

NATIONAL PARKS ASSOCIATION ACT

BUSHFIRE MANAGEMENT: BALANCING THE RISKS

21-22 JULY 2017

**PILGRIM HOUSE
CANBERRA**





ACT
Government



National Parks Association of the ACT **Bushfire Management** **- Balancing the Risks**

Friday 21 – Saturday 22 July 2017

Pilgrim House, 69 Northbourne Avenue,
Civic ACT 2601

A community symposium to discuss research, strategies and expectations for fire management in the ACT in a changing climate

Aim: an informed ACT community able to contribute positively to ACT government policy, goal setting and strategic directions of fire management

Symposium proceedings



Publisher: National Parks Association of the ACT Inc.
GPO Box 544
Canberra ACT, 2601

July 2017

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The Proceedings were compiled from the material provided by speakers. More content is provided on-line at the NPA ACT website www.npaact.org.au.

Printer: Instant Colour Press, Belconnen ACT 2617

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Science and decision making – the McArthur model as a case study

We all agree that science holds the key to managing the impact of bushfire on people, assets and the environment. Our planning and risk reduction strategies, our emergency systems and equipment all need to be managed with a sound understanding of fire behaviour and what contributes to the risk of destructive fires. However there is considerable disagreement on what makes up a reliable, accurate model of fire behaviour and what actions actually reduce risk. For example, on the one hand there is strong support for intensive fuel reduction programs in natural areas to protect communities and assets. Others argue that too many fires too close together not only destroy ecosystem functioning but actually make the landscape more fire prone. However, when we realise that the science of global warming is fully accepted and actively included in fire management research and planning, we can see the benefits of coming to common ground.

The debate about fire management can become very heated and personal. It is complicated by intra-community tensions as well as local and national politics. As a community we need to find our way through the complexities and tensions of current fire research in order to make informed comment on fire management. The McArthur Index provides an excellent case study for the issues we face.

When McArthur became the first full-time fire control officer for the Snowy Mountains area in 1951, he began more than twenty-five years of studying the behaviour of fires in a wide range of fuel types, devising systems for rating the danger of fires under different meteorological conditions. These systems became an essential tool for rural bushfire brigades; they were adopted by the Bureau of Meteorology in forecasting fire-hazard conditions; and they were recommended by the United Nations Food and Agriculture Organisation for use in developing countries. McArthur also prepared guidelines for controlled burning, a practice he regarded as essential in containing fires in native forests. Much of his data was derived from field exercises on Black Mountain with forestry students and as part of CSIRO research programs.

Since his death in 1978 the McArthur model has been studied, refined and expanded and is the basis for fire predictive tools such as Phoenix and Vesta. McArthur's preference for large scale hazard reduction burns in natural forests is almost part of fire management DNA. So how has his model stood up to the test of time?

There is no point critiquing his work in the context of today's science. His work was important because it moved the thinking of the time from intuition and individual experience to solid scientific observation. But let us remember that at the time McArthur was doing his best work, the car of choice was the huge American gas-guzzlers with long shiny fins and tiny back seats. Today we drive cars that

focus on safety, reduction of carbon emissions as well as the school-drop off and needing big car boots to carry our shopping. Driving a Yank Tank these days is an expensive hobby, not a practical way of moving around.



McArthur did his research on Black Mountain, conducting small burns and interpreting the implications of his data into large scale burns, still a very valid scientific method. He would not have dreamt of the power of LIDAR (Light Detection and Ranging) which can 'read' a forest right through all its layers and – correctly interpreted – even classify tree species. He could not have conceived of the work done by our own Jason Sharples and Rick McReadie who broke the rules of weather prediction and placed portable weather stations in gullies to collect data at a micro scale across different weather events and then harnessed the data to explain previously inexplicable fire behaviour.

At the time of McArthur's work the ACT had no accurate vegetation maps. He had only a very broad idea of what was out there. Now we are part of citizen science where any of us can download GPS data on the sighting of a specific orchid, butterfly or eagle. We can only speculate as to what McArthur would have done with all this data. Would he still have supported large scale prescribed burns for forests? Working in an era which still had not recognised Aboriginal people as Australian citizens, what would he have made of our growing respect for indigenous burning practices? I like to think he would have been intensely excited by what is unfolding in the bushfire science field but we can only speculate.

We have a different task. We need to understand the insights and ideas which the new data and research have made possible in our time. We need to listen carefully, examine critically and think deeply about what science is now telling us.

More than that though, we need to see the cultural context in which science has always operated. We have to accept that science on its own cannot make our decisions for us. We need to understand the values which we bring to the table and acknowledge the different values which others might have. With respect and openness we, as a community, might be able to develop effective risk management strategies for the future which value and protect us, our assets and our environment.

Christine Goonrey

Convenor
Bushfire Management: Balancing the Risks Symposium
July 2017

Aranda Bushland fire history

Aranda Bushland has an extensive history of fires, from before the construction of the suburb in the late 1960's to the present day. From 1978 to 2003 there were 74 recorded wildfires in the area, which includes Black Mountain and Bruce Ridge, and all were reported as arson. In Aranda Bushland the fires came from Caswell Drive, Bindubi St. and the suburb itself. Recently only one fire (to my knowledge) was arson, and this was on Christmas Day 2001 in the bushland behind Mirning Crescent and was quickly extinguished by the fire brigade, followed up by Colin McDonald and myself.

Since 1995 controlled burns in the Aranda Bushland have been undertaken by the Parks Fire Unit as components of the ACT bushfire management plan. These fires are relatively frequent, and based on fuel load and proximity to the suburb. Closest to the suburb, in the asset protection zone, slashing of vegetation behind the houses is (at least) annual, and controlled burns are carried out 100-200 metres into the bush regularly. In the bushland overall, different areas are burnt (or scheduled to be burnt) almost every year, so that the whole of the northern forested section of Aranda Bushland will eventually have been burnt.

Most areas are scheduled to be burned on about a 10-15 year rotation, depending on fuel load. One recent burn (2014) was done in an area that had no fire history at all and was furthest from the suburb. We were unable to find records of any fires there since the beginning of the last century. To burn this area seemed to us as unjustified as it would have provided a control site which could have been used for comparison to the burned ecology elsewhere.

The present endeavour by Parks to provide patchy burns, saving about 25% of the areas unburnt, is a welcome development. In collaboration with Parks we have identified areas that we would like saved from recent burns, particularly those with rare orchids, and a considerable effort by the Parks Brigade has been put into preserving these sites, with success.

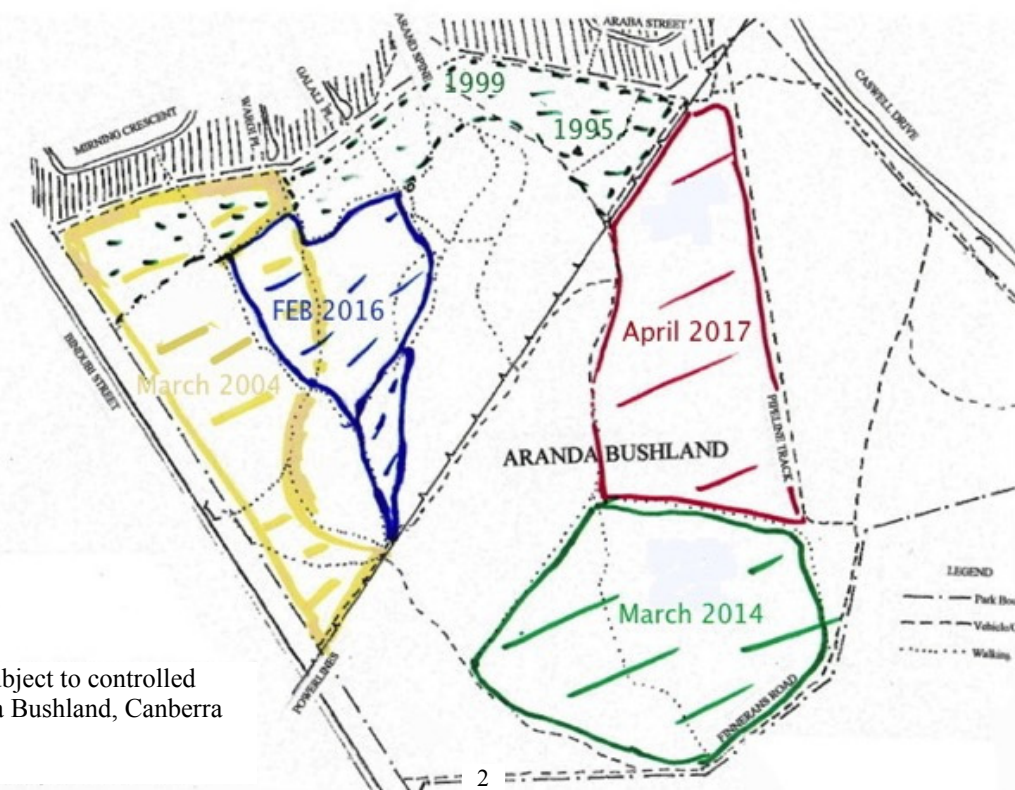


The controlled burn areas of 1999, 2004, 2014, 2016 and 2017 are in varying stages of recovery, and our field trip will particularly examine the regeneration of vegetation from the burns of 2014, 2016 and 2017. The area burnt in 2004 is a good contrast, as it is fully revegetated with a dense understory and abundant orchids (see Map).

Ian Falconer

Ian is a water quality consultant with an interest in drinking and recreational water, and in catchment management. He is also Independent Chair of the ACT and Region Catchment Management Coordination Group.

He has lead a Community Fire Unit in Aranda and is a member of Friends of Aranda Bushland, which is concerned over the biodiversity effects of recurrent controlled burns. He will be leading the field trip to Aranda Bushland on Sunday, to see the impacts of burns over the last decade on dry eucalypt forest adjacent to the suburb.



Map of areas subject to controlled burns in Aranda Bushland, Canberra Nature Park

Some examples from Aranda Bushland, CNP



2014: Fire damaged educational walk



2017: Cool burn



2016: Hot burn, 80% crown scorch



2017: Cool burn, some crown scorch

Aboriginal fire management

Aboriginal people have lived in the ACT and surrounding districts for thousands of generations and Aboriginal cultural heritage exists throughout every part of the ACT. Their land-management practices achieved sustainable living within the surrounding environment in climatic extremes over thousands of years. This management has always included purposeful implementation of effective fire regimes and their use of fire was closely regulated by specific lore and customs.

However in non-Aboriginal society there has been some confusion about what Aboriginal fire management meant. For many years it was widely referred to as supporting extensive hot burns across the landscape with little research or reference to local traditional custodians. Even recent submissions to the House of Representatives report on the 2003 fires “A Nation Charred” claimed that a major cause of the devastation in Kosciuszko National Park was the neglect of extensive annual prescribed burning which supposedly mimicked the Aboriginal practice.

The claims were given fresh impetus by the 2011 publication of Professor Bill Gammage’s book, “The Biggest Estate on Earth”. The book documented first hand reports of early colonists and explorers on the use of fire throughout the landscape. It explored an extraordinarily complex system of land management using fire and the life cycles of native plants to ensure plentiful wildlife and plant foods throughout the year. However some readers saw the book as continuing to justify large scale frequent burns; other readers took the opposite view and the discussion on Aboriginal fire management continued to focus on the opinions of non-Aboriginal sources.

Then in 2014 Bruce Pascoe published “Dark Emu” which explored the complex engineering and land management traditions of Aboriginal people from the Aboriginal point of view. Pascoe was asking us to see the landscape as Aboriginal people lived in it, as they interacted with and managed the land. His documentation of housing, farming and resource management has brought forward the traditional custodial voice, which has been missing, in our debates.

Traditional custodians have been speaking to us quietly all the time we have been banging on about what “Aboriginal fires” meant. Up to now we haven’t been listening. Many of us have convinced ourselves that traditional practices are long gone, lost in two centuries of disruption and destruction. It is time to put aside that myth and start a real conversation.

