 18.1.1	Preliminary report available on first field study of fitness, stress, and fatigue impacts and crew management (Dec 2005).	Yes	Research continuing.		
Output 18.2 Capabilities for measurement and control of the exposure of fire fighters to Air Toxics					
Milestones 18.2.2	Annual reports of exposure measurements and data analysis for each fire season from 2005 to 2008 (June each year)	Yes	Research continuing.		
Outcome 19: Recruitment and Retention of Adequate Levels of Appropriately Trained Volunteer Fire Fighters					
Output 19.2 Guidelines for Fire Services to ensure Sustainable Volunteerism					
Milestones 19.2.1	Policies, strategies, tools and management and training guidelines that recognise demographic trends and individual and social needs so as to ensure an adequate supply of appropriately trained volunteers.	Yes	Ongoing research.		

Program E: Education and Training

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome E1: Well Qualified, Integrated and Self-Renewing Fire Research Community					
OutputE1.1 Thirty PhD Qualified researchers created by 2010					
Milestones E1.1.1	Thirty post-graduate scholarships established across all nineteen Research Sub-Programs (March 2006).	Yes	28 PhD students in progress 4 Masters students		
Output E 1.2 Exposure of researchers to leading national and international researchers and programs					
Milestones E1.2.1	Participation of all post-graduate scholarship holders in annual CRC conferences and some post-doctoral researchers in overseas collaborations (Each Year).	Yes	All students participated in conferences and workshops.		
Outcome E2: Australia recognised as One of the Three Leading Countries In Bushfire Research					
Output E 2.1 Annual CRC Conferences and one International Bushfire Conference					
Milestones E2.1.1	CRC Conferences in conjunction with AFAC or Ausfire Conferences held annually and one major global bushfire conference convened (March 2008).	Yes	Conference held in Auckland 2005; Melbourne 2006. Planning underway for 2007 conference in Hobart and 2008 international conference in Canberra 2008		
Output E2.2 Regular International Research Collaboration Assignments and Conference Participation / Papers to identify emerging trends or themes					
Milestones E2.2.1	Two international research collaboration assignments (Each Year)	Yes	1. BCRC researchers (4) visited UC Berkley Fire Lab and 2 UC Berkley researchers visited in June 06. 2. Research workshop on fire modelling held in NZ, within participation from researchers from Canada and US.		

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Milestones E2.2.2	Five participants and papers given at international conferences (Each Year).	Yes			
Milestones E2.2.3	Support provided by senior researchers to the post-doctoral researchers working on international collaboration assignments.	Yes	Maria Taranto - US Klara Finkle - France		
Outcome E3: Fire Services and Communities Aware and Trained in their Relevant Bushfire Risk Management Elements					
Output E3.1 Appropriate Training Courses developed and in place					
Milestones E3.1.1	Three short courses developed for Fire Services personnel in response to priority agency needs (Each Year).	In-part		Arrange of workshops and conferences were provided trough the year for fire mangers to participate in CRC projects and learn about research outcomes.	Review of higher education courses in the field of bushfires /emergencies /environment will identify opportunity for the CRC to develop short courses. Plan to work with agencies in 2006/07 to identify short course opportunities.
Milestones E3.1.2	Community education materials or courses developed on priority topics identified by the CRC and/or agencies (One per year).	Yes	*Black Tuesday*, documentary film developed in partnership with CRC partners and screened on TV. Further film work for 06/07		
Output E3.2 Effective technology transfer to the main Bushfire CRC End-Users					
Milestone E3.2.1	Technology Transfer Officers in place to translate research outputs into usable materials. Three officers from institutions or Fire Services in place supporting tropical northern, south-eastern, and western Australia (Dec 2004).	In-part	Fire Managers' research meetings are serving a vital technology transfer function	Part time staff member employed to develop *Fire Notes* – a publication on emerging research/issues from CRC research – jointly with AFAC. Four editions in 2005/2006	To be assessed as part of technology transfer plan. Further *Fire Notes* for 2006/2007

Program F: The Fire Knowledge Network

Type of Milestone and/or Output	Description of all 2005-06 milestones and/or outputs incl. past milestones which have not been met (and date)	Achieved	If achieved, progress during 05-06 and planned activities 06-07	Reasons why milestones and/or outputs have not been achieved	Strategies to achieve milestones which have not been met
Outcome F1: Regional and local community's relevant policy and decision makers aware of the Bushfire CRC, more informed on fire science, and more engaged in sharing fire knowledge.					
Output F1.1 The Fire Knowledge Network developed and operating effectively					
Milestone F1.1.1	Initial survey of stakeholders and scoping exercise on the concept and operation of The Fire Knowledge Network completed (April 2005).	Yes	Completed, detailed consultations of senior stakeholders completed and plan developed.		
Milestone F1.1.2	Initial network meetings with researchers, end users, community groups and policy makers (October 2005)	No		No, due to late appointment of Project Manager, Focus groups in progress, planned for November 2006.	Detailed user needs analysis also in progress.
Milestone F1.1.3	Modified Bushfire CRC Web site to reflect Fire Knowledge Network initiative and provide architectural framework for a dedicated new site on Fire Knowledge (June 2005).	Yes	Web site revised and architecture for dedicated new site in place. To be further developed and launched in 2006/07		

RESEARCH COLLABORATIONS

During the last year the CRC has developed a number of formal and informal research collaborations. We have built upon our linkages with various CRCs. For example links have been developed with Spatial Information CRC following the signing of a Memorandum of Understanding early last year; we have jointly funded an education project with Tropical Savannas CRC and have jointly funded a research fellow and PhD student with Desert Knowledge CRC. We also have students in common with the CRC for Sustainable Forestry and the Asthma CRC.

In the last year we have developed our relationship with the University of California, Berkeley, which has progressed towards a formal Memorandum of Understanding (pictured below). This will provide a strong linkage with a leading US research group that is addressing similar issues to those in Australia.

More informal relationships exist with a number of the Research Laboratories of the US Department of Agriculture, Forest Service in Riverside California, Firelab in Montana, and the Rocky Mountain Research Station. Discussions are now underway on formal agreements.

The CRC, as part of the HighFire project, has developed a large number of research connections including the Valles Caldera National Preserve in New Mexico, and Fraunhofer Institute for Atmospheric Research, Garmisch, Germany.

The CRC has also developed close linkages with the US Desert Research Institute, Nevada, with extended visits by Dr Tim Brown, who has assisted with the development of a national seasonal bushfire assessment.

⮜ Signing of a Memorandum of Understanding between the Bushfire CRC and the University of California Berkeley.

Picture from left to right: Professor Scott Stephens UC Berkeley, Professor John Handmer RMIT, Professor Max Moritz UC Berkeley, Professor Ross Bradstock UoW, Ian MacDougall, Chairman Bushfire CRC, Malcolm Gill CSIRO and Kevin O'Loughlin, CEO Bushfire CRC.

PROGRAM OVERVIEWS

PROGRAM A: SAFE PREVENTION, PREPARATION AND SUPPRESSION

User Leader: Phil Koperberg, NSW Rural Fire Service

Research Leader: Jim Gould, Ensis- Bushfire Group (CSIRO)

Overview

Program A is divided into five major research themes. Each theme has a range of research projects, postdoctoral research fellows, postgraduate studies, end user collaboration and national and international linkages. The five research themes are:

- Fire behaviour modelling
- Fire weather and fire danger
- Suppression technology
- Bushfire risk management
- Computing modelling and simulation

Each of these themes is lead by researchers from the CSIRO, the Bureau of Meteorology, and the Universities of Melbourne, New South Wales and Western Australia.

The Safe Prevention, Preparation and Suppression program was founded on the principles of risk management. Prevention, preparation and suppression of bushfires are separate risk treatments, each of which has an integral place in overall management of bushfires. This program is providing a better understanding of fire behaviour, fire weather, the danger of bushfires and strategies for suppression. This program is improving the management of fires by delivering a better, more tightly integrated understanding of strategies for prevention, preparation and suppression of bushfires. It is end-user focused - it aims to deliver decision support tools that will be enhanced through interaction between the researchers and the end-users.

The past three years have seen major advancements of research activities in Program A. We now have greater depth in a full range of science disciplines required to reduce the risk and impacts of bushfires including meteorology, fire behaviour, computer science, remote sensing fuel and risk management. The recruitment of PhD students and post doctoral researchers has enabled us to advance knowledge in key areas that will ensure a continued benefit to Australia and New Zealand. Researchers have been invited to participate in national and international conferences. Program leader Jim Gould is a member of the European Union Fire Paradox IAC (International Advisory Committee).

After a period of delay in some fire behaviour projects due to recruitment difficulties, the resources available to the CRC have been strengthened following successful recruitment and benefits from the CSIRO/Scion joint venture Ensis.

Key Outputs and Stakeholder Benefits

One of the highlights over the past year has been the First International Workshop on Fire Simulation Modelling in Christchurch, New Zealand (Project A1.1, A5). Bushfire CRC co-hosted this workshop with the Ensis-Bushfire Research Group. Developers from Canada, the United States, and Australia were invited to apply the Prometheus, FARSITE, and other similar fire behaviour models to New Zealand and Australian wildfires in grass, scrub and forested fuel types. Prometheus and FARSITE performed very well and further research is being done to develop a more physical base fire simulator (Project A5 and A1.1).

An inaugural workshop to develop a seasonal outlook of fire weather potential across Australia was conducted in collaboration with the Bureau of Meteorology, the Desert Research Institute (Dr Tim Brown), CRC researchers (Project A2) and end users around Australia. The workshop has generated the first national seasonal outlook of fire potential for the upcoming fire season. This was achieved by end users providing information on fuel conditions and fire management from the relevant state-based fire agencies across Australia. Fire weather meteorologist and climatologists provided the seasonal weather outlooks. From these inputs, a consensus outlook of fire potential for the upcoming season was developed.

More than 250 operational reports on aerial firefighting have been collected from all the fire agencies across Australia. These provided expert judgment on aerial suppression effectiveness from experienced air attack supervisors and ground crews. Selected data was used to provide an assessment of probability of aerial suppression effectiveness. Analysis of coefficients of these probability assessments showed that fire size, fire danger rating, and the time to first attack significantly influenced the success of the aerial suppression (Project A3).

The Bushfire Risk Management Model aims to improve fire management in its broadest sense. There are three components being developed for the risk model:

(i) The bushfire management business model (mitigation)

(ii) The spatial - temporal fire characteristics model (likelihood) and

(iii) The bushfire impact model (consequence).

The bushfire management business model quantifies the effect of the various impact mitigation options on the risk of wildfire impact.

The spatial-temporal fire characteristics model (PHOENIX) shows the distribution of fire intensity, inter-fire interval, time since ignition to impact and the size of the fire at time of impact across the landscape under different weather and management scenarios.

These spatial and temporal aspects of wildfires are then used as inputs to the bushfire impact model to indicate the potential level of impact on social, environmental, economic and political values. This model has successfully run on some wildfires in Victoria and Program A will be collaborating with state agencies to continue the application of the model on single fires before advancing to multi fire scenarios.

Future developments

The Project FuSE (Fire (u=wind) Shrubland Experiments) first stage of experimental burning was completed in Ngarkat Conservation Park in South Australia in May 2006. In collaboration with South Australia Department of Heritage and Environment fire behaviour and fuel assessment researchers will continue their experimental program to develop a prescribed burning guide for mallee-heath vegetation. The project (Project (A1.1, A1.3) is focusing on:

- Fuel structure change over time since fire
- Fuel moisture dynamics in mallee-heath vegetation

- Threshold conditions for fire spread sustainability, and
- Fire behaviour associated with mallee-heath vegetation.

The second stage of Project FuSE experiments will be on steep slopes and other shrubland vegetation types in New Zealand and will aim to improve fire behaviour models that predict rate and direction of fire spread in steep country.

The development of the new physical based fire spread simulator (Project A5) will continue. It will use historical experimental fuel, weather and fire behaviour data (Project A1.1) to provide rigorous evaluation and validation of fire spread simulation before extending the validation on operational and wildfire data.

Three PhD projects are well advanced with field and laboratory experimental studies. One PhD project on predicting fuel moisture in different heath vegetation is scheduled for completion in early 2007. A fourth PhD project on remote sensing and grass curing (Project A1.4) commenced in the third quarter of 2005/06. Suitable PhD candidates are still being sought for two additional projects - fuel consumption and pasture growth and curing modelling.

Project title	Project Leaders	Objective
A1.1 **Fire behaviour modelling**	Jim Gould, Wendy Anderson	To improve firefighter and community safety in the management of bushfires, by providing better knowledge and understanding of the interaction of fire, fuel, weather and topography across Australia.
A1.3 **Fuel classification and availability**	Peter Ellis	To develop a single fuel classification system in Australia to be used in smoke emission models, fire behaviour predictions and habitat modelling. To develop a model of fuel availability based on fuel, weather and fire behaviour characteristics.
A1.4 **Improved methods for the assessment and prediction of grassland curing**	Stuart Anderson	To develop improved methods for the assessment and prediction of grassland curing as an input into fire danger rating systems and fire behaviour models.
A2.1 **Fire weather and fire danger**	Graham Mills	To improve the operational utility of fire weather forecasts and outlooks by providing a better understanding of wind, temperature and humidity structures and distributions, on the very short-term (1-12 hours), short to medium term, and seasonal time scales.
A3.1 **Evaluation of suppression techniques and guidelines (aerial and ground)**	Jim Gould	To optimise the effectiveness and efficiency of aircraft use during firefighting operations.
A4.1 **Bushfire risk management**	Kevin Tolhurst	To develop a risk management decision support system for communities living in the rural/urban interface, town planners, power companies, firefighters, land managers.
A5.1 **Fire spread simulation**	George Milne	To develop a physically accurate modelling, simulation and animation toolset that will permit rapid execution of a model of a specific bushfire situation to permit the prediction of fire development and the effect of containment strategies.

PROGRAM B – FIRES IN THE LANDSCAPE

User Leader: Ewan Waller, Department of Sustainability and Environment, Victoria

Program Leader: Mark Adams – University of New South Wales

Overview

Program B "Fires in the Landscape" had another good year with all broad indicators – outputs, outcomes, new projects and new funding – being strongly positive.

Some highlights are discussed below. Many of the teams involved in Program B have strong international collaborations and these have clearly helped the CRC develop its international profile. For example, following initial contact with Professor Scott Stephens at the University of California, Berkeley, several other Bushfire CRC research groups have now built the relationship to the point where a Memorandum of Understanding has been developed.

Program B and the Bushfire CRC supported a number of international visitors to Australia this past year with perhaps the highlight being Professor William Bond's visit to CSIRO Sustainable Ecosystems in Darwin and his contribution to the Fire Managers' Research workshop in Wollongong. Bond also spent considerable time with Professor Ross Bradstock and his group at the University of Wollongong.

The entry of the University of Wollongong as a new Associate Partner in the Bushfire CRC will help the CRC and Program B strengthen their student activities as well as cement links to the New South Wales Department of Environment and Conservation. Program work based in Darwin produced several publications in leading international journals such as *Oecologia*, and a new project beginning in the Kimberley was added to high profile activities in Kakadu on indigenous burning and at the Territory Wildlife Park.

Western Australian partners continue to lead efforts to better integrate end-users and researchers with an outstanding degree of cooperation and collaboration evident across at least four CRC projects. Researchers at the Western Australian Department of Conservation and Land Management (now Department of Environment and Conservation) are pushing hard to improve use of remote sensing tools in land management and to make heavy use of the substantial fire history records held in Western Australia. The spirit of cooperation also led to the collation of fire size and weather data across Australia by Dr Matthias Boer of the University of Western Australia with inputs from several groups in Program B. This will result in significant outputs in the coming year.

A new project on forest decline has begun, lead by Dr Neil Davidson from the University of Tasmania. This project has been made possible with additional funding contributed to the CRC by its stakeholders. This project spans four states with major activities in NSW, Victoria, Tasmania and Western Australia.

Key Outputs and Stakeholder Benefits

Smoke features highly in the list of outputs and outcomes of immediate significance to the stakeholders of the CRC.

The Bureau of Meteorology team lead by Dr Graham Mills has produced a range of tools that can be used by land management and fire-fighting agencies and these tools are steadily being made web-accessible. Graham Mills also featured in the media with his work on atmospheric conditions (the "dry slot" phenomenon) that contribute to fire severity.

Establishment of a smoke analysis facility at the University of NSW was completed courtesy of a generous financial contribution from the university. That facility will be developed in coming years - in conjunction with land management agencies and rural and urban fire brigades.