This task is not easy; the landscape has changed significantly. Natural areas are infested with feral pests and weeds which significantly alter fire behaviour; urban and rural assets have sprung up on traditional sites and require protection; we have an obligation to our neighbours to prevent fire spreading into their jurisdictions. We are moving into a period of drastic climate change which will challenge all our fire management strategies; and we have extensive scientific research and amazing machines and

tools which are changing established practice in fire management. How can Aboriginal knowledge contribute to this modern world?

The simple fact is that where we walk in Namadgi National Park and in local traditional

cultural areas we still walk in a landscape familiar to the local custodians. Less has changed than we think. Properly conducted burns easily carry on the long-established practices of the traditional custodians.

Here in the ACT, Parks Conservation and Lands (PCL) are committed to Cultural-Ecological burns as “a vital component of implementing highly effective fire regimes for the future”. An Aboriginal staff member of PCL is required to facilitate every phase of planning, implementing and monitoring Cultural-Ecological burns. Traditional Custodians must be given the opportunity to be involved and “a Traditional Custodian is required to be part of any team that implements any burn”. (*Aboriginal Cultural Guidelines for Fuel and Fire Management Operations in the ACT*)

Cultural burns are generally low-intensity and take place within a traditional seasonal calendar indicated by certain native flora and fauna species mainly in autumn. Burns are lit from multiple ignition points and ‘creep’ or ‘trickle’ through the fuel layers with very little or no crown scorching. They provide cultural renewal for the Aboriginal community; safeguard culturally significant sites and renew native vegetation.

So what does this mean for broader fire management? How could traditional knowledge contribute to the extensive work being done to extend our fire management practices? There is a temptation to consign traditional knowledge to the sidelines and get on with the hard work of scientific research and development. We’ve made that mistake before with Aboriginal knowledge, corralling it into a specific, limited ‘heritage’ category but it need not be ‘either/or’; it can be ‘both’. We need to ask what we can learn and apply to our broader fire strategies and how to use that information in conjunction with our scientific knowledge.

Some jurisdictions are already going through this process. In Northern Australia traditional fire management is being used to re-write previous fire management practices. Traditional methods and traditional timing is being used to manage ferociously dangerous feral weeds like buffle grass; to reduce carbon emissions from large wildfires; and to restore traditional country. It is also contributing significantly to better management of commercial properties and increased productivity. The key process appears to be a respectful partnership between the two strands: professional fire management teams supporting and training tra-



ditional custodians in modern fire management with modern tools and equipment; then working with them to fulfill both their traditional duties and the wider public safety goals.

Down here in the ACT it is a very different landscape with different challenges but we've made a good start. It is clear from the PCL guidelines quoted above that Aboriginal Fire Management in the ACT is built around Aboriginal ownership of the processes and execution of cultural burns. We are only beginning to explore how this knowledge can be extended into fire management for boarder public safety but I am willing to make a prediction: western science and Aboriginal knowledge have many meeting points and this will be yet another point where modern understanding and skills will be enhanced by traditional wisdom and experience.

The journey is just beginning.

Christine Goonrey

Convenor

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Christine has been active in community environmental organisations for many years. She was President of the National Parks Australia Council; Secretary of the Conservation Council of the ACT Region; President and Vice President of the National Parks Association of the ACT, and she works with Gudgenby Bush Regeneration Group in ACT reserves and Namadgi National Park.

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Apart from environmental issues, her particular passions are bushwalking and writing.

Future burning: Meeting the challenge of bushfire management

Finding common ground for ACT and regional fire management: A case study from 2007

In September 2007, 28 fire management practitioners and policy makers gathered over two days to discuss and explore common ground on ACT and regional fire management.

The objective of the workshop ‘*Future Burning: Meeting the Challenge of Bushfire Management*’ was to build constructive dialogue between key stakeholders with a role or interest in fire management so as to increase future collaboration particularly within the context of an uncertain fire future, such as under a climatic changing world.

The workshop was timely taking place immediately prior to the official start of the 2007-08 bushfire season and in time to contribute to the review the ACT Strategic Bushfire Management Plan.

Jointly initiated by the Conservation Council of the South East Region and Canberra and the Emergency Services Agency, the workshop aimed to discuss fire management away from the previous forms of consultation around specific fire management proposals, plans or a fire event. It was understood by participants that it was not a decision-making forum, the views of all stakeholders were not necessarily represented and has to be viewed in the wider context of a number of other processes relating to fire planning and ongoing land management.

Workshop participants included government officials with responsibility for fire management, conservationists, scientists, volunteer fire fighters, professional fire-fighters, land managers, rural landholders and community groups.

Participants identified a number of common values, a series of challenges facing various stakeholders and suggested some ways forward. The most notable shared view was the importance of bipartisan support and continuity in government policy, structure, strategies and budget for fire management in the ACT. Participants noted one step towards developing this would be a transparent and inclusive process in the current review of the Strategic Bushfire Management Plan framework and the forthcoming sub-regional planning processes.

Participants acknowledged the need to protect life and property as well as the importance of protecting our environmental assets.

A prominent recurring challenge identified was finding the balance between fuel management practices which conflict with other land management objectives, particularly environmental and catchment protection. A second recurring challenge was the use of science in fire management, particularly ‘conflicting’ scientific advice and translating research and scientific information into operational practise.

A key theme was the importance of working in partner-



ship, particularly planning with the community in order to build an understanding and acceptance of shared and personal responsibility in regard to fire management.

Overall participants welcomed the opportunity to talk in an ‘unpressured’ environment, and supported ongoing dialogue.

Common values

The workshop participants agreed on the following common values:

- we must aim to protect life and property
- we value our environmental assets and therefore we must aim to protect biodiversity and conservation values to the extent that we can
- we need to take into account and balance a broad range of values – production, heritage, cultural, indigenous, environment/conservation, infrastructure, human life, etc
- community education is a key part of fire management and we need to actively work with the community – to move toward shared and personal responsibility
- there is no one fix all solution to fire management – we need to use the complete toolbox
- fire management requires flexibility in terms of approaches used
- planning is a key part of the fire management toolbox
- cultural change is needed.

Future trends

The workshop participants agreed that the following future trends will impact on fire management policy and practice:

- increased land-use planning including building design
- increasing knowledge of some sectors of environmental assets and biodiversity values
- increasing recognition of climate change impacts
- increasing litigious environment
- changes in land use
- increased population and increasing urban interface
- better integration of fire management planning within ACT and at the border
- better community education and engagement but also potential increased expectation of technological fixes
- better technology and planning within some well established basic fire operation approaches
- increase in arson-lit fires

- decreasing volunteerism
- greater attention to management of water catchment areas in a drier environment

Certainty – what will not change

The workshop participants agreed there are certain aspects of fire that cannot be changed including:

- our ability to control extreme fire events
- on-the-ground fire practitioners will still continue to make difficult decisions under pressure, although with better information
- fire is inevitable and natural in the ACT

Challenges

The workshop participants acknowledged the following challenges in fire management policy and practice:

- understanding each others' different perceptions
- defining what is the 'community'
- use of science in fire management
- how best to integrate science into hazard reduction policy and operations
- how to balance competing objectives and values
- does the level of risk mitigation justify the ecological impacts?
- how to access information in a form that is useable
- how to bring research down to an operational level
- how to ensure clarity and consistency of terminology and concepts, for example definition of 'protection'
- protecting the 'asset' at the 'asset' – is it culturally, socially, operationally, ecological feasible?
- divergence in views on importance of climate change and what that actually means on the ground
- historical misperceptions which colour interpretations of current fire management policy and planning
- political influence on the fire management context is likely to continue
- without community education and engagement community expectation will remain as 'protection' although climate change awareness may change this.

Some suggested solutions to these challenges were decision making and communications which:

- make the best use of available information even if it isn't all there – recognise what is missing
- plan at the landscape/temporal level, which can provide a balanced solution
- are transparent of the process
- use adaptive policy – understand what you are doing, monitor the impacts of what you do, continual assessment and modify accordingly.

Ways forward

Three key ways forward were identified by workshop participants including:

- bi-partisan support of fire management approach – with continuity in government policy, structure, strategies and budget
- post fire investigations focus on technical issues not blame or litigation
- increased community and individual responsibility and awareness of their role in fire management

To achieve this, participants thought a transparent and inclusive process in the current review of the Strategic Bushfire Management Plan framework and the forthcoming sub-regional planning process was required. In turn, for this to be effective it was felt it needs time, resourcing and commitment from all parties to continue dialogue and to build consensus.

Compiled by Christine Goonrey

Convenor

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Community involvement in the SBMP planning process

(The Strategic Bushfire management Plan or SBMP is a mouthful and for the purposes of this opinion piece I will refer to it in its various forms as ‘the Plan’.)

In 1952, when fire roared across the Bega valley, my father and his mates closed the shops, jumped onto whatever vehicle was driving past, grabbed wet sacks from the ice factory and went out to fight the fire. The communications network was the telephone exchange ladies in every village. They tracked the fire, kept police up to date and directed volunteer efforts. The men would do what they could to save farmhouses and dairies, then phone the exchange – often from a public phone booth – for directions and race off to help the next property at risk. Many houses and farms were saved but four people died on that ferocious day and there were hundreds of thousands of pounds in stock and asset losses. It occurred to people, and not for the first time, that it was probably better to have a plan.

Planning and communications improved over the following years but the catastrophic damage and loss of life in the 2003 fires spurred a much more systematic approach in Canberra. The Emergency Services ACT was re-drafted to specify that a Strategic Bushfire Management Plan would be a mandatory instrument of bushfire planning in the ACT. In particular it would set out the principles and strategies for managing risks between fire events; for ensuring preparedness for fighting fires; and planning for recovery after fire events. Recognising that managing fire is a whole-of-community responsibility, it specified community consultation as a key part of the process and had to be reviewed every five years.

The first version was written in the old Emergency Services building at Curtin. In December 2004 a draft of the “Strategic Bushfire Management Plan” Version 1 was released “to set the scene and provide clear objectives, strategies and actions for bushfire management.” It was put out for written comment in January 2005 and NPA ACT and the Conservation Council of the ACT had a few things to say about it. The principles were reasonably benign but focussed on people and buildings and ignored environmental values and assets. Namadgi National Park was to get an extensive network of fire trails which would create ongoing ecological problems, not to mention the cost of upkeep over the years. The plan was also very specific in details for example the height to which grasses could grow before they must be subjected to prescribed burns.

Our comments were quite forthright but SBMP V2 was released in July 2005 with very little change. NPA ACT began an intensive public campaign to remove many of the plan’s impractical provisions and improve its focus on environmental values.



Regime change in the Emergency Services sector was a feature of those years. In 2008 the new management decided it might be better to get community voices around the table when developing the 2009 Plan. The Conservation Council was invited to nominate a member of the Strategic Bushfire Management Planning Committee (SBMPC). I have been a member of the review committees ever since.

Some aspects of the new plan were quite exciting. It put the environment right at the front of fire management as ‘protection of life, property and the environment.’ The Plan was to incorporate a systematic fuel management approach which, among other things, recognised environmental constraints such as ecological intervals (the period between destruction by fire and capacity for different species to set seed); using fire to form mosaics of burnt/unburnt country both within the burn and across the wider landscape to allow fauna and flora to recover; adjacent burns in sequential years would be avoided, again to allow species recovery; and recognition that long unburnt country would not be subjected to immediate treatment, subject to more research being carried out.

The vehicle for this new approach was a series of maps setting out rolling five year plans for fuel treatment which would be tenure neutral. Land managers and landholders would be partners in planning for fire treatments. An intensive community consultation process was undertaken because we really needed widespread community support to make the new approach work. There were information sessions for key groups such as NPA ACT and the Conservation Council Biodiversity Working Group and a series of separate consultations jointly run by ESA and TAMS (currently called PCL).