Many project leaders in Program B spend large amounts of time working either directly with land management and emergency service agencies or indirectly with them through community groups and public forums. Several projects are noteworthy in this regard. The Program B components of the HighFire project have been on display at five public meetings or briefings and more are planned by HighFire project leader Dr Maria Taranto.

Future developments

2006/7 will be a demanding year in which outputs and milestones must be delivered and translated into policy and practice. Major changes in the external environment, including findings and recommendations from inquests and inquiries will have a significant bearing on our key stakeholders. It seems inevitable the focus on prescribed burning will intensify and that the CRC will be looked to for advice that takes account of community expectations. This leads logically to a greater emphasis on community education, outreach and training.

Many project leaders are no doubt asking themselves questions about sustainability of research funding in an environment where more emphasis will be placed on use of existing knowledge that, many would argue, is already sufficient to improve both policy and practice. The answer to continued CRC support for research is undoubtedly delivery on the promise. In addition, further sources of funding will need to be explored and many project leaders are identifying funding targets. One of the most likely sources may be found in the link between climate change and fire regimes and we expect to see several proposals in this area soon.

Project title	Project Leader	Objective
B1.1 **Managing fires in forested landscapes in south-western Australia**	Lachlan McCaw	To identify patterns of change in the abundance and richness of biota as a result of different fire regimes in forested landscapes in south Western Australia.
B1.2 **Managing bushfire risk in a changing world**	Ross Bradstock	To provide optimal solutions for sustainable bushfire risk management, in differing ecosystem, management and global/climate change contexts.
B2.1 **Behaviour of smoke plumes and hazes**	Graham Mills	To assist in the reduction of impact of smoke from an urban or rural fire on community health and safety by predicting the transport, dispersion and concentrations of smoke particulates.
B2.2 **Smoke composition and impact on health and ecosystems**	Tina Bell	To identify and quantify the chemicals in smoke produced from biomass burning.
B3.1 **Effect of fire on ecosystem processes and biodiversity**	Alan York	To understand the interaction between fire, vegetation, invertebrates and soil organisms in carbon and nutrient cycling, and how this contributes to biodiversity conservation and ecosystem function.
B3.2 **Prescribed fire and biodiversity in northern Australia**	Alan Andersen	To enhance the effectiveness of fire management for biodiversity conservation in northern Australia.
B4.1 **Synthesis and integration**	Mark Adams	To synthesise existing data and integrate with world literature and produce plain language text on prescribed burning.
B4.2 **Multi-scale analysis of patterns in ecological processes in relation to fire regimes**	Pauline Grierson	To integrate ecological information derived at smaller scales with larger scale management perspectives.
B6 **HighFire: underpinning evidence-based policy for fire regimes and their management in the high country**	Maria Taranto, Mark Adams, John Handmer, Rick McRae, Rod Weber.	To contribute to the current evidence-base for fuels management, understanding and improving human resilience and managing bushfire risk in high country landscapes.

PROGRAM C – SELF-SUFFICIENT COMMUNITIES

User Leader: John Gledhill, Tasmania Fire Service

Program Leader: Professor John Handmer

Overview

The main cross-Program output was a special issue of the Elsevier Journal Environmental Hazards containing papers from projects in Programs C and D, edited by John Handmer. This initiative arose from a Program researcher and end-user meeting in December 2005, hosted by Emergency Management Australia, where it was agreed to produce a book of material from research results to date written specifically for users.

Program C research has been recognised in a number of ways. The Arson project (C3), being undertaken by the Australian Institute of Criminology in partnership with the ACT Department of Justice and Community Safety was highlighted in the 2005-06 Australian Government's Innovation Report. This project along with the Stay or Go (C6), and Understanding Communities (C1) Projects received extensive media coverage on radio and in print, and will be featured in an ABC TV documentary series later this year. Along with researchers from elsewhere in the CRC, John Handmer was invited to participate in the Californian Living with fire in the Chaparral project. This is leading to ongoing collaboration in the form of exchanges and joint papers between our Fire Economics project, the Stay or Go project and the US Forest Service and the University of California at Berkeley.

Conference papers were presented at Australian meetings and some international gatherings. Papers on the Stay or Go project were presented at Boulder and Berkeley in the United States, and John Handmer presented a keynote address at the United Nation's Third Early Warning Conference in Bonn, Germany.

Surveys on community expectations have been completed and written up in Queensland (C1), and further work here is planned in conjunction with the risk communication project (part of C4). Many people participated in community focus groups held across north eastern Victoria to discuss bushfires and community safety (C6), and detailed interviews were held in the Eyre Peninsula (C7 and C6) as part of research into why people leave their homes at the last minute. Our media project (part of C4) held a focus group in western Victoria on the media and community warnings.

Program C's contribution to the Alpine project, HighFire, has commenced with the appointment of Jennifer Indian as a field based Research Fellow.

All projects have established user Advisory Panels. There have been many meetings between researchers and end-users including the possibility of additional research or expanding the research to include states and areas not currently covered as well as they should be. In December 2005 EMA hosted the sixth Program C researcher/user workshop.

There are currently 12 students in Program C, including one from the University of Canterbury, Christchurch, New Zealand.

Key Outputs and Stakeholder Benefits

The Australian Institute of Criminology continued its research note series by publishing its 34th Arson Bulletin. These are very popular in the industry and one of the most accessed products on the CRC website.

The media project produced a number of reports for end-users, including Reporting Bushfires: What motivates the media? and a paper in the Australian Journal of Emergency Management.

A compilation of the existing evidence base for the "Stay or Go" policy has been published in Environmental Hazards. A revised assessment of the relevant law is being circulated. Both documents provide support for the existing approach but raise a range of implementation issues.

A report was produced by the Economic Assessment of Aerial Fire-fighting project. This essentially supports the use of aerials on economic grounds and is an important input into decision-making on aerial investment.

A joint project between our Understanding Communities project, and Queensland Fire and Rescue Services was completed -The Sudanese Refugees and Fire Hazard Study.

The evaluation report on the Blue Mountains Street FireWise program was very favourably received and is being acted upon.

Future developments

Major project outputs over the next year include:

- A comprehensive analysis of bushfire incidence data from across Australia is being finalised. The report will provide a foundation for assessing the impacts of bushfire arson in the community and inform the implementation of appropriate preventative measures.
- An examination of how children perceive risk and the implications this has for educating them about bushfire risk is underway in Tasmania.
- The media project is examining fire agencies and the Web, the role of ABC Talk Back radio in the January 2006 NSW fires; and will shortly publish their analysis of The media, bushfires and community resilience.
- The Understanding Communities project will be undertaking hazardous weather warnings training for BRACS (Indigenous radio) operators in Queensland.

The major cross-Program output this coming year will be in the form of a commercially published book, Community Wildfire Safety. This will set out summaries of the work to date in a form useful to senior practitioners. The book will include contributions from other Programs highlighting a commitment to gain synergies across the CRC.

The other area of cross-Program development is the expanding work on linking Program C research to other areas of the CRC, so that projects in cognate areas inform each other to produce more useful output. This is occurring between Programs B and C in the HighFire project; between Programs C, D and others through work on aspects of "Stay or Go"; and with Program A through work on the cost-effectiveness of aerial fire-fighting – among other areas. Most of these linkages have produced joint papers or reports.

International collaboration in this program is now solid and will be reinforced through joint papers with colleagues at the Forest Fire Laboratory at Riverside, California, and at the University of California at Berkeley. This will help ensure that the CRC's work is of international standing. Within Australia Program C is about to link formally with Macquarie University's hazard research centre Risk Frontiers.

Project title	Project Leader	Objective
C1 **Understanding communities**	Alison Cottrell and Judy Newton	To contribute to the understanding of community needs, expectations, behaviours and attitudes to bushfire risk, response and recovery.
C.3 **Bushfire arson**	Matthew Willis, Toni Makkai and Derek Jory.	To reduce the impact of deliberate and negligent fire lighting in Australian bushland environments.
C4 **Effective risk communication**	Douglas Paton, Peter White and Peter Hughes	To investigate the factors in a risk communication program to promote readiness for bushfires and to respond effectively on receiving warnings.
C5 **Bushfire economic costs**	John Handmer	To coordinate research in Australia to increase the self-sufficiency of communities in managing the risk from bushfires.
C6 **Stay or go**	John Handmer	To identify impediments to the full implementation of the ‘‘Prepare, Stay and Defend or leave early’’ policy.
C7 **Development of an evaluation framework for community safety policy and programs for bushfire**	Gerald Elsworth	To develop an evaluation framework and associated methodology for the community safety approach to bushfire risk.