These consultations were carefully structured. Two meetings were held in each area to allow participants to take the information away to consider the detail and discuss with others before an in-depth discussion of the proposals the following week. Participants included landholders, RFS personnel and the general public. The process gave participants time to mull over the information provided, to raise issues and concerns and to contribute ideas and advice. For the first time, environmentalists, landholders and fire managers were in the same room in real time in a supported environment.

Many people made significant sacrifices of time and effort to make the process work but two people deserve special mention: Dylan Kendall of TAM's Fire Unit and Margaret Kitchin of TAM's Research and Planning unit. Their detailed briefings at every session and ready availability to answer questions and explain complex issues contributed significantly to community acceptance of what has become known as the Regional Fire Management Plans.

In 2013 the process began all over again. We had learnt a lot in the interim years and one of the biggest problems was just emerging: weather conditions had prevented many of the planned burns in natural areas, including Canberra Nature Parks. The backlog was creating plans for larger burns across the landscape and there was a sense in some areas that the mosaic approach wasn't hot enough or intense enough to do the work. The tenure neutral approach had not worked well and was being replaced by a requirement for landholders to prepare their own Bushfire Operations Plans in conjunction with the Rural Fire Service.

This time the process was very bureaucratic. A series of committees was established to draw in government departments across the spectrum. This had the advantage of 'no surprises' for some key players but it slowed down the thinking processes and left the community consultation as a last minute add-on. Two major benefits though were important: new developments would not be able to use parks and reserves for their mandatory asset protection zones; and Canberra would have a system of Bushfire Prone Areas declared in the city which would place some responsibility on builders and owners to build or renovate according to the ASA fire safety standards.

These were ground breaking changes and we welcomed them. The trade-off however was worrying. A key safety mechanism protecting natural values on parks and reserves was removed: the Emergency Services Act would take precedence over parks and reserves management plans. It meant, for example, that prescribed burns which were mandated by the Plan would override provisions for protecting environmental values. SBMP V4 was gazetted in 2014.

So here we are in 2017 thinking about where to go to next with our fire planning. Is the idea of smaller mosaic burns really dead or just coming into its own? The Regional Fire Management Plans were a solid idea but, no matter how flexible our fire managers are, can we really plan for fire treatments across a fifteen year period? What is the future role of large prescribed burns? Should we be looking at making our landscapes more fire resilient through careful nurturing of wet areas of vegetation which dampens or slows fire? Or should we be moving towards the Victorian idea that we burn 5% of the entire landscape every year, regardless of weather, terrain and vegetation? (The answer to that is 'no' but the idea still has supporters.)

The next Plan is due in 2019 and work on it will commence in the next few months. Now is the time to find the right questions to ask and ask them. Now is the time to think about what we want our Plan to do for us.

Christine Goonrey

Convenor

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Christine has been active in community environmental organisations for many years. She was President of the National Parks Australia Council; Secretary of the Conservation Council of the ACT Region; President and Vice President of the National Parks Association of the ACT, and she works with Gudenby Bush Regeneration Group in ACT reserves and Namadgi National Park.

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Ecological principles involving the use of fire in grassland and grassy woodland

Sarah Sharp

Summary: In grassland and woodland, grasses in particular, can become overgrown, and inhibit the successful regeneration of other plant species. Fire plays an important role in the removal of overgrowth, and providing opportunities for other species to grow and regenerate.

For many years it was difficult to get burns undertaken in grasslands and woodlands to enhance biodiversity (as opposed to biomass control for wildfire mitigation), but recent work by scientists have provided excellent data to show fires are extremely beneficial in encouraging a diversity of species to regenerate.

Broad principles have been developed, that include the importance of burning in small patches and ensuring burns are low intensity and do not burn into trees, but little is known about optimal frequency, and the impacts on plant and animal species that have become rare, or impacts on weed species.

Much is to be gained by better understanding and utilising Indigenous fire management practices for both cultural and ecological outcomes.

What natural landscapes occur in Majura Valley?



1928 (Mildenhall photo collection): from Mt Pleasant, overlooking Duntroon Note the lack of naturally occurring trees in the valley and the wider spaced trees on the lower slopes, blending into forest on the hills on the eastern side of the valley. Ecologically, this landscape contains a mosaic of grassland in the cold valleys, open woodland above merging into forest on the upper slopes of the hills.



1997, showing the large area subject to wildfire on the eastern side of Majura Road. While large areas have been cultivated, extensive areas of native vegetation remain.

What is the ecological ideal state for native grasslands and grassy woodlands?

As a generalisation, the higher the diversity of habitat features and plants, the higher the diversity of fauna, and the healthier the ecosystem, in terms of resistance to detrimental effects (for example, drought, wildfire, overgrazing, disease, weeds or soil disturbance)

Regular biomass removal removes the biomass of the grasses, creating canopy gaps, keeping grass tussocks healthy and increases the growth of inter-tussock forbs, including their seed production leading to further recruitment.



Healthy, wildflower-rich woodland



Healthy Kangaroo Grass dominated grassland

How is this achieved?

In woodlands and grasslands biomass removal of particularly grasses is required to enable a diversity of plant species to regenerate. Grazing and burning and slashing can all achieve this.



Dense grass tussocks shade out spaces for other species to recruit.



Continued growth of grasses leads to shading and rotting of the bases of the plants, that may lead to the death of the plants and favouring weed establishment. The roots of these Kangaroo Grass plants easily pulled out of the ground after not having been managed for some years.

What impacts do grazing, burning and slashing have on native grassy ecosystems?

Each method of biomass reduction has advantages and disadvantages (see table next page).

The role of fire in grassy ecosystems

Burns may occur in different ways, each of which have different pathways, objectives, but may or may not have different outcomes. Frequent burning particularly of Kangaroo Grass dominated grassland is considered a key method to maintaining floristic diversity and fauna habitat.

1. Wildfire – uncontrolled, no planning, may be over very large areas, wildfires can also have good outcomes.



This fire revealed that the Grassland Earless Dragon sheltered in spider burrows during the wildfire in 1997.

Recovery after this fire was very good; fortuitously it occurred in a relatively wet period, so that a high diversity of plants regenerated and set seed. A similar wildfire during a drought may have severely impeded the recovery of plant and animal species.

Impact on targets	Burning	Livestock grazing	Eastern grey kangaroo grazing	Slashing
Impact on biomass	All or most herbaceous vegetative material removed	Selective removal of palatable grasses and wildflowers	Selective removal of palatable grasses	All erect material removed, generally trash created is retained on site
Positive effects on native species	Cooler burns remove biomass of grasses creating spaces for other species to regenerate, without impacting fauna	Regulated grazing retains a diversity of structure and inter-tussock spaces to favour retention of a diversity of species.		Opens canopy
Negative effects on native species	May result in exposed soil until regrowth occurs. Hot or too frequent burns may reduce habitat and kill plants and animals	Overgrazing may result in loss of species, especially taller, more palatable species, increased bare soil and soil compaction	Overgrazing results in increased bare soil and soil compaction (but lower than livestock grazing)	Can minimise seed maturation if too frequent; trash can advantage weeds
Effects on weed species	Can advantage or disadvantage weed species depending on season, intensity etc of burns; can be used to assist in weed control	Livestock can spread weeds from other sites. If not palatable they are likely to go to seed and recruit. Nutrients from dung (or fertiliser) advantage weed species. However, can be used to assist in weed control	Can spread weed seed in dung and sticky seeds on coats.	Trash remaining may mulch down and suppress native regeneration; weed seed is spread through machinery

Figure 1. Impacts of biomass reduction on native grassy ecosystems

2. **Fuel reduction**, to mitigate against uncontrolled wild-fire events. These aim to have ecological outcomes, but at times the requirement to reduce biomass may lead to compromise.



This burn is hot because the biomass being burnt is dense.

3. **Enhancement of ecological diversity**

The outcome for burns to enhance ecological diversity is to ensure trees are not burnt, especially the trunk and especially within the trunk, other plants are not destroyed (either killed or unable to regenerate), fauna are not impacted, either through loss of life or loss of nesting or shelter habitat by retaining unburnt patches.





The tree trunks and foliage were not burnt in this fire



Patch burns (e.g. Aboriginal culture), may involve burning off overgrowth of grasses, in very small patches that essentially put themselves out.

How do we know what to do?

To enable these outcomes, four factors are taken into account

- Frequency – how often an area is burnt: currently, conservatively 10-40 years for grassy woodland and 4-10 years in grassland;
- Intensity – how hot, which is affected by amount of biomass, dryness (curing) of the biomass, season, weather (dry/windy/damp/foggy) and time of day (affects dryness)
- Season – affects how the fire burns – too hot, not enough,
- Patch size: how much to burn, spaces for shelter of fauna

Trials by Ken Hodkinson (retired CSIRO ecologist) comparing season of burning with slashing are showing some interesting results:

	Autumn burns (every two years)	Spring burns	Slashing	No management
Native species richness	Highest	Lower	Lower	Lower
Exotic species richness	Highest	Highest	Lower	Lower
Kangaroo Grass recruitment	Highest	Highest	Lower	Lower
Longer period retained of lower density of biomass	Highest	Lower	Lower	Lowest

ACT Government are undertaking trials in grassland in Jerrabomberra to determine how to undertake small patchy burns to retain habitat for grassland fauna.

Much more research is needed, and integration of Aboriginal cultural practices and their role in maintaining biodiversity and heritage.

1. Ecological understanding is that, as a generalisation, the higher the diversity of soils, habitat and plants, the higher the diversity of fauna, and the healthier the ecosystem, in terms of resistance to detrimental effects (drought, overgrazing, disease, weeds),
2. In woodlands and grasslands biomass removal of particularly grasses is required to enable a diversity of plant species to regenerate.
3. This may be achieved by burning, grazing, slashing or a combination of all.
4. Each has advantages and disadvantages; see table
5. Weed type and density is also a factor that needs to be taken into account. The majority of weeds are affected similarly to burning to native species – ie often positively at the same time that natives increase.
6. Frequent burning particularly of Kangaroo Grass dominated grassland is considered important to maintaining floristic diversity and fauna habitat.
7. Four factors are always taken into account considered for burning:
 - frequency – how often;
 - intensity – how hot, which is affected by amount of biomass, dryness (curing) of the biomass, season, weather (dry/windy/damp/foggy) and time of day (affects dryness)
 - season – affects how the fire burns – too hot, not enough
 - how much to burn: patch size, spaces for shelter of fauna
8. The general aim is to ensure trees are not burnt, especially the trunk, other plants are not destroyed (either killed or unable to regenerate) and fauna are not impacted, either loss of life or loss of nesting or shelter habitat, for example
9. There has been a slow change in attitude towards burns undertaken for ecological purposes. Prior to 2003 they were given very low priority by government, but since they have gradually increased.
10. More research is required to determine frequency, intensity, seasonality and size of patches burnt.
11. Some research is occurring in ACT, following extensive work in grasslands elsewhere, especially Victoria.
12. Excellent work by government and particularly a trial by Dr Ken Hodkinson (retired CSIRO ecologist) comparing season and other methods (slashing). Results.....

13. Burning results (Ken):

- Frequent autumn burning (every 2 years) germinates and maintains higher native plant species richness (+10 species) than spring burning, annual mowing and no management (control).
- Burning (spring or autumn) germinates more exotic plant species than the other treatments.
- Burning (spring or autumn) enlarges patches of *Themeda triandra* which appears to be outcompeting and replacing Chilean Needlegrass and African Lovegrass (and other exotics).
- Autumn burning has the longest hazard reduction period.

14. Restoration and fire (Ken): The GCG restoration project began autumn 2016. Thirteen sites and four treatments; autumn burning every 2 years, autumn burning every 4 years, the Canberra mow (6 times a year) and control. Into each treatment plot we have planted 5 forbs that are rare or lost from most NTG in urban Canberra. We are interested in survival and spread under each management. Sites range in native plant species richness from zero to mid-level and in landscape position (top, slope and bottom).

15. ACT Govt also undertaking monitoring at selected locations of impacts of the Bushfire Operational Plan, especially where more frequent burning than deemed ecologically correct is mandated for high fire risk areas

16. Much more notice needs to be taken to consider Indigenous cultural practices and their role in maintaining biodiversity.



Sarah Sharp is a plant ecologist, specialising in conservation management of grassy ecosystems. She worked with ACT Government for 18 years as a scientist, particularly providing advice on conservation of grasslands and grassy woodlands. She was involved in the preparation of the Strategic Action Plans for Grasslands and Woodlands, has provided input into management plans including the Bushfire Operational Plans and prepared site management plans, for example, sites managed by National Capital Authority. She was a member of the ACT Bushfire Council between 2011 and 2013, providing ecological input, and is a member of the ACT Weeds Advisory Group. Now semi-retired, she works as a volunteer with community groups (including Friends of Grasslands, Conservation Council Biodiversity Working Group and Molonglo Catchment Group) to conserve grassland and grassy woodland sites and species and to work with Parkcare groups to promote the application of quantitative and scientifically robust monitoring after management is applied. She has a strong interest in the dynamics of species and ecological communities, including the use of fire and impacts of fire on these ecosystems, and in gaining understanding and utilisation of indigenous fire management practices for both cultural and ecological outcomes.

The community and bushfire management

Sarah Sharp

Fire, controlled or wildfire, is with us for good or bad, often both. No one who was in ACT on January 18 2003 or in Victoria or South Australia during their fires will ever forget what wildfire feels like and how many people were affected by it.

Since 2003 there have been many modifications to management to reduce the likelihood of such an event occurring again. Unfortunately, it probably will, if not in the next 50 years, but in the next 100 years. In 2003 after burning through native vegetation and pine forests the fire moved through almost bare paddocks at tremendous speeds towards and into Canberra. This was a firestorm – uncontrollable. Wildfires on a smaller scale occur regularly, generally every year.

Recommendations from the fire included no replanting of pines on the eastern side of the Murrumbidgee, although allowing for growth to maturity for existing plantations. Other recommendations were to as soon as possible create non-vegetated areas adjacent to housing. This caused a great deal of consternation with residents who had deliberately chosen to live adjacent to reserves. In the longer term, to ensure there were adequate bare-earth boundaries between houses and vegetated areas specifically to provide a fire-fighting space. In many cases these are now roads and roadsides, siting houses more safely about 40 m from reserve boundaries. Community fire units are placed in many residential areas that are at risk.

Actions undertaken by ACT Government and other landholders (Defence and NCA) aim to reduce the biomass. This may be by fuel reduction burns, grazing, mowing or slashing. Information on when and where these actions is contained in documents on the ACT government website.

Other burns are also undertaken:

- burn for enhancement of ecological outcomes (enhancement of individual species and community biodiversity); for example NCA at Stirling Park, Yarralumla; and
- cultural (Aboriginal) burns, for example patch burns, to open areas for easier traversing country and hunting, encouragement of specific species utilised for food or other purposes, green pick to encourage herbivores. Community reactions to fire are mixed of course. Fears may include:
 - fear, loss of property
 - ‘destruction’ versus regeneration
 - fear that a controlled burn will turn into wildfire
 - lack of understanding of how wildfires can be ‘fought’ or contained
 - nuisance factors – smoke and ash.

Others welcome the use of fire to reduce the potential for wildfire and/or to enhance biodiversity – many people would have experienced going out into a burnt site after

even a week, and see a variety of plants emerge from the blackened ground.

Fire definitely plays a role in reducing wildfire threat and outcomes, and we all need to learn to live with it. There are many things that community can do to minimise nuisance, loss of property.

These include becoming fire-ready –

- ensuring plantings used have a lower fire threat rating, usually being ones that are green in summer and have lower biomass
 - keeping down weeds especially African Lovegrass, Wild Oats and other annual grasses that cure in summer
 - reducing high biomass materials around perimeters of buildings
 - ensuring fires aren’t lit in high risk weather or sparks generated (such as the fire at Carwoola in late 2016)
 - ensuring all buildings in fire prone areas are built.
- Other changes include a better understanding of the role of fire, to reduce the misunderstanding about fire being destructive to the landscape. It can be destructive but it can also be restorative.

A large gap in our understanding is how an understanding of and practice of Indigenous cultural practices can be integrated into bushfire management.

During this symposium we will be hearing about all these different sides to bushfires – studies of attitudes to fire, how research has been used to improve understandings of hazards and risks and ecological outcomes, how climate change may impact bushfire management.

Sarah is a plant ecologist, specialising in conservation management of grassy ecosystems. She worked with ACT Government for 18 years as a scientist, particularly providing advice on conservation of grasslands and grassy woodlands. She was involved in the preparation of the Strategic Action Plans for Grasslands and Woodlands, has provided input into management plans including the Bushfire Operational Plans and prepared site management plans, for example, sites managed by National Capital Authority. She was a member of the ACT Bushfire Council between 2011 and 2013, providing ecological input, and is a member of the ACT Weeds Advisory Group. Now semi-retired, she works as a volunteer with community groups (including Friends of Grasslands, Conservation Council Biodiversity Working Group and Molonglo Catchment Group) to conserve grassland and grassy woodland sites and species and to work with Parkcare groups to promote the application of quantitative and scientifically robust monitoring after management is applied. She has a strong interest in the dynamics of species and ecological communities, including the use of fire and impacts of fire on these ecosystems, and in gaining understanding and utilisation of indigenous fire management practices for both cultural and ecological outcomes.



Bushfire management: Balancing the risks

Dominic Lane

ACT Emergency Services Agency

It is the role of the ACT Emergency Services Agency (ESA) to protect life, property and the environment.

The *Emergencies Act 2004* (the Emergencies Act) outlines the ESA Commissioner's role to provide for the effective and cohesive management of the emergency services.

The ESA mission statement is: *we work together to care and protect.*

This mission emphasises; the ESA works together; through Cohesive Operations, Collaborative Management, and as a Unified Executive.

Legislation

The Emergencies Act under which the ESA operates is viewed as part of best practice in emergency management.

It is a piece of legislation that provides for an all hazards approach. It recognises the importance of the four separate operational services – ACT Ambulance Service, ACT Fire & Rescue, ACT Rural Fire Service, ACT State Emergency Service – under the command of the Chief Officers brought together through the functions of the ESA Commissioner. It allows for effective coordination and provides for a whole of government approach to emergency planning.

The Emergencies Act was amended in 2016 to strengthen these elements by making accountabilities very clear. It clarifies that ACT Fire & Rescue is responsible for the complex hazards of a large city in the built up area, and the ACT Rural Fire Service, primarily made up of our dedicated volunteers and ACT Parks and Conservation staff, remains responsible for the highly valued assets of the ACT's National parks, reserves and farms.

The roles and functions of the ESA Commissioner and the Chief Officers are clear not only in times of emergency, but in training, planning and community education roles.

The public's safety is protected by assuring these accountabilities can be enacted in times of significant emergency through the appointment by the Chief Minister of an Emergency Controller. This is a reminder that, during declared emergencies it is ultimately the Chief Minister who is accountable for the ACT in times of crisis.

Lessons learnt

The ACT community, ACT Government, and ESA, have learnt a lot from the 2003 bushfires. This includes the scrutiny that came with Ron McLeod's review, the coronial inquiry, and at least four reviews by the ACT Auditor-General over the last decade.

Information gathered from many other significant natural disasters and emergencies that have occurred across Australia since that time, also assists in this learning.

The ESA has made the necessary and sometimes difficult changes, not only to improve operation performance, but to also improve its governance, financial management, and support to staff and volunteers.

Investment

Both the ESA and the ACT community benefit from the record investments in emergency capability. This includes additional firefighting appliances, communications, Community Fire Units, aircraft, the Hume Training Centre and airbase, heavy machinery, and the Emergency Coordination Centre (ECC) at Fairbairn. The ECC enables the whole of ACT Government and utility companies to coordinate services to the community during a major incident.

To make sure that our workforce of the future are accommodated in suitable buildings, the ACT Government is making sustained investments to the workplaces our emergency services workers to work in, and from, to ensure they are fit for purpose and suitable for a diverse and varied employees and volunteers.

The ACT Government also supports the significant upgrade to fire trails. This allows immediate access to bushfires. The Mount Franklin fire trail upgrade completed in 2015 is a great example of a major upgrade that allows not only good access for fire tankers, but also for transporting heavy machinery, bulk water, and responders into remote areas quickly and effectively.

The diligent preparation and planning of this trail through remote wilderness areas in a pristine water catchment is an outstanding example of collaboration across government.

Strategic Bushfire Management Plan

The focus of the ESA's Strategic Bushfire Management Plan (SBMP) is protection of the community and its assets by preventing bushfires, mitigating their impact, coordinating across government during emergencies, and recovery. It is a dynamic document that allows emergency services and fire managers to have the flexibility they require to implement measures that reduce bushfire risk, and to apply improved methods and knowledge as they are developed.

The SBMP is reviewed and renewed every five years under section 72 of the Emergencies Act and sets out complementary and integrated strategies through which the government and the community will reduce the risks of bushfire in the ACT. This planning allows the ESA to bring the community together to combat the threat, manage the consequences of its impact, aid in emotional recovery, and re-build the things that are valued.

Another important aspect of the SBMP is focusing attention to where the risk is greatest. The ESA is able to refine



its focus from a broad brush approach to pinpoint exactly where the ACT is most vulnerable as a community.

Version 3 of the SBMP includes an implementation action plan, which focuses on the following 12 objectives:

- A reduction in bushfire ignitions
- Effective firefighting operations by skilled and motivated personnel
- The necessary equipment and resources to respond to and extinguish bushfires
- Extinguish bushfires when they occur
- Planned fire management on rural lands
- Broad Area bushfire fuel reduction across the natural and rural landscape of the ACT
- Access for vehicles and firefighters to undertake bushfire fighting and fuel reduction
- Adaptive management to provide continuous improvement in bushfire management
- A community that is prepared for bushfires
- Effective land-use policy and planning that reduces bushfire risk
- Integrated measures for bushfire protection at the urban edge
- The community and government recover from the effects of bushfires

Bushfire Mitigation

The work of the ACT Parks and Conservation Service, supported by the ACT Rural Fire Service volunteer members, sees the ACT as the only jurisdiction achieving its bushfire hazard reduction targets. Many of the prescribed burns undertaken over the past few years have been very complex. Some have been in sensitive alpine areas, or at the back fences of residents in suburbs. All of them require the sensitive application of science, skills and experience. Prescribed burns do come with elements of risk, but the ACT Government is willing to accept these risks in order to achieve a greater public safety outcome.

Other bushfire mitigation activities that prepare the ACT for the next bushfire season include slashing, grazing, mowing and physical removal of vegetation.

Firefighters and emergency workers, both paid and volunteer, door knock the streets that are most vulnerable to the impact of bushfire. There is nothing more powerful to a member of the community than receiving a personal message on how to protect themselves and their families than when it comes from one of the ESA's own trusted professionals.

Bushfire Science and Warnings and Alerts

The ESA is also using science to better map where risks are greatest. Ongoing changes to prediction and information systems, and improvements to systems for issuing warnings and alerts, means the ESA is far better placed than ever before to provide the community with the best possible early advice to assist in their protection.

The ESA partners and supports farmers in the bushfire abatement zone to ensure fuel management and access for firefighters improves. The ESA has also reviewed the role

of Community Fire Units, and continues to recognise volunteers in the community as a significant resource in the protective model for collective assets.

Communications Centre Reform

The ACT Government announced its intention to reform the Communications Centre (ComCen) in June 2016.

A Project Manager has been working with staff from ESA's operational services to design the implementation of the ComCen Reform project.