PROGRAM D: PROTECTION OF PEOPLE AND PROPERTY

User Leaders: Neil Bibby and Naomi Brown, Country Fire Authority, Victoria

Program Leader: Bob Leicester, CSIRO, Manufacturing and Infrastructure Technology

Overview

In 2005-2006, Program D completed a national tour of the capital cities of Australia. These roadshows were extremely effective in publicising not only the research within Program D, but also that of the whole Bushfire CRC. One set of spin-offs achieved was that the various projects within the program were able to initiate useful collaborations with end-users for advice, access to data, setting up field trials and eventually assistance in the implementation of research. One result was the first successful gathering of field data during fire fighting operations, specifically in projects D2.2 (smoke toxics) and D2.3(safe decisions).

This year there were several specialist meetings on the topic of smoke exposure. In part these were motivated by the need to ensure that the CRC does not create any unnecessary alarm in discussing the incidence of potentially toxic chemicals in smoke. However the meetings were also very useful in clarifying the scenario of risk. It is now appreciated that in our discussions we need to make a careful distinction between talking about the chemicals in smoke, the concentrations in the environment, the dosage that a person receives and the medical health effects that may occur. It is only the latter that is of critical concern.

Another matter addressed was to ensure that the projects within Program D were not duplicating the work undertaken during Project Aquarius, a major research program that preceded the formation of the Bushfire CRC. To this end a special seminar was arranged in which Grahame Budd, John Brotherhood and Phil Cheney (all key participants of Project Aquarius) were present. In the discussions it emerged that the current studies on physiology could be regarded as a logical sequel to those undertaken during Project Aquarius. The Aquarius project concerned a limited number of relatively fit career firefighters operating on foot and using hand held equipment, whereas the current project focuses on tanker crews comprising volunteer fire-fighters who have a wide range of age and fitness levels. In the same meeting it was agreed that the current projects relating to smoke formed a much wider program than those in the earlier Aquarius project.

Program D was also involved in both national and international initiatives. Within Australia, assistance was given to the coronial enquiry into the Eyre Peninsula fires of 2005. Internationally, Justin Leonard was an invited expert speaker to a Chaparral Ecosystems project at the University of California and was partly instrumental in the development of a Memorandum of Understanding between that university and the Bushfire CRC.

Most of the individual projects within Program D are progressing effectively. Project D1, concerned with the rural-urban interface, has nearly completed an extensive test program to measure the impact of bushfires on critical infrastructure elements, such as glazing, decking, water tanks, fences and power-poles. For this sub-project, the CRC formed a useful collaboration with BlueScope Steel to fund a significant part of the research. A new PhD student has been recruited to assist in the development of a risk model. When complete, this research should lead to recommendations for optimum building regulations and firefighting resourcing, town planning concepts (including fuel management at the interface) and recommendations for advising on community education. The end result will be that people will be able to live with greater confidence and safety in the rural-urban interface zones that are so popular with Australians.

In research on safety on the fireground, Project D2.1 (Physiological Effectiveness) is now well underway involving a full team of researchers from the University of Melbourne. In Project D2.1 (Smoke Toxics) data has been obtained through continuous monitoring of firefighters working on a number of prescribed fires and one accidental fire. It now has a set of data to provide a first idea of the work environment of operational firefighters.

Within Project D3 (Enhancing Volunteerism), surveys of the current volunteer services have provided solid data where previously information was largely from anecdotal sources. A picture of the demographics of the current volunteer services is becoming clear and it is possible to make a reasonable estimate of the demographics in the near future. Research is now in progress to examine ways of enhancing, retaining and improving the effectiveness of the current volunteer force.

In project D4 (Respiratory Health) tests have shown the type of filters that should be used when face masks are considered necessary. Project D2.3 (Safe Decisions) has also completed a successful season of field monitoring comprising more than 100 interviews with firefighters and this has provided data to form initial hypotheses on factors that affect decisions. These factors will be trialed through the computer simulator Network Fire Chief which is now considered to be at a stage of development where it produces realistic fire scenarios.

Project D5 (Information Flow in IMT) is the most recent project to commence in Program D. It has proven to be extremely popular, and has attracted the support of more than a dozen firefighting agencies.

The eventual outcomes of this research on safety on the fireground include:

- a series of training and operational strategies that will lead to more efficient use of the manpower available;
- the avoidance of the rare but traumatic occurrences of multiple death or injury events, and;
- the provision of data that could be used as a first step in detecting any potential long term health effects for firefighters.

Future developments

Several strategies are being examined for the immediate future of Program D. The most important is to examine the interactions and synergies that exist between projects within Program D and with projects in the other programs. For example, decisions in the field may be affected by smoke toxics or by physiological factors such as dehydration and fatigue. Similarly the safety of buildings is very much dependent on the actions of the building occupants, a topic studied in Program C. During the past year, these potential interactions have given rise to several papers whose authors reside in more than one project. It is anticipated that from the point of view of original research of international significance, these interactions provide the CRC with unique opportunities for success.

Other plans for Program D include the setting up of more effective researcher/end-user groups. Also, methods will be sought for obtaining more field data, both from past and for future fire events. In particular, plans have been discussed with end users to obtain video coverage of significant factors that occur during a bushfire. The motivation for this arises from the fact that much of the data on which current theories are based come either from forensic evidence from past events or from interviews with traumatised eye-witnesses after the event.

Project title	Project leader	Objective
D1.1 **Building and occupant protection**	Justin Leonard	To improve awareness and understanding of the issues surrounding building loss in bushfires, through research, communication and education.
D 2.1 **Fire fighter health and safety**	David Nichols	To improve the safety, health and general well-being of volunteer and career fire fighters in their fire fighting duties.
D 2.2 **Personal exposure of firefighters to air toxics and OHS risk management strategies**	Steve Brown (until December 2005), Donavan Marney (from January 2006)	To develop and apply capabilities for measuring the personal exposures of bushfire fighters to a wide range of air toxics in different fire scenarios.
D2.3 **Safety in decision-making and behaviour**	Mary Omodei	To identify the human factors that lead bushfire fighters to make decisions that place themselves or others at risk.
D2.4 **Safe, cost-effective equipment for reduced firefighting risks to firefighters**	David Nichols	To increase the safety of firefighters through improvements in equipment, vehicles and processes.
D3 **Enhancing volunteer recruitment and retention**	Mary Omodei (Manager: Jim McLennan)	To carry out joint research with fire agencies that will assist them to maintain sufficient numbers of volunteers and brigades to meet community needs.
D4 **Respiratory health of firefighters**	Phil Weinstein, Angus Cook, Phil Thompson, Brian Devine	To investigate the respiratory health effects of occupational exposure to combustion products from bushfires as well as the efficacy of the protective filters on firefighters' masks.
D 5 **Optimising information flow through collaborative work performance: Enhancing emergency incident management team effectiveness and organisational learning**	Christine Owen	To improve teamwork effectiveness and subsequent organisational and cross-organisational learning.

PROGRAM E: EDUCATION AND TRAINING

Overview

Developing a new generation of bushfire researchers for Australia

This year has seen a marked increase in activity in the Bushfire CRC's Education Program. During the year the CRC gave a total of 48 grants to students participating in the program at Honours, Vacation, Masters or PhD level. Students are represented in projects across the CRC's four research areas.

Eleven new students (9 PhD and 2 Masters) joined the program in 2005/2006, bringing the total number of postgraduate students to 31. Supervisors of higher degree students are from across the CRC research program. Students are actively engaged in Bushfire CRC workshops and events and regularly participate in project level activities.

The CRC's successful vacation placement program was held over summer 05/06. This year eleven students participated in the program, with half of the students based at Bushfire CRC partner agencies. The results of the summer projects have been published in reports, posters and papers. One of the indicators of success has been the number of students who have gone on to further study from the vacation program – three students of the 11 in this year's program have since joined the CRC as PhD students.

Bushfire CRC students 2005-2006	
Phd	27
Masters	4
Honours	6
Vacation	11
TOTAL	48

[Note – three vacation students have since joined the PhD program and one Honours student, actual total number is 44].

The program will continue to grow through to 2006/2007 and the CRC looks forward to the first CRC supported students graduating later in 2006. A particular focus of activities in 2006/2007 will be on developing a transition strategy and working with students on professional development activities to increase their employment potential and retain their skills within the fire and land management arena.

A complete list of students supported throughout 2005/2006 is included in Table 1 and Table 2.