The ComCen reforms will:

- Put more fighters on the frontline, available for response duty.
- Allow flexibility for more training and to potentially reduce overtime.
- Support opportunities to improve response times.
- Providing faster warnings and alerts to the community.
- Improve the ESA's ability to scale up during emergencies.
- Provide better support to ACT Rural Fire Service and ACT State Emergency Service volunteer members in the field.
- Reduce the need for duplication of duty officer roles within ACT Rural Fire Service and ACT State Emergency Service.
- Better meet the needs of volunteers of the ACT State Emergency Service during severe storm events.

Change and Improvement

The ESA is always prepared to change and improve. An example is the difficult decision made by firefighters not to place crews in danger on the first night of the Mount Clear fire in December 2015. The ESA was prepared to accept that this decision may attract criticism, but it also highlighted that the ESA will always put the safety of its people first. The ESA then implemented a successful plan to launch a massive aerial attack.

Even more significant, and very different to how remote fires had previously been tackled in the ACT, was the use of bulldozers to get to the fire line. This action provided for the swift and secure containment of the fire edge in advance of forecast extreme fire weather conditions.

The ESA also works closely with interstate neighbours, training and exercising together. The ESA frequently provides support to inter-jurisdictional ambulance services, State Emergency Services, Rural Fire Services and fire and rescue services, and in turn the ACT can draw on their significant resources in times of need. Formal arrangements have been established through the ACT Government signing up to the Arrangement for Interstate Assistance – Fire and Emergency Services Version 3, which was developed by the National Resource Sharing Centre.

Diversity

The ESA recognises that it can increase its capability as emergency services by becoming more diverse and inclusive. The ESA is a leader in Australia in terms of trying to attract more women into emergency service roles. The ESA continues to do a lot of work in determining the issues that are important to women for them to consider being a member of our emergency services. There is more to diversification agenda than simply employing a wider gender profile, however, the Women in Emergency Services strategy has been our first step along this pathway.

Conclusion

Whilst the Canberra community has enjoyed 14 safe summers since the last bushfire tragedy, the time will come again when emergency services will be put to the test.

Crippling drought, multiple lightning strikes, scorching temperatures, and strong winds will one day come together

again. There will be days when it is too dangerous to put firefighters into remote areas, too difficult to fly helicopters, and too overwhelming for firefighters to stop a fire from impacting on farms, homes and community assets.

However, a lot will be different next time.

Dominic Lane AFSM
Commissioner, Australian Capital Territory
ACT Emergency Services Agency

Dominic Lane is the Commissioner of the ACT Emergency Services Agency, and brings with him 28 years of operational experience ranging from fire-fighter through to Commissioner, as well as 10 years in senior executive leadership and strategic management. His current role covers a wide portfolio including the strategic direction and management of all of the emergency services including the ACT Ambulance Service, the ACT Fire & Rescue, the ACT Rural Fire Service and the ACT State Emergency Service.

Dominic was awarded the Australian Fire Service Medal in 2004 and the National Medal in 2005.

Role of the Conservator of Flora and Fauna

The position of Conservator of Flora and Fauna is a statutory position established by the *Nature Conservation Act 2014* (NC Act) with additional responsibilities under the *Planning and Development Act 2007* (P&D Act), the *Fisheries Act 2000* and the *Tree Protection Act 2005*.

The conservator's main functions are—

- to develop and oversee policies, programs and plans for the effective management of nature conservation in the ACT;
- to monitor the state of nature conservation in the ACT;
- to provide information to the Commissioner for Sustainability and the Environment for inclusion in a state of the environment report.

The Conservator acts on issues that affect conservation matters embodied in the NC Act, in particular to protect native plants and animals. The position includes:

- overseeing the management of the nature reserve system;
- protecting and conserving threatened species and ecological communities;
- the administration of a licensing system for the taking, keeping, selling, importing, exporting, disturbing, displaying and killing of native plants and animals.

Emergencies Act 2004

The Conservator has a formal role in preparing the draft Strategic Bushfire Management, in that the Commissioner must consult with the Conservator (s.72(2)).

Planning and Development Act 2007

Under s.316 of the *P&D Act*, each area of public land identified in the Territory Plan must be managed in accordance with the management objectives applying to the area and the public land management plan for the area. If the area is a reserve, the public land management plan is a reserve management plan under the NC Act.

An amendment to the Emergencies Act in 2014 provided that where there is an inconsistency between the Strategic Bushfire Management Plan (SBMP) and a public land management plan, then the management plan has no effect.

This is unlikely to be an issue as none of the plans of management rule out fire fuel management and are not prescriptive in how it is achieved. For example the fire management objectives in the Namadgi Plan of Management are:

- Fire management strategies integrate fire protection, water supply and conservation objectives and, to provide guidance for management, are supported by an effective research and monitoring program.
- Fire management strategies create a mosaic of areas across the park with differing fire histories and a consequent diversity of vegetation age-classes and fuel loads.



Ecological Assets are taken into consideration in the preparation of the SBMP and the related 5 year Regional Fire Management Plans and the annual Bushfire Operational Plans

If a development proposal is mentioned in Schedule 4 of the Planning and Development Act then an EIS is triggered. This includes impacts on listed species or communities, clearing of greater than 0.5ha of native vegetation, or developments in reserves. The triggers provide an 'out' from the requirement for an EIS in some instances if the Conservator provides an environmental significance opinion that the development is not likely to have a significant adverse environmental impact.

Mount Franklin Road

The upgrade of Mt Franklin Road triggered the requirement for an EIS. The first step in the EIS process is that the proponent must apply to ACTPLA for a scoping document that identifies the matters that are to be addressed in the EIS. This scoping request is a mandatory referral to the Conservator, to ensure that all relevant conservation issues are addressed.

The proponent must prepare a draft EIS which is placed on public notification. At this point the draft EIS is also referred to the Conservator for comment. (Not a mandatory referral under the Act but it is practice that all EIS's are referred to all Agencies).

The Conservator obtained advice from Conservation Research and the Rangers on the impact. In fact, Conservation Research had a large input into the final works that were approved.

Presented by Daniel Iglesias

Daniel Iglesias is the Director of the ACT Parks Conservation Service. He has been Director since 2012 and previously had been a ranger with the PCS since 1996. As part of his role as Director of PCS Daniel is responsible for oversight of the Fire Forests and Road Unit. He is currently acting Conservator while Annie Lane is on leave.

He will be presenting on the role of the Conservator in the Law and Legislation session as well as being moderator for the "Impacts of fire on the community" session on Saturday.

Balancing nature conservation and emergency risk management

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Abstract

Managing natural disaster risk, and in particular bushfire risk, is necessarily a compromise between competing interests – people want to be able to build their dream home with magnificent views surrounded by gum trees but their actions may adversely impact upon the environment or expose them and more importantly others to a risk that is considered too high. Other people may want to leave natural areas completely alone, allowing nature to develop its own sustainable eco-system but to do that can lead to a build-up of fuels that in turn allow massive, unstoppable fires to develop or restrict the way fire fighters can do their job. Finally, we could make an area totally fire proof by clear felling the land. None of those are acceptable options. Here I look at the various objectives and requirements of the *Emergencies Act 2014* (ACT) the *Nature Conservation Act 2014* (ACT), *Planning and Development Act 2007* (ACT) and the *Environment Protection Act 1997* (ACT) to look at how some of these potentially competing activities align-up from a legal perspective.

Managing natural disaster risk, and in particular bushfire risk, is necessarily a compromise between competing interests – people want to be able to build their dream home with magnificent views surrounded by gum trees but their actions may adversely impact upon the environment or expose them and more importantly others to a risk that is considered too high. Other people may want to leave natural areas completely alone, allowing nature to develop its own sustainable eco-system but to do that can lead to a build-up of fuels that in turn allow massive, unstoppable fires to develop or restrict the way fire fighters can do their job. Finally, we could make an area totally fire proof by clear felling the land. None of those are acceptable options.

One of the objects of the *Emergencies Act 2014* (ACT) is to ‘to protect and preserve life, property and the environment’ (s 3). That statement doesn’t priorities those objectives, they are all things that must be considered. The final report of the *2009 Victorian Bushfires Royal Commission* (Summary, p. 2) said ‘The Commission views protection of human life and the safety of communities as the highest priority for bushfire policy’. But the report of the 2011 Perth Hills Bushfire was critical of the fire service. In that fire they evacuated the population which ensured that no lives were lost, but people were not allowed to stay and defend their properties so many homes were lost. Former AFP commissioner Mick Keelty sitting as the Special Inquiry said (*A Shared Responsibility: The Report of the Perth Hills Bushfire February 2011 Review* (2011), p 3):

There remains one question the answer to which eluded the Special Inquiry but it is an answer that requires further examination and that is: What is the measure of success of the outcome of a bushfire? Is the loss of no lives the only performance measure? If so how many houses is an acceptable number to lose? Does one performance indicator have the potential to cloud the ‘Shared Responsibility’ of all to build resilience of our community?

Similar concerns could be expressed about protecting the environment. Steps to reduce bushfire risk or to fight bushfire may cause irreparable harm to the environment. Whether it’s clearing land, building fire trails or using toxic fire retardants there is a risk to the environment. My colleagues tell me about the impact of hazard reduction burns on native vegetation and the need to understand that impact to know how often burns can take place without fundamentally altering the ecology of the area. And when it comes to prioritising the response to fires is it always necessary or desirable to save a private home in preference to diverting firefighting resources to protect an area of habitat of an endangered species or to protect a water catchment for a city?

These are questions my colleagues in this forum must grapple with. The Emergency Services Commissioner cannot insist that fire risk reduction and when necessary, firefighting, takes precedence over the needs of the environment. And the Conservator for Flora and Fauna equally cannot insist that the conservation of examples of flora or fauna occurs regardless of the risk that might pose to others.

The various items of legislation discussed today anticipate that there will be coordination and cooperation between the agencies. For example, the Emergency Services Commissioner may declare that an area is a bushfire abatement zone but may only do so after consultation with ‘the conservator and the planning and land authority’ (s 71). The Commissioner is to prepare a strategic bushfire management plan but again he or she ‘must consult with the conservator’ (s 72) and the public (s 75). Where there is an inconsistency between the strategic bushfire management plan and any public land management plan then the land management plan is overridden by the bushfire management plan (s 77A).

The Bushfire Council is established to advise the Minister on issues relating to bushfire. The Council must include a person ‘with relevant skills or experience to represent the

community's interest in the environment' (s 129). The ACT Emergency Plan is there to provide for the 'coordination of Territory, Commonwealth and State agencies' (s 147). It would be expected that the role of the Environment, Planning and Sustainable Development Directorate will be included to ensure that they are appropriately involved in the response to any fire.

On the other side of the equation, the objective of the Territory Plan is to '... provide the people of the ACT with an attractive, *safe* and efficient environment in which to live, work and have their recreation' (*Planning and Development Act 2007* (ACT) s 48; emphasis added).

Neither the *Nature Conservation Act 2014* (ACT) (s 7) nor the *Environment Protection Act 1997* (ACT) (s 6) applies to a person exercising a function under the Emergencies Act for responding to an emergency. It follows that the Chief Fire Officers are free to take whatever action they think is necessary to combat a bushfire. It may be an offence to interfere with the nest of a native animal (*Nature Conservation Act 2014* (ACT) s 128) but not if you are making a fire break at the direction of the incident controller responding to a bushfire.

The result must be that perceived tensions between the Acts are manageable. Given that the agencies are all part of government it is fundamentally up to the government to resolve any impasse between agencies interested in developing land or conserving the environment and the emergency services. One can conclude that the 'trump card' lies in the hand of the emergency services but it would be inappropriate for the Commissioner to simply insist that his or her view prevail in the event of any disagreement. Rather he or she would be expected to work with the other agencies to come up with a compromise solution.

And that is the key. The decision on how to balance private and public rights, fire protection and safety against the protection of nature is essentially political. It is not a matter that the interests of one take priority over the other. That is important for people who want to advance a particular cause – those that want a pristine environment and those that demand that national parks are burned and burned often to reduce fuel loads have to appreciate that neither is going to find in the legislation for their cause a rule that says 'this must occur'. Legislatures appoint people to leadership roles to exercise leadership, not simply apply rules that the legislature has already determined.

The critical issue is risk but risk is more than the probability of an event measured against its likely outcome. It may be agreed that in some areas there is a very high risk of fire but whether the outcome of the fire will be catastrophic or not depends on the assets at risk. Some may prioritise the homes that may be lost and others the natural habitat.

What you perceive as the more significant asset will determine what needs to be done to manage the risk – and the only way to do that is for all stakeholders to be engaged in both prioritising the assets to be protected and the steps to be taken to achieve that outcome (see Michael Eburn 'Bushfires and Australian emergency management law and policy: Adapting to climate change and the new fire and emergency management environment' in Burton, L and Sun, L (eds) *Cassandra's Curse: Law and Foreseeable Future Disasters* (Studies in Law, Politics and Society; Elsevier, 2015)).

Community planning is the key (see for example, Tasmania Fire Service, *Community Protection Planning* <http://www.fire.tas.gov.au/Show?pageId=colCommunityProtection>). Involving the community in identifying priorities for fire and land management and identifying how responsibility for emergency management – preparation, prevention, response and recovery – will be shared across the whole community.

By working together agencies and communities will find the ways to manage both the demands of nature conservation and emergency risk management.

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Social attitudes towards fuel management used to reduce bushfire risk to life and property

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Acknowledgements

I would like to acknowledge the time and effort provided by those who participated in interviews and surveys for this project, and thank them for their time and contributions. I would also like to thank my supervisors and advisors: Assoc. Prof. Jacki Schirmer, Prof. Peter Kanowski, Prof. Steve Dovers, Dr. Malcolm Gill, Dr. Helena Clayton and Dr. Kath Williams. This research was funded by the Cooperative Research Centre for Forestry, Hobart.

Introduction

Bushfires can have devastating impacts, the results of which are sometimes graphically presented by the media (Gill 2008). Managing fuels to reduce bushfire risk in Australia is a complex and often controversial land management issue, often generating strong debate (Gill *et al.* 2013). The media debate often focuses on the negative impacts of bushfires or fuel management, but few studies have been conducted into public perceptions and attitudes about fuel management in Australia, and therefore little is known about how the public actually feels about the issue.

Fuel management strategies cannot be successfully implemented without public support, and practices that do not have support are unlikely to be broadly implemented, regardless of their effectiveness in reducing fuels and bushfire risk (Brunson and Evans 2005, Shindler *et al.* 2002, Toman *et al.* 2011). Bushfire managers need to recognise the importance of public perceptions and attitudes, and understand the social acceptability of their fuel management strategies within multiple spatial, temporal and social contexts (Arno and Brown 1989, Brunson and Shindler 2004, Brunson *et al.* 2006). Understanding public perceptions and acceptability of fuel management strategies can assist in developing more appropriate fuel management policies and strategies that better incorporate social expectations, and can help prepare better communication and engagement strategies (Mylek and Schirmer 2016).

A substantial body of work has been conducted in North America that explores public perceptions and attitudes about various land management activities used to reduce bushfire risk (Brunson & Shindler 2004, Brunson & Evans 2005, Carroll *et al.* 2007, Carroll & Bright 2010, Lijeblad *et al.* 2009, Manfredo *et al.* 1990, Shindler *et al.* 2002, Shindler & Toman 2003, Toman & Shindler 2006, Winter *et al.* 2002 & 2004, McCaffrey *et al.* 2013). However it was unknown whether the findings were applicable to other fire prone countries such as Australia. This PhD study begins to address this gap, focussing on public perceptions and attitudes towards three fuel management strategies: controlled burning, livestock grazing and vegetation thinning.

Controlled burning is the planned application of fire under

specified environmental conditions, weather conditions and area, to meet particular management objectives (Bushfire CRC and AFAC 2006, Fernandes and Botelho 2003). Livestock grazing refers to the use of livestock to reduce edible fuel levels. Livestock predominantly eat such fuels as grasses, herbs, forbs and some shrubbery, thereby reducing the volume and height of these fine fuels (Gill 2008). Vegetation thinning involves ‘thinning out’ forest trees and understorey shrubs by removing a proportion of stems in a given area, in order to reduce the amount of combustible fuels in a landscape. The thinned material is either left on-site (changing the structure of the fuel rather than reducing it) or removed off-site. In some circumstances, thinned material can be sold as timber, woodchips, mulch or firewood.

Various factors can be associated with public attitudes towards fuel management, including (but not limited to) the perceived outcomes of fuel management strategies, social trust in agencies undertaking fuel management, previous experiences with wildland fires and fuel management, knowledge about fuel management, feelings of vulnerability to wildland fire, the location in which the fuel management operation is taking place in relation to places of personal value, and to some extent socio-demographic characteristics (Mylek and Schirmer 2016). Understanding how these factors affect attitudes provides additional resources for bushfire managers to more effectively communicate and engage with communities and stakeholders.

This paper summarises some of the results from a postal survey sent to residents living in and around the Australian Capital Territory (ACT). For more detailed methodologies and results, see Mylek and Schirmer (2012 and 2016).

Survey of residents in and around the ACT

A quantitative postal survey was used to explore perceptions and attitudes towards controlled burning, livestock grazing and vegetation thinning used to reduce bushfire risk. The study region included the ACT and surrounding areas of New South Wales (NSW), including the city of Canberra, nearby towns Queanbeyan and Yass, peri-urban areas, small country townships, rural residential properties, productive farming properties, commercial forestry plantations, small conservation areas located within and around the urban centres and the Namadgi National Park. The study area was severely affected by bushfires in January 2003. Four people lost their lives, over 500 homes were destroyed and many more were damaged, important infrastructure was lost and pasture areas, forests and nature parks were also severely damaged (McLeod 2013).



The survey was sent to a representative sample of urban dwellers, peri-urban dwellers and rural landholders in this region. A total of 650 surveys were sent to urban and peri-urban dwellers and 600 surveys were sent to rural towns and rural properties. After removing ‘return to sender’ parcels from the sample, a total valid sample of 1110 was achieved. A total response rate of 44.2% was achieved (Mylek and Schirmer 2012).

The survey asked respondents to list their own arguments for and against each of the fuel management strategies and to rate how acceptable they felt each strategy was when conducted in different parts of the landscape in relation to

Overall, there was strong support for all three fuel management strategies in the ACT and surrounding region (Table 1), with the majority of respondents indicating that all strategies were considered acceptable, and that not undertaking any fuel management was unacceptable. There was no significant difference in response between the strategies, or where in the landscape they were undertaken, although all were considered slightly less acceptable in areas considered ‘natural’ (conservation areas and native forests), compared with landscapes dominated by human activity, such as farming areas, plantations and residential areas (see Mylek and Schirmer 2016 for a detailed analysis into these relationships).

TABLE 1: Acceptability of controlled burning, livestock grazing and vegetation thinning

Survey questions	n	% unacceptable (score 1-3)	% neither acceptable/ Unacceptable (score 4)	% acceptable (score 5-7)	% don't know	
How acceptable is controlled burning... ^A	...used for fuel management in general?	472	8.3	5.3	85.2	1.3
	...undertaken in conservation areas?	466	24.7	14.4	61.8	2.1
	...undertaken in farming areas?	465	14.1	9.7	73.9	2.2
	...undertaken in native forests?	468	26.1	7.9	64.6	1.5
	...undertaken in plantations?	465	15.6	9.5	71.8	3.0
	...undertaken close to my home?	467	15.2	10.5	73.4	0.9
How acceptable is livestock grazing... ^A	...used for fuel management in general?	468	6.8	7.9	83.5	1.5
	...undertaken in conservation areas?	461	33.2	10.0	55.8	2.8
	...undertaken in farming areas?	468	4.5	5.6	88.4	1.5
	...undertaken in native forests?	466	35.9	9.3	51.3	1.7
	...undertaken in plantations?	463	7.2	13.2	77.8	1.7
	...undertaken close to my home?	466	8.0	11.2	78.9	1.9
How acceptable is vegetation thinning... ^A	...used for fuel management in general?	467	7.5	12.2	79.0	1.3
	...undertaken in conservation areas?	465	25.2	11.8	62.0	1.5
	...undertaken in farming areas?	460	8.3	10.2	80.7	1.5
	...undertaken in native forests?	461	25.0	11.3	61.7	1.5
	...undertaken in plantations?	462	6.2	10.4	81.6	1.7
	...undertaken close to my home?	467	6.7	9.9	81.5	1.1
How acceptable is it... ^A	...NOT to carry out any fuel management at all?	476	87.0	4.8	7.4	0.8
^A Measured on a scale from 1 (highly unacceptable) to 7 (highly acceptable).						

areas/things people often place a value on (for example, near their home, in conservation areas, farming areas or plantation areas). The survey also included various questions about the respondents, where they live, their knowledge about fuel management, how vulnerable they feel to the risk of bushfire impacting their place of residence, how important they feel their own actions are in reducing bushfire risk at their home, how useful different information mediums are in delivering fuel management information, and the trust placed on different groups delivering information about fuel management.

Table 2 describes the top 5 arguments for and against each of the three fuel management strategies. General comments regarding hazard reduction were the top arguments for all three fuel management strategies. The top arguments against controlled burning were related to the risk of the fire getting out of control and smoke impacts, the top arguments against livestock grazing were related to environmental degradation, and the top argument against vegetation thinning was the cost and labour required to carry out the strategy.

TABLE 2: Top 5 arguments for and against controlled burning, livestock grazing and vegetation thinning

	Top 5 arguments listed FOR	Top 5 arguments listed AGAINST
Controlled burning (n=403)	<ol style="list-style-type: none"> 1. Hazard reduction 2. Positive for environment 3. Reduces intensity, speed, continuity and/or likelihood of unplanned bushfires 4. Protection of lives. Assets and/or stock 5. Training/familiarisation opportunity, research opportunity, and/or community awareness 	<ol style="list-style-type: none"> 1. Risk of fire getting out of control 2. Smoke impacts 3. Impacts on wildlife and/or other animals such as pets or stock 4. Impacts on environment, ecosystems and/or biodiversity 5. Impacts on vegetation
Livestock grazing (n=382)	<ol style="list-style-type: none"> 1. Hazard reduction 2. Dual benefit, positive use of resources and public areas 3. Safe, low impact, reduced need for burning 4. Cost-effective, less labour-intensive, less time-intensive 5. Controlled, managed, planned and selective 	<ol style="list-style-type: none"> 1. Overstocking, overgrazing and/or land degradation 2. Impact on native vegetation 3. Impact on soils 4. Impacts on environment, ecosystems and/or biodiversity 5. Requirements for infrastructure, water, control, management, monitoring and/or veterinary care
Vegetation thinning (n=361)	<ol style="list-style-type: none"> 1. Hazard reduction 2. Low environmental impact 3. Reduces competition, allowing remaining plants to thrive/creates space for other plants to grow 4. Reduces intensity, speed, continuity and/or likelihood of unplanned bushfires 5. Targeted at specific areas, species and/or fuel type 	<ol style="list-style-type: none"> 1. Costly, labour-intensive and/or time consuming 2. Environmental impact/not natural 3. Impacts on wildlife and/or habitat 4. Counterproductive (when left on site) 5. Impractical on large scales

Mylek and Schirmer (2016) describe in more detail the types of factors that may influence acceptability of the fuel management strategies, finding that factors such as knowledge about fuel management and trust in information sources were associated with overall acceptance of fuel management strategies. The importance a person placed on their own actions in reducing bushfire risk at their place of residence, feelings of vulnerability, past experiences with bushfire and some socio-demographic factors such as age, gender, income, employment status, and location of residence were also associated with acceptability of fuel management.

Conclusions

Managing fuels in a landscape is one tool used to reduce bushfire risk, however the strategies used, the location in which they are undertaken and in what frequency can sometimes attract considerable attention, both negative and positive. Communicating about fuel management strategies, bushfire management intentions and effectively engaging with affected communities is an important part of bushfire management planning. Understanding public perceptions and attitudes towards fuel management and the variety of factors that can influence these attitudes, can assist bushfire managers to more effectively communicate and engage with communities as well as develop more appropriate fuel management policies and strategies that better incorporate social expectations.