Knowledge transfer – facilitating adoption of research outcomes

The centre's research adoption and knowledge transfer activities are gathering momentum. A range of activities such as forums, workshops and publications are facilitating adoption of Bushfire CRC research.

Central to the program has been the development of a framework comprising four key activity areas for future technology transfer activities:

1. Fact sheets and publications – such as the recently developed *Fire Note*.
2. Workshops and road shows – showcasing research outcomes and their implementation with agencies, across Australia.
3. Short courses – working with agencies to incorporate new research into existing training programs.
4. Higher degree courses – working with partner universities to incorporate CRC research into existing courses and working to fill identified gaps.

Highlights of this year's program include:

- A range of activities carried out in conjunction with Blue Scope Steel to facilitate promotion of adoption of research outcomes from the Project D1 research into the efficacy of steel fencing during bushfires. BlueScope Steel and the Bushfire CRC jointly developed flyers on the research and the Bushfire CRC hosted a forum in conjunction with ACT Rural Fire Service for fire and planning agency staff in Canberra.
- Annual conference held in conjunction with AFAC in Auckland in October 2005, along with presentations the conference showcased over 40 research posters. These posters were packaged together and distributed as a compendium of current Bushfire CRC research activities to CEOs and senior staff from fire and land management agencies.
- Posters have also been reproduced by the Tasmania Fire Service in the quarterly Fireground magazine. Posters are also available for download from the Bushfire CRC website.
- The new *Fire Note* research publication, developed jointly with AFAC and the Bushfire CRC, provides a background on emerging issues in the field and profiles current research. The audience is staff in fire and land management agencies. Based on the positive feedback, the publication will be used as a vehicle for promoting research outcomes as part of the knowledge transfer program.
- Production of the Short documentary film – *Black Tuesday* – about the 1967 Hobart bushfires. The film screened on Southern Cross TV in Hobart and in Darwin. The film interviewed survivors of the fires and focused on the lessons learnt from the event and the importance of science and research in the prevention of large scale wild fire events.
- The awarding of a prestigious 2005 National ASCILITE Awards for Educational Design and Technology in Tertiary Education for Fire Ecology & Management in Northern Australia, the undergraduate science unit developed by Bushfire CRC researchers from the CSRIO in conjunction with Charles Darwin University.

Complete table of knowledge transfer activities is included in Table 3.

Bushfire CRC Postgraduate students

TABLE 1: BUSHFIRE CRC POSTGRADUATE STUDENTS 2005/2006

STUDENT	AWARD	PROJECT TITLE	CRC LINK	SUPERVISORS	AGENCY LINKS
1 Brendan Pippen, UNSW	PhD	Predicting factors affecting fire behaviour in heathland vegetation	A 1.1	Dr Wendy Anderson (UNSW ADFA)	NSWNPWS
2 Phil Lacy, UNSW	PhD	Burning under young eucalypts	A 1.2	Professor Rodney Weber (UNSW ADFA) and Jim Gould (CSIRO)	NSW Forests
3 Bobby Chu, UWA	PhD	Modelling and simulation of bushfire sensor networks	A 5.1	Professor George Milne (UWA)	FESA WA
4 Danielle Martin	Masters	Development of satellite vegetation indices to assess grassland curing across Australia and New Zealand	A 1.4	Dr Ian Grant (BOM) and Dr Simon Jones (RMIT)	Bureau of Meteorology
5 Ken Scott, CDU	PhD	Fire & savannah grass ecology	B 3.2	Dr Alan Anderson (CSIRO) & Dr Sam Setterfield (CDU)	Bushfires NT
6 Phil Zylstra, UNSW	PhD	Plant species contributions to fire intensity – towards a total fuels model	B 1.2	Professor Rod Weber (UNSW), Dr Ross Bradstock (NSW NPWS), Dr Geoff Cary (ANU) & Dr Malcolm Gill (CSIRO)	NSW NPWS
7 Bevan McBeth, SCU	PhD	Soil, fire & physiological processes & dieback in coastal eucalypt forests.	B	Associate Professor Alison Specht (SCU) and Professor Mark Adams (UNSW)	Forests NSW and NSW NPWS
8 Rohan Sadler, UWA	PhD	Long term monitoring & modelling in quantifying the role of fire in grasslands	B 4.2	Dr Pauline Grierson & Dr Matthias Boer (UWA)	CALM WA
9 Adam Levesley, ANU	PhD	Impact of fire mosaic on birds in mulga woodlands of central Australia.	B 1.2	Dr Malcolm Gill (CSIRO), Dr Geoff Cary (ANU) & Dr Ross Bradstock (NWS NPWS)	Bushfires NT & Desert Knowledge CRC
10 Alison O'Donnell, UWA	PhD	Fire patterns and vegetation structure in semi-arid south-east western Australia	B 1.1 & B 4.2	Dr Lachie McCaw & Dr Li Shu (CALM), Dr Pauline Grierson & Dr Matthias Boer (UWA)	CALM WA
11 Jaymie Norris, UWA	PhD	Microbial clues for ecological sustainable management of fire	B 4.2	Dr Pauline Grierson, Dr Matthias	CALM WA

			prone landscapes.		Boer , Dr Richard Cookson (UWA)	
12	**Madeline Osborn, Uni Melb**	PhD	The role of fungi in fire prone forest communities	B 3.1	Dr Tina Bell & Dr Cassandra McLean (Uni Melb)	Forests NSW
13	**Rowena Morris, Adelaide Uni**	PhD	The effect of prescribed burning on sediment movement in the Mt Lofty Ranges	B 3.1	Dr Meredith Henderson (SA DEH)	SA DEH
14	**Anne Miehs, Uni Melb**	PhD	The role of coarse woody debris in fire-prone forests: Achieving both fire management and conservation objectives.	B 3.1	Dr Alan York and Dr Tina Bell (Uni Melb)	DSE Victoria & Forestry Tasmania
15	**Francesca Harris-Spence, UWA/Adel Uni**	PhD	Catchment management groups - volunteer community organisations and bushfire management	C	Dr Marcus Lane (Uni Adelaide) and (UWA)	SA CFS and FESA
16	**Sarah Chapman, UWA**	PhD	Factors affecting the fight or flight decision in the face of bushfires.	C6	Dr John Morrison (UWA)	FESA
17	**Josh Whittaker, RMIT**	PhD	Adaptive capacity and social resilience to bushfires in Southeast Australia	C6	Professor John Handmer (RMIT)	CFA
18	**Laura Kelly, UTAS/Canterbury**	Masters	Community resilience to and recovery from wildfire in New Zealand.	C1 & C4	Professor Douglas Paton (UTAS), Dr Lisa Langer (ENSIS) & Dr Richard Vokes (Canterbury)	CFA & TFS
19	**Alan Rhodes, RMIT**	PhD	Evaluation of the stay or go policy and community preparedness	C7 & C6	Professor Gerry Elsworth (RMIT)	CFA
20	**Tim Prior, UTAS**	PhD	Community responses to bushfire threat	C4 & C1	Professor Douglas Paton (UTAS) & Dr Alison Cottrell (JCU)	TFS
21	**Brioney Towers, UTAS**	PhD	Developmental perspective on bushfire risk communication	C4 & C1	Professor Douglas Paton (UTAS)	CFA & TFS
22	**Mae Proudley, RMIT**	Masters	Reducing bushfire risk through improved household decision making.	C6	Professor John Handmer (RMIT) and Dr Helen Goodman (RMIT)	CFA and CFS
23	**Luke Balcombe, JCU**	Masters	The perceptions of bushfire hazard in urban fringe areas of tropical Australia.	C1	Dr Alison Cottrell (JCU)	QFRS
24	**Matt Phillips, Uni Meld**	PhD	Physiological demands of Australian volunteer fire-fighters	D 2.1	Dr Glenn Mc Connell (Uni Melb)	CFA

			during bushfire suppression		and Dr Brad Aisbett (Uni Melb)	
25	**Sean Cowlishaw, La Trobe**	PhD	Effects of Fire Service Volunteering on families of volunteers	D3	Dr Jim McLennan (La Trobe)	CFA
26	**Melissa Fixter, UWA**	PhD	Bushfire exposure and respiratory health of fire fighters	D4	Professor Phil Weinstein & Dr Angus Cook (UWA)	FESA
27	**Annemarie De Vos, UWA**	PhD	Health effects of occupational exposure to bushfire smoke in WA	D4	Professor Phil Weinstein & Dr Angus Cook (UWA)	FESA
28	**Yih-Pyng Lee, UWA**	Masters	Community asthma and bushfires in Western Australia	D4	Professor Phil Weinstein & Dr Angus Cook (UWA)	FESA & CALM
29	**Clare Johnston, La Trobe**	PhD	Worst Case Scenarios: their role in safe decision making in bushfire fighting.	D 2.3	Professor Geoff Cummings and Dr Mary Omodei (La Trobe)	CFA, RFS
30	**Dane Hansen, RMIT**	PhD	Characterization of the volatile organic components adsorbed to particulates generated in bushfires	D 2.2	Dr Nichola Porter (RMIT), Dr Fabienne Reisen (CSIRO) & Mr Terry Elms (RMIT)	CFA
31	**Ian Dwyer, UTAS**	PhD	Communication strategies and collaborative work practices in high-reliability workplaces: A study of coordination centres.	D5	Dr Christine Owen & Ross Brooker (UTAS)	CFA, RFS, TFS

TABLE 2: BUSHFIRE CRC HONOURS AND VACATION STUDENTS 2005/2006

HONOURS STUDENTS						
STUDENT		**AWARD**	**ORGANISATION**	**PROJECT TITLE**	**PROJECT**	**SUPERVISOR**
1	Kate Lawrey	Honours	RMIT	Community Expectations: an investigation into support services provided to bushfire affected communities	C 5	Professor John Handmer (RMIT)
2	Clare Johnston	Honours	La Trobe	A field and laboratory study of decision making by bushfire fighters	D 2.3	Professor Geoff Cummings and Dr Mary Omodei (La Trobe)
3	Amy Davidson	Honours	ANU	Key Determinants of Fire Frequency in the Sydney Basin region, Australia.	B 1.2	Dr Geoff Cary (ANU) Dr Malcolm Gill (CSIRO) Dr Ross Bradstock (NSW NPWS)
4	Rob de Light	Honours	ANU	Determining the risk profile for unplanned fires in the Sydney region	B 1.2	Dr Geoff Cary (ANU), Dr Malcolm Gill (CSIRO) Dr Ross Bradstock (NSW NPWS)
5	Carola de benarik	Honours	ANU	Determinants of fire severity in the Cotter River catchment, Canberra region.	B 1.2	Dr Geoff Cary (ANU), Dr Karen King (ANU) & Dr Ross Bradstock (NSW NPWS)
6	Andrew Stanton	Honours	UNSW	Bushfire in the Blue Mountains: people, processes and outcomes	C 1	Dr Alison Cotterel (JCU)
VACATION STUDENTS						
1	Julian Black	Vacation	CSIRO	Spatial analysis of bushfire impact at the urban interface	D 1	Dr Raphael Blanchi (CSIRO)
2	Dane Hansen	Vacation	CSIRO	Personal exposure measurements of fire fighters to bushfire smoke	D 2.2	Dr Fabienne Reisen (CSIRO)
3	Sandra Plummer	Vacation	Forests NSW	Variation in seed bank properties in managed forests	B 3.1	Dr Trent Penmam (Forests NSW)
4	Chloe Flaherty	Vacation	CALM WA	Retrospective measures of fire intensity for forested landscapes in southwestern Australia	B 1.1	Dr Roy Wittkuhn (CALM)
5	Petina Blackwell	Vacation	Uni Melb	Mycorrhizal associations of trees and understorey species in fire-prone forests	B	Dr Tina Bell (Uni Melb)

6	Guy Barrett	Vacation	ACT RFS and ENSIS	Assessment of drop patterns and penetration of foam suppressants from medium aerial platforms in grassland and open woodlands in the ACT	A 3.1	Dr Matt Plucinski (ENSIS) and John Fisher, (ACT RFS)
7	Paul Killey	Vacation	ACT RFS and ENSIS	Assessment of the application of CAFS technology for bush and grassland fire fighting	A 3.1	Dr Matt Plucinski (ENSIS) and John Fisher (ACT RFS)
8	Nick Valentine	Vacation	La Trobe	Reluctance to change outdated fire control plans: Development of Networked Fire Chief test scenarios	D 2.3	Dr Mary Omodei (La Trobe)
9	Katie Glasgow	Vacation	QFRS and JCU	Refugee Groups and Fire Hazard: a preliminary study	C 1	Dr Alison Cottrell (JCU) and Judy Newton (QFRS)
10	Vicky Chu	Vacation	UWA	A survey of allergic symptoms in fire-fighters exposed to bushfire smoke	D 4	Anne Marie de Vos and Dr Angus Cook (UWA)
11	Sean Cowlishaw	Vacation	La Trobe	Impacts of Family-Related Issues on Aspects of Fire Service Volunteering	D 3	Dr Jim McLennan (La Trobe)

TABLE 3: BUSHFIRE CRC KNOWLEDGE TRANSFER ACTIVITIES 2005/2006

ACROSS CRC KNOWLEDGE TRANSFER ACTIVITIES					
No.	**Title**	**Project**	**TT Activity**	**Details**	**Outcome**
1	**BCRC / AFAC 2005 Conference - Auckland**		Conference	Annual conference held in conjunction with AFAC	1000 delegates and 40 posters exhibited
2	**BCRC / AFAC 2005 Conference - Posters Compendium**		Posters Compendium	A compendium of BCRC research posters exhibited at the BCRC / AFAC 2005 Conference	40 copies produced, send to all board members, AFAC Council members and program leaders
3	**AFAC Strategy Groups**		Stakeholder engagement	Regular presentations to AFAC strategic issues group on the progress of and outcomes from BCRC research	
4	**Fire Note - Gels**		Fire Note	Four page publication, developed in house, on the use of gels in aerial suppression operations - compilation of overseas and BCCR research	Distributed for BCRC partner agencies and available on website
5	**Fire Note - Prescribed burning**		Fire Note	Four page publication, developed in house, on prescribed burning - compilation of overseas and BCCR research	Distributed for BCRC partner agencies and available on website
6	**Black Tuesday 1967 Film Production**		DVD	30 minute documentary on 1967 Hobart fires	30 minute film, 1000 copies produced, distributed to emergency services libraries, public libraries and schools in Tasmania.
7	**Black Tuesday 1967 Film Screening on commercial TV**		Film screening on commercial TV	Film screened on commercial TV (Southern Cross, WIN TV) in Hobart and Darwin	Film screened in Darwin and Hobart
8	**Fire Note - Smoke**		Fire Note	Four page publication, developed in house, on smoke from wildfires and prescribed fires - compilation of overseas and BCCR research	Distributed for BCRC partner agencies and available on website
PROGRAM A KNOWLEDGE TRANSFER ACTIVITIES					
9	**Fire Modelling Workshop**	A	Workshop	Workshop on fire models - audience for end users and researchers - some international guests	Greater links between projects

PROGRAM B KNOWLEDGE TRANSFER ACTIVITIES					
10	**HighFire Community Day**	B6/ F	Field Day	Public forum on the HighFire projects and bushfire CRC research activities	Attended by over 80 community members and agency staff
11	**Bushfire CRC Community Forum**	B6/ F	Public Forum	Public forum and open day on the HighFire projects and bushfire CRC research activities	Attended by 25 community members and agency staff
12	**HighFire Project Forum - Canberra**	B6	Research forum and workshop	Workshop and forum on BCRC new project - HighFire detailing the three sub projects, held at GeoScience Australia	Over 40 attendees from fire and land management agencies as well as community groups
PROGRAM C KNOWLEDGE TRANSFER ACTIVITIES					
13	**Understanding communities Bulletins 6-10**	C1	Fact Sheet	Thuringowa bushfire survey - fact sheets, used in delivering results of the project to agencies and the community	5 fact sheets on the outcomes of the research in Thuringowa, Qld
14	**Bushfire Arson Bulletins (15)**	C3	Bulletins	Continuing series on arson research being undertaken by the Australian Institute of Criminology. Follows publication of a literature review last year.	Extensive uptake by fire investigation units of all partner fire agencies (both urban and rural).
15	**Program C Meetings**	C1	Workshop	Workshop on the progress of and outcomes from BCRC research - with researchers and end users	15 end users
PROGRAM D KNOWLEDGE TRANSFER ACTIVITIES					
16	**BlueScope Steel Fencing Flyer**	D1	Fact Sheet	Fact sheet on steel fencing and bushfires research in Project D1	Fact sheet distributed to building supply organisations and used in trade journals
17	**BlueScope Steel Fencing Forum**	D1	Workshop	Forum on steel fencing and bushfires research in project D1	Staff from ACT RFS and ACT PLA invited to research presentation and workshop on implications of the research
18	**BlueScope Steel Media Package**	D1	Media kit	DVD, Fact sheet and interviews with researchers - promoted by Blue Scope and Stellar Communications to promote the outcomes of the fencing research	Extensive media publicity/ TV news stories on use of steel fencing
19	**Program D Road shows**	D1	Workshops	Road show - workshop in each state, promoting BCRC program D research and seeking further engagement from agencies	6 road shows

PROGRAM F – COMMUNITY OUTREACH

Through its Community Outreach program the Bushfire CRC is supporting its partners and the community by providing ways for researchers and fire and land management agencies to work together to share learnings and ensure the application of research findings across the industry. The Program also aims to promote, educate and communicate, to regional and local communities, information about bushfire knowledge and research. It is doing this through the development of The Fire Knowledge Network (TFKN) and by conducting regional and local CRC forums across Australia, in conjunction with CRC partners.