Additional information

For more detailed results from this study, see:

- Mylek M, Schirmer J (2012) Reducing bushfire risk: public perceptions about fuel management strategies in the ACT and surrounds. CRC for Forestry, Technical Report 221. (Tasmania, Australia).

(Found at <http://www.crcforestry.com.au/publications/technical-reports/>)

- Mylek, M, J. Schirmer (2016) Social acceptability of fuel management in the Australian Capital Territory and surrounding region. *International Journal of Wildland Fire* 25: 1093-1109

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Mel is undertaking a PhD at the Australian National University, exploring public perceptions and attitudes towards fuel management strategies used to reduce bushfire risk to life and property. The study's focus is on prescribed burning, livestock grazing and vegetation thinning. Qualitative interviews and a quantitative postal survey were used to gather data for this project. Mel is also a research assistant at the Health Research Institute, University of Canberra. Mel's background is in forestry, natural resource management and social science, and her area of research focusses on the social dimensions of natural resource management in Australia.

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How the sense-making of myths can help us understand bushfire

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Bushfire fits uncomfortably in land management portfolios in highly settled areas and significantly altered ecosystems, despite acknowledgement in scientific circles of fire being an element for ecological dynamics. Contradictory, multi-scalar problems from two major 21st century bushfires in SE Australia are presented in terms of paradoxes between scientific knowledge and local, cultural perceptions; political and economic drivers; and anthropocentric responses to impacts of climate on altered environmental conditions. Culturally derived ‘baggage’, retold and stimulated after each bushfire, refers to a particular choice of language and mythic concepts to construct and share meaning. These narratives function as important sense-making myths that are static, cross temporal boundaries and places and encompass ambiguity. Significantly, societal learning and knowing is shaped by myths, since they effectively frame perceptions of risk and control at critical moments, coinciding with reactive policy making. To help guide community and management responses and awareness, this paper will discuss how paradoxes function: they must be based upon the articulation of a myth; and for myths to function, they rely upon the paradoxical. In this context, exploring environmental and cultural learning is based upon historic representations, loaded with mythic roles and characterisations of how to connect with, and manage, the environment.

Introduction to the problem

Humans shape the physical world and evidence of this is noted in myriad records through time. Humans research and record visual and biophysical changes, write histories, create art and share verbal personal accounts. As storied beings, humans make sense of the world through sharing storied accounts to shape constructions of the world. In our efforts to try to understand many complex issues, our use of language is a significant shaper of the world; thus we can also have conflicting and contradictory understandings of the world. This paper focuses on some of the most complex issues of this century in south east Australia that concern relationships between humans, vegetation and fire.

Complex issues relating to Australia’s environment stem from its particular evolutionary history. Australian native vegetation is of global significance biologically due to the number of endemic species, yet many Australian ecosystems have been profoundly altered over the past 200 years since European colonisation as a result of large scale vegetation loss (Oliver, Smith, Lunt, & Parkes, 2002). It is understood that 87 per cent of native vegetation has been cleared since the arrival of Europeans, of which forests and woodlands are the most depleted vegetation type (State of the Environment Committee, 2011). In addition, the fre-

quency and severity of bushfires is exacerbating impacts on native vegetation and the human communities who live in close proximity to these areas, such as in Canberra and the peri-urban and forested townships north east of Melbourne.

The south east region of Australia has experienced numerous major bushfires and the most severe have been investigated through inquiries and royal commissions. The most recent inquiries, prior to 2009, were the 2002-03 Alpine bushfires in north east Victoria and the ACT. Consequently, the recovery of human settlements following catastrophic bushfires is lengthy, socially and economically disruptive and traumatic for those communities and families who have lost loved ones and property. Losses caused by the bushfires extend to many flora species, in particular, those threatened with extinction and the effects of frequent bushfire and other forms of vegetation loss. Hence, native vegetation management in Australia is part of complex, problematic and interconnected issues operating at multiple scales (Bührs & Christoff, 2006).

Implementing land use policies, for regeneration of vegetation, its structural distribution and to replenish soils (Lunt, 2002; Murphy, Abrams, Daniel, & Yazzie, 2007), occur in contradiction to those that support intense settlements in fire prone areas. Consequently, increased social impacts have arisen from loss of life and property in major bushfires, particularly over the past twenty years. As a result, there is now more attention in research and community programs of how communities live in these landscapes with the prospect of bushfire literally at their back door (for example Beilin and McLennan in Beder, 2006; Beilin & Reid, 2013; Dale, 2006; Eriksen & Gill, 2010; Lampin-Maillet, Jappiot, Long, Bouillon, & Morge, 2010; Murphy et al., 2007).

Environmental management of this complex situation is framed as ‘wicked’, due to interconnected factors around native vegetation use, and a combination of social and economic values that cross multiple landscapes, jurisdictions and social and ecological communities (Brennan, 2004; Head, 2008). Management issues have developed and shifted over time and led to different management practices and in response to environmental conditions and the anthropogenic factors influencing conservation and its management. To understand how to approach the com-

plexities of these problems and the context from which they emerge, we need to recognise how we make sense of the world—particularly during crises, which then shape and influence our efforts to grapple with converging technicalities and the confluence of complexities of native vegetation, fire and humans.

Methods

This paper focuses on narrative as the contextual unit of analysis to explore the presence of paradoxes in native vegetation management in the 21st century. Iterative and thematic analysis was applied to two bushfire case studies for in-depth reflections. This is because storytelling, inherent to narrative, is important for attempting to make sense of situations that are complex, confusing, and challenging (Brockmeier & Meretoja, 2014). With something so essential as ‘narrative’ for humans to communicate their understanding of the world, it is not surprising that there should be such diversity and development of how defining the term is approached. To avoid ambiguity I have adopted Polkinghorne’s definition of narrative to refer to content within the data in the case studies: “narrative can denote any prosaic discourse, that is, any text that consists of complete sentences linked into a coherent and integrated statement” (Polkinghorne, 1995, p. 6).

The case studies

To explore these contradictory problems two major bushfires in south east Australia were selected as case studies: the 2003 ACT and 2009 Kilmore-Murrindindi complex of bushfires in central Victoria. Diverse data were created to capture the range of paradoxes, expressed as important components of post bushfire management processes and public ‘sense making’. Data included public narratives in newspapers, Bushfire Royal Commissions reports, State and Federal policies and strategies relating to native vegetation and bushfire management, and key environmental histories. In-depth semi-structured interviews with land and fire agency staff and bushfire memorial sculptures were selected as forms of ‘silent’ stories that are not typically referred to in numerous publicly available studies, reports and management responses.

Case study overview

Canberra Bushfires, the Australian Capital Territory January 2003

On the 18th January 2003 Canberra was severely impacted by bushfires that had been ignited by lightning strikes in New South Wales and on the border of the ACT. Suburbs in the south west of the city were burnt by a fire tornado (Camilleri et al., 2007), which resulted in 501 houses destroyed and the deaths of 4 people. Approximately 70 percent of the ACT was fire affected (House of representatives Select Committee on the recent Australian Bushfires, 2003, p. 332). Three separate inquiries dealt with the bushfires (Doogan, 2006; House of representatives Select Committee on the recent Australian Bushfires, 2003; McLeod, 2003). Considerable restructuring of emergency communications and land and fire management departments respon-

sible for public land management and bushfire occurred, following Bushfire inquiries and the coroner’s report recommendations. Another outcome was the removal of forestry zones from areas close to the city and, in some areas, recreation areas have been established (Bartlett, Butz, & Kanowski, 2005).

Victorian Central Highlands, February 7 2009

In Victoria on the 7th February 2009 hundreds of bushfires ignited in some of the worst bushfire conditions on record in Australia (Terms of reference, Teague, McLeod, & Pascoe, 2010). One hundred and seventy three people died and hundreds more were injured. In Central Victoria numerous small towns were almost completely burnt, thousands of houses and properties destroyed and where 159 people of the deaths occurred. Approximately 150,000 hectares of land, including fire-sensitive rainforests and Mountain Ash (*Eucalyptus regnans*) were burnt (Campbell, 2009; Department of Sustainability and Environment, 2009). The bushfires caused Australia’s second worst civilian losses from a natural disaster in recorded history (Cameron et al., 2009) and the largest recovery program in the State of Victoria’s history (Teague et al., 2010). A bushfire Royal Commission was established soon after the fires, led by Justice Bernard Teague (2010). Recommendations were handed down in July 2010, many of which concerned land and emergency management policies, organisational responses, land management, communications and knowledge.

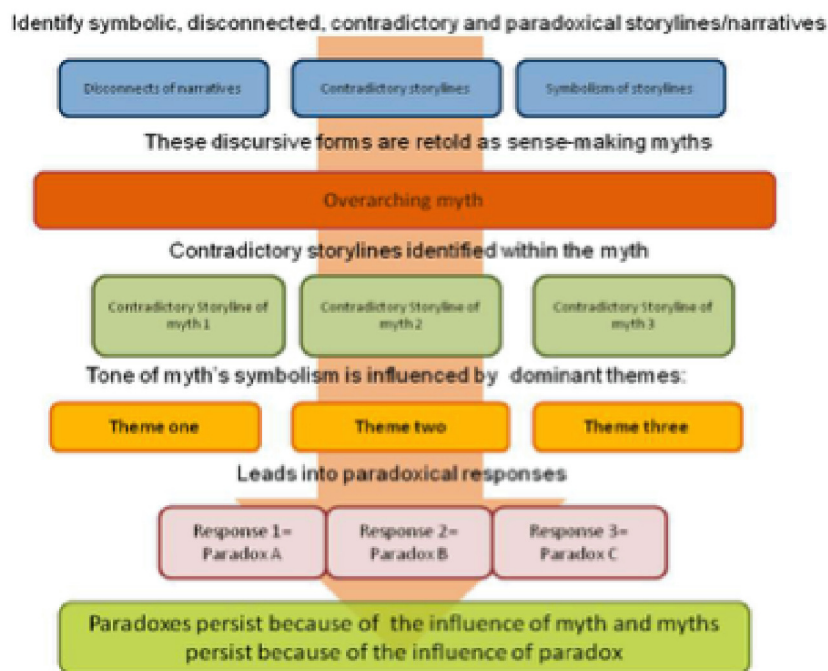
Findings

Iterative analysis of the narratives led to a deeper and more nuanced understanding of the issues and narratives describing them. The findings show that there is a long history in south east Australia of complex links between paradoxical outcomes of native vegetation and bushfire management decision making associated with the retelling of sense-making myths. For each paradox that is identified, there is a myth to explain its background and outcomes, and for each myth, the story it tells must be contradictory, thus is paradoxical. The symbiotic link between the two is critical for understanding environmental problems within a paradoxical context. The intrigue and frustration of these problems, explored via analysis of myths, is provided in the following sections.

The myth-paradox relationship

While the retelling of a static storyline is one point of difference to stories, myths, like stories and other discursive forms, also assist in understanding the world and constructing a sense of reality. Traditionally myths have been influential in the moral values that they prescribe, as a means to control social chaos and bring together those who subscribe to the myth (Cuthbertson, 1975; Dundes, 1984). The myths provide roles for believers to adopt during crises; the provision of simple and timeless, or static, storylines, often where the good atone for the wrong-doing of others, articulate a way for creating social cohesion and making sense of a moment in time following great upheaval. What makes myths particularly relevant for this research into environmental crises and policy is that as a discursive vehicle, myths focus on making sense out of

Figure 1: Example of the structure and process for exploring myths and paradoxes in the case study narratives



chaotic events such as catastrophic bushfires. The situation has been described in the following way:

"Myths are the product of cultural crises; they are a response to the challenges of politics...Natural catastrophes cause myths of "divine" wrath and appeasement." (Cuthbertson, 1975, p. 159)

Yanow (1992) notes that during times of crises myths help direct attention away from equally valued but contradictory societal principles, using storylines that are rich in symbols, allegory and emotion.

The myths' storylines identified in the narratives concern various ways the public, agencies and media express and understand the enormity of the environmental, political and social shifts following the two major bushfires via a particular choice of language and mythic concepts. The storylines of myths have been grouped according to:

- Cultural awareness of the Australian landscape;
- The subjective interpretations of conservation;
- Perceptions of the community;
- Government responsibility, or control;
- Achieving a sense of certainty through acquiring more knowledge.

Themes associated with the symbols and rhetoric repeated throughout the narratives of the diverse data.

- Blame
- Politicisation of issues
- Complexity

For the purpose of this paper an outline of two of the five myths is presented, followed by some associations between paradoxes relating to risk and control. Key find-

ings relevant to the ACT and the conference theme of values conclude the paper.

Myth of the cultural landscape

To better understand the context of the myths, and the relevance for contemporary land management problems discussed previously, it is useful to explore the origins of some deeply embedded cultural perspectives of the environment. In particular, the cultural landscape myth refers broadly to the contradictory and contrived realm of a designed and constructed 'natural' environment, where revered aspects of Australian nature are described as the 'bush' providing both spiritual and economic benefits for humans. The case studies exemplify this by referring to idealised and mythologised Australian landscapes encompassing three forms of mythical landscapes:

- a). preserving the gentleman's park landscape;
- b). the Bush Capital as haven;
- c). and in Victoria, the peri-urban retreat as a haven.

The storylines to the myth support an ongoing belief in human intervention in the environment. Both case studies concern the historic influence of artistic interpretations of an idealised Australian environment, portrayed in landscape paintings such as those by Joseph Lycett, (such as *Aborigines hunting Kangaroos*, 1817), or in the case of Canberra, the impressive and moody sketches of an imagined bush capital city by Marion Burley Griffin for their Federal Capital Competition entry in 1902 (see Clough, Griffin, & Griffin, 1909).

This myth contains important components of historic social mechanisms that contribute to paradoxes of land management, whilst pervading cultural understandings of

the Australian environment. Mythologised landscapes also contain romanticised interpretations of Indigenous Australians' connections to the bush, when convenient, while other storylines describe a masculine landscape dominated by either gentlemen or brave bushmen. Artistic references are important to denote landscape elements still referred to as 'natural' and desirable, with paintings of early colonial artists providing useful themes retold in the myth in contemporary narratives. Descriptors such as "the gentleman's park" or "park-like" landscapes, sought after as "havens", contribute to the now contested imagery of Canberra as the "bush capital" and the peri urban settlements north east of Melbourne (see article, *The Age*, McNaught, 2009).

Contradictions to the cultural landscape myth

Analysis shows that when exploring the inconsistencies of the myths, there is an opportunity to seek alternative understandings of paradoxical elements to contemporary reference to the myth, and how the myth has developed. The contradictions of the 'cultural landscape myth' contain subjective understandings of environmental and population changes, planning regulations and community environmental awareness.

The scale and proximity to interface settlements of the bushfires of 2003 and 2009 represent a psychological tipping point, where a sense of urbanised nature becomes suddenly threatening. The shared space and the interrelationships with the bush shifts; so these places are described in terms of requiring controls of such cultural and physical magnitude in order for human existence to persist. The media repeatedly presents storylines of frustration; that a growing urban population in both case studies still admire notions of the bush haven:

"We can insulate people from the effects of wild-fires like those that occurred in Canberra by eliminating available fuel. The problem is that many people want to live intimately with something that approximates nature. The result is an interface between settlement and bush that is so extended and diffuse that it is impossible to defend." (Hoggett, 2003)

The physical reality of the environment is that it is, occasionally, neither a haven nor benign, yet the persistence of the haven myths seems to defy reality and rationality, as population densities in fire-prone areas continue to rise. Consequently the concerns noted by Hoggett have direct implications for land management agencies legislated to oversee risk mitigation.

The power of myth-making to maintain such interpretations of the landscape demonstrates how effective this process of human reasoning is. The haven, as a particular form of imagined landscape, persists because myths have the ability and purpose to defy logic, and paradoxically present stability and sense (see Honko in Dundes, 1984). The contradiction between actual and mythic realities demonstrates the strength of Western values and perceptions of what Indigenous Australian managed landscapes would have been like before their practices were utterly disrupted.

Another paradox of the cultural landscape myth is that increasing populations in the haven areas create significant conflicts and challenges in managing fire risk through planned burning—due to conflicting aesthetic and ecological values and health impacts. However, at a local level, urban development policies contribute to internal management conflicts, due to revenue-raising from private land sales and rates. A perverse consequence is that population increases in high risk areas result in the need for additional risk mitigation measures to provide public safety.

In the ACT an additional land management conflict has arisen due to the land tenure system, which has unintentionally protected Temperate Grasslands and Grassy Woodlands, described below by an ecologist interviewee:

"...the ...thing about how land tenure and policies had an impact on biodiversity is interesting because they shut up a lot of land; or they took it away from people and gave it back to them on a short-term basis. So that meant that it was not worth the while investing in pasture and so on. One of the reasons that we have got quite a substantial area of Temperate Grassland for instance is because it is an artefact of that tenure history." (ALM12)

As a consequence of benign neglect, the management of these now highly valued and ecologically significant ecosystems contributes complexity to the management of bushfire and native vegetation. Since the introduction of the Asset Protection Zones following 2003, management of nature reserves through planned burns is disputed, not by just those who are smoke sensitive, but also by ecologists and other professionals, a number who live adjacent to these areas. The sensitivities of the situation is summarised by the interviewee below:

"... there's a lot of burns done, but it's not just in terms of bushfire management planning; a lot of is also grazing and slashing, clearing of some areas. Some of that is very controversial, in terms of clearing within some of the Nature Reserves where they back onto housing, or housing backs onto them. that's been a difficult one to deal with... there was heavy vegetation coming down to back fences and backyards full of heavy vegetation, up to the houses, and surprise, surprise, a lot of them burnt. ...Almost anything would have burnt that day; in fact a lot of nothing, including air, burnt. There was no safe area for people to fight fires; there was no break between the houses and the bush. So it had to happen... it's peoples' safety of course that comes first, but it also goes for fire fighter's safety as well." (ALM10, interview)

A change occurred in management priorities of nature reserves after the bushfires of 2003. These areas are now deemed bushfire protection areas in order to protect human assets. Consequently, major shifts have been required in professional values, objectives and priorities for some who manage areas of significant flora. Applying these changed

planned fire regimes has been a confronting process for those who have attempted to maintain what may be seen as entrenched intellectual and professional positions. Human populations are having a direct impact on not just the quality of significant ecosystems, but the way ecologists must work, in terms of the confrontations virtually occurring in their own backyards. The shifts in policy to increase biomass reduction in Asset Protection Zones has ironically occurred during a similar time when the national biodiversity values of the Temperate Grasslands has become more critical due to ongoing loss through human activities such as urban development. This is a paradoxical storyline of accidental conservation, where both biodiversity values and human knowledge of these values increased through the establishment of the reserve system, but which now are perceived as a threat to the very people who want to protect them.

The situation has not been wholly negative, as analysis of the ACT case study interviews shows that people closely associated with the preparation of the initial Strategic Bushfire Management Plan (SBMP) (now in the third revision, Emergency Services Agency, 2014) shared a greater respect of the need for planned burning and for one another's knowledge and experience. As a result, compromises were reached for applying changed management priorities, methods and approaches. This shift gradually transferred across to negotiations with some land developers who have also compromised their designs through the mandate to include Asset Protection Zones within the urban area, rather than in existing conservation reserves. Consequently, the development of the SBMP can be understood to represent a unifying process of healing following the intense period of blame, loss and disruption.

The myth of 'conservation'

There is an emotionally charged belief associated with the issue of controlling fire and fuel, in that conservation of native vegetation is associated with causing harm to humans. This myth's storyline perpetuates such public responses in the aftermath of the bushfire crises. Believers in the myth group apportion blame in the negative portrayal of those who support, or are involved in, biodiversity conservation. The myth's storyline depicts conservationists as controlling a reduced level of planned burning on public land, resulting in the creation of high levels of bushfire fuel. Proponents of the myth group, including prominent members of the forestry lobby, believe that if public land was returned to forestry managers, there would be better management of fuel loads and less risk to human life and property. Rather than representing diverse forms of native vegetation, the myth presents the predominant native vegetation type as forest.

The myth of conservation frequently frames native vegetation posing a risk to humans, and is therefore important for epitomising ideological land management conflicts that emanate from the 1900s. The outcomes of management of native vegetation are often depicted in a quantified form, such as via a 5% planned burn target to create an 80% reduction in residual risk. Seeking blame for risk and harm extends to people. Land managers and conservationists are

labelled in the post bushfire media as "greenies", hence this social group is claimed to be responsible for maintaining the preservation of environmental conditions that harm humans. In some extreme examples, "greenies" are portrayed as actually causing the staggering human losses in the case study bushfires. The risks, claimed to be associated with native vegetation conservation, are described as a consequence of the "rise" in green political influence having a "dangerous" effect on the development of native vegetation management policies, particularly on public land. When depicting actors simplistically, but effectively, as "goodies" and "baddies", such polarisation embellishes the mythic effect of the storylines that draw in audiences, particularly when retold in the media. Moralistic intonations are emphasised, whereby conservation is depicted as not being the kind of knowledge or ideology required to manage such tremendous loss of human life and ecological 'destruction'. The scene is set in the peri-urban landscapes; complex, high risk and land tenure systems that have not only challenging jurisdictional responsibilities, but geographies.

The myth sets up the concept of ill-conceived conservation decisions emanating from distant cities, rather than allowing what are described as real and more objective management decisions being made by those who have factual knowledge of the amorphously termed 'bush' (for example, the article by Petrie, 2009). Native vegetation, described as "rubbish", has little value to myth proponents, which therefore legitimises its disposal. Conservation implies a messy landscape filled with hazards. The reference to "green influences" signifies, metaphorically, a cognitive process of removing technical knowledge and expertise from those who promote biodiversity conservation; thus, conservation proponents are devoid of any professional identity and instead represent harm. An interviewee described how this de-identification process functioned from their own experience in the ACT:

"I think ['greenie' is] even broader than just a derogatory term for people like me that are doing something. It's a derogatory term for people who won't let people do things. So, 'the greenies are stopping me from running my farm like I want to; the greenies are stopping this road; the greenies are stopping this aged-care home'. It's just taken on this really large scale. ... "Let's leave things the way they are, the greenies are pushing us too fast". It's horrible. But I don't know if- there's no other word." (ALM1, interview)

The repetition of the term greenie throughout the case studies silences alternative descriptors, and helps set up a polarised tone. Reflection upon bushfire impacts are represented in terms of anything "green", as used above, being equated to "bad". The negative metaphoric association with green then crosses to the domain of the physical environment where green is associated with harm, and those who are 'green' therefore are part of the greater harm to society.

An example of the portrayal of the environment in such a context is promoted in the media, where a metaphorically

terrifying devil appears to savage an almost biblical scene:

"[The] fire that swallowed Strathewen came with such ferocity and menace and at such blistering pace that it overwhelmed the bushland paradise within moments. Many who stayed were condemned to a living hell..." (Mann, 2009)

Concepts of nature such as these capture the power of archetypal symbols widely used in the myths. For example, The Age newspaper (Strong, 2009) describes fire as a terrifying beast with religious fervour: *"The killer called 'IT', which is still stalking our wide brown land like a demon unleashed from hell"*. The ongoing storyline presents fire as something unnatural:

"an alien force, catching the tops of the local messmate trees, which exploded in walls of flame. It was as if you were looking at a medieval painting of hell. Then it quietly slipped into a grassland in front and suddenly there was a different urgency." (Strong, 2009)

It is hardly surprising that vegetation is therefore viewed as deeply problematic