This year has seen significant progress in the Community Outreach Program particularly in the area of stakeholder and community engagement. Much work has been undertaken to understand stakeholder needs in order to establish the foundations for development of TFKN and to guide the activities for regional and local forums.

The Fire Knowledge Network

As a developing focal point for fire knowledge in Australia, New Zealand and globally, The Fire Knowledge Network is bringing together leading national and international research, and linking this knowledge and research to practice. Its value to the fire industry will be in the way it synthesises fire information and provides tailored knowledge to decision and policy makers, practitioners, researchers, the media and general public. This will be done by collecting, collating, analysing and disseminating information in varying forms, from detailed reports to short, succinct fact sheets.

The CRC envisages that this initial development work on The Fire Knowledge Network will provide the foundation for a lasting legacy of knowledge sharing of benefit to the fire and land management industry, researchers and the broader community.

Highlights of this year's program include:

- Completion of TFKN Stakeholder Survey by Howard Partners. Stakeholder consultations were conducted with member agencies of the Bushfire CRC. These consultations identified the need for a 'single', reliable source of validated evidence-based knowledge that was easy to access. The findings from this survey are being used to guide the development of the TFKN Business Plan.
- Appointment of a Manager, Knowledge Networking in June 2006 to guide the development and implementation of TFKN.

Bushfire CRC Forums

The Bushfire CRC commenced its program of Community Forums by aligning the knowledge transfer activities of the Education and Training Program with the Community Outreach Program.

Highlights of this year's program include:

- HighFire Community Day – field day on HighFire projects conducted in the Snowy Plains, New South Wales
- Bushfire CRC Community Forum – public forum and open day on the HighFire project and Bushfire CRC activities
- HighFire Project Forum – research forum and workshop held in Canberra outlining the HighFire project

(see Table 3 under Education and Training for a complete list of activities)

Future developments

In 2006/07 the Bushfire CRC will accelerate the number of forums held in regional areas and develop The Fire Knowledge Network to a level where it is functioning as a practical, valued resource. The CRC is working closely with its industry in the area of knowledge management and sees its work on capturing existing knowledge and experience on past major fire events as a major contribution to an Australian Centre for Lessons Learnt.

PERFORMANCE MEASURES

CRC PROGRAMME OBJECTIVE 1:

To enhance the contribution of long-term scientific and technological research and innovation to Australia's sustainable economic and social development

Centre Objectives	Performance Measures	2005-2006 Performance
1.1 Achievement of and delivery of research outcomes	Develop at least 4 new technological breakthroughs	
1.2 Seminars, workshops and presentations	>5 Seminars, workshops and public forums p/a	Public forums held in Berridale (HighFire and CRC), Canberra (fencing project), Canberra (Highfire),Canberra (national risk meeting), Christchurch (international fire spread meeting), Various Program meetings.
1.3 Centre publications transferring R&D outcomes and technology to End Users and the Public	At least 50 End User focused publications and reports	On track
1.4 Scientific status and User satisfaction	Demonstrated leading edge research and development quality through peer review processes	Planning underway for research review and third year review will help in ensuring this is achieved
1.5 International interest in research	Collaboration with at least 4 overseas groups	Formal collaboration with University California Berkeley, and strong links with USDA-FS. Informal collaboration is active with research groups in US, Canada, Portugal, and Germany. Two CRC researchers are on international advisory panel for European Union's Project paradox.
1.6 Scientific Status	Rated world class in its activities by an independent international review board	Will be partially assessed by the third year review panel.
1.7 Project Reviews	Regular meetings of a Users, Researchers and Technical committee Regular project reviews held by Project Leaders	There are many ongoing meetings between the researchers and end-users. The research sub-committee of the board assess the funding of each project annually.

CRC PROGRAMME OBJECTIVE 2:

To enhance the transfer of research outputs into commercial or other outcomes of economic, environmental or social benefit to Australia

Centre Objectives	*Performance Measures*	*2005-2006 Performance*
2.1 Economic Benefit to Australia	Actual and future benefits > 3 times the Commonwealth Grant through cost benefit analysis.	A specific investigation of this is underway. Initial indications are that return is likely to be high.
2.2 Economic benefit to Centre	Additional income through contracts and consultancy: $2M	Increased contract research funding has been received from both our existing partners and external organisations.
2.3 Research Publications	10 Book chapters 2 Books 25 refereed Journals per annum 30 refereed conference papers per annum	On track
2.4 Patents	5 Patents	None planned at this stage
2.5 Achievement of and delivery of research outcomes	Develop at least 4 new technological breakthroughs	In progress.
2.6 Financial return to the Centre	Exceed budget plan	On target
2.7 Adoption of the research outputs by End Users	Greater than 60% of the know-how and research deliverables adopted by End Users	In progress, A technology transfer strategy is being developed to help ensure that the research is transformed into outcomes for the industry and community.
2.8 IP Review	Intellectual Property reviews to be held once a year	Completed

CRC PROGRAMME OBJECTIVE 3:

To enhance the value to Australia of graduate researchers

Centre Objectives	Performance Measures	2005-2006 Performance
3.1 Placement of Centre trained students and researchers into Industry	10 PhD's fully employed by User Groups	Not yet applicable
3.2 Staff/Student exchange	At least one student and one postdoctoral fellow per annum on an exchange program	In progress.
3.3 Postgraduate students trained to become the future leaders in Australia in the design, research and management of bushfire management	At least 20 fully funded PhD students graduated with further training in research management and all employed within three months of graduation	Not yet applicable
3.4 Industry training	All students to undergo an industry/end user induction	All students have been offered and most have undertaken training on fire ground safety, presentation and media skills.
3.5 PhD Degrees Awarded	Greater than 90% of students completing postgraduate studies	Not yet applicable
3.6 Health and Safety	Zero lost time injuries	Zero

CRC PROGRAMME OBJECTIVE 4:

To enhance collaboration among researchers, between researchers and industry or other users, and to improve efficiency in the use of intellectual and other research resources.

Centre Objectives	Performance Measures	2005-2006 Performance
4.1 Frequency of interchange of personnel between participating organisations	At least one student and one postdoctoral fellow per annum on an exchange program	Under review.
4.2 Projects involving End User Participants	60 percent of projects to involve End User Participants	All projects have active involvement of end-users, all projects are linked to an end user "sponsor" or steering group.
4.3 Extent of participation by each participant in research and support programs	Participants involved in research and support programs	All CRC participants are actively involved in the activities of the CRC.
4.4 Time commitment of researchers	Less than 10% with 20% of time or less	Will be considered in response to Third Year Review. All employed post-docs are 100%. Many researchers involved in projects <20%.
4.5 Degree of consultation between research providers and End Users	Research reviews at least twice a year	All projects have established steering groups from the end-user agencies that oversee the direction, performance and relevance of the research program. Regular program meetings also take place.
4.6 The extent of participation by each participant in research and support programs	All participants to be involved in active and proposed research projects	See comment in 4.3
4.7 Communication to Users	At least 50 newsletters to all Core and Associate Participants	Regular CRC newsletters from CEO. Circulation of research Updates throughout the CRC and AFAC. Development of "FireNotes"
4.8 Evidence of collaboration between participants	Active integration with more than 90% of CRC projects to involve more than two participants User participants to have contributed the equivalent of one person year of in-kind from their organisation over the life of the CRC	In progress In progress
4.9 Collaboration with other research groups within Australia	At least three formal collaborative associations with other CRCs	Formal engagement of Spatial CRC in the form of an MOU and jointly funded projects with Tropical Savannas and Desert Knowledge CRC. Informal contacts with Sustainable Forestry.

COMMUNICATIONS

The communications strategy seeks to promote the research and activities of the Bushfire CRC amongst stakeholders and to the broader community. The strategy aims to complement the communications objectives of the stakeholder agencies.

The Bushfire CRC has a range of communications activities that are aligned to the strategic direction of the CRC. To enable the CRC to better communicate with its partners, government and the wider community, the activities are focussed on priority areas of online communications, publications and media.

Online Communications

The Bushfire CRC website is a prime communications tool for both internal and external audiences. It has been receiving a steady increase in hits since its launch and this growth is expected to continue over the next few years. Up until May, the website was on a shared server. The performance of the website fluctuated with the volume of traffic on other unrelated websites and frequently crashed in times of high demand.

In May the Bushfire CRC website was moved to a dedicated and more powerful server that will cater for the anticipated growth in use. The CRC now has a more stable and responsive base for its online communications. A systematic overhaul of the content of the CRC website is now in progress. From May, a significant number of research reports, news items, photographs and other documents have been uploaded and outdated material has either been modified or deleted. Six members of the Bushfire CRC have been given a full day's training on updating and managing the website.

Communications Publications

- The inaugural *Fire Australia* journal was published in May. The journal is a joint publication of the Bushfire CRC, Australasian Fire Authorities Council, Fire Protection Association Australia and the Institution of Fire Engineers Australia. The first edition contained articles on CRC research into safer fences, fire retardants, bushfire arson, the "stay and defend or go early" policy, and the CRC produced Black Tuesday DVD.

Fire Australia is designed to communicate the research activities of the CRC to broad range of parties across the fire industry. It will be published four times a year with a distribution list of 5500 that includes all Bushfire CRC researchers and end-users, AFAC members, the fire protection industry, academic libraries, and selected local, state and federal members of parliament.

- One-page *Bushfire CRC Updates* on research projects were emailed to end-users and researchers on a weekly basis from May/June. The *Updates* serve as a brief summary of the project designed to keep all Bushfire CRC members abreast of current developments. The Updates are also available online.

Media

Highlights in media coverage include:

- Bushfire CRC work was prominent in feature articles in *The Australian* on bushfire arson and on the January 2006 fires.
- The work of Bushfire CRC researcher, Graham Mills of the Bureau of Meteorology, was featured in *The Australian* newspaper in May. The article "Dry slots fan fire theory" reported on the finding

that dry air descending from high altitudes onto a bushfire can cause a dramatic changes in wind, humidity and temperature.

- BBC Radio Worldservice produced a feature item on Australian bushfires that aired on 14 July and also ran on ABC Newsradio. The Bushfire CRC provided much support to the feature, including taking the journalist on a tour of the regions burnt in January 2006 in the Brisbane Ranges and Anakie in Victoria. Kevin O'Loughlin was interviewed for the program.
- *The Canberra Times* ran a series of articles in March and May on fire management in alpine Australia. CEO Kevin O'Loughlin was interviewed at length by the journalist and quoted in some of the articles. A letter to the editor by Kevin O'Loughlin, clearly stating the purpose and scope of High Fire, was published on 26 May.
- An overview of the Bushfire CRC work of Program C Leader John Handmer was featured in the Education section of *The Age* newspaper in June.
- The ABC TV Natural History Unit interviewed many Bushfire CRC researchers from across the programs for a four-part documentary on bushfires in Australia. The program is scheduled to show in late 2006.
- The Bushfire CRC produced DVD *Black Tuesday* on the 1967 bushfires in Tasmania was shown on Southern Cross TV in both Hobart and Darwin.

SPECIFIED PERSONNEL

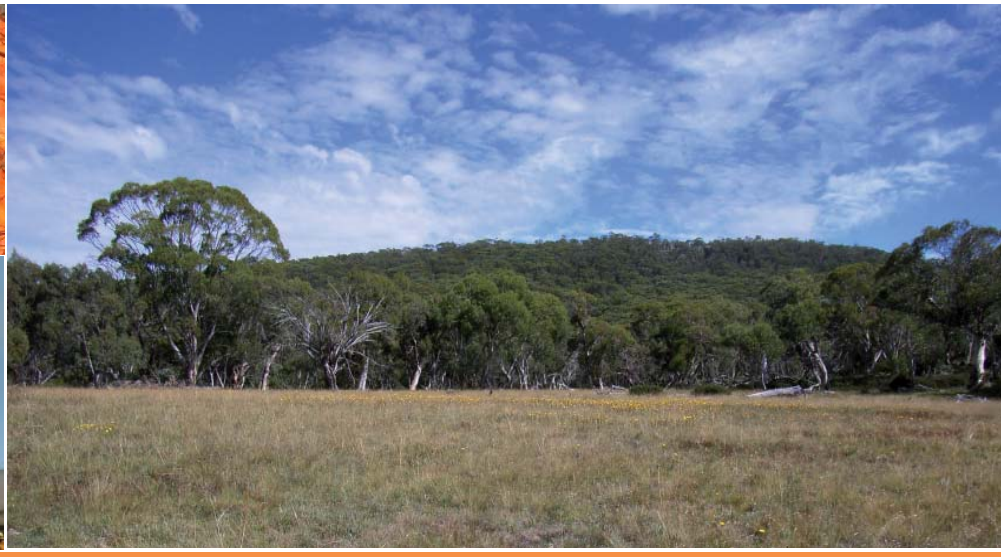
The table below lists key staff positions whose involvement is essential to the successful day to day running of the CRC and relate to positions contained in the Schedules of the Commonwealth Agreement.

Title and Name	Role in CRC	Contributing Organisation	Time allocation to CRC (0.0 - 1.0)	Changes during the year
Mr Kevin O'Loughlin	Chief Executive Officer	Bushfire CRC Ltd	1.0	
Mr David Peterson	Business Manager	Bushfire CRC Ltd	1.0	Until 10 October 2005.
Stan Skrbal	Business Manager (Acting)	Bushfire CRC Ltd	1.0	From 13 October 2005 to 29 January 2006.
Mr Ian Wilson	Business Manager	Bushfire CRC Ltd	1.0	From 30 January 2006.
Dr Richard Thornton	Research Director	Bushfire CRC Ltd	1.0	
Mr Derek McCormack	Communications Coordinator	Bushfire CRC Ltd	1.0	Until 12 August 2005.
Mr David Bruce	Communications Manager	Bushfire CRC Ltd	1.0	From 30 January 2006.
Ms Kellie Watson	Education Manager	Bushfire CRC Ltd	1.0	
Mr Jim Gould	Program A Manager	CSIRO	0.8	
Prof Mark Adams	Program B Manager	UWA	0.75	
Prof John Handmer	Program C Manager	RMIT	0.7	
Dr Bob Leicester	Program D Manager	CSIRO	0.4	

GLOSSARY OF TERMS USED

ACTEW	ACT energy, water and wastewater services
ADFA	Australian Defence Force Academy
AFAC	Australasian Fire Authorities Council
AIC	Australian Institute of Criminology
ANU	Australian National University
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management WA
CFA	Country Fire Authority Victoria
CFS	Country Fire Service South Australia
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific Industrial Research Organisation
DEC	Department of Environment and Conservation NSW
DSE	Department of Sustainability and Environment Victoria
EMA	Emergency Management Australia
ESA	ACT Emergency Services Agency
FARSITE	USDA Fire Modelling Program
FESA	Fire and Emergency Services Authority WA
FFDI	Forest Fire Danger Index
FuSE	Fire, u = wind, Shrubland Experiments
GIS	Geographic Information System
IC	Intellectual Capital
IMAP	Project management system
IMT	Incident Management Team
IP	Intellectual Property
JCU	James Cook University
KBDI	Keech-Byram Drought Index
LTER	Long term ecological research
MOU	Memorandum of Understanding
NPWS	National Parks and Wildlife Service NSW
PTR-MS	Proton Transfer Reaction Mass Spectrometer
RFS	Rural Fire Service NSW

RMIT	Royal Melbourne Institute of Technology
SCU	Southern Cross University
SDI	Soil Dryness Index
SIROfire	Computer Simulation/Fire Spread Model
TFKN	The Fire Knowledge Network
TFS	Tasmania Fire Service
USDA-FS	US Department of Agriculture – Forest Service
UWA	University of Western Australia



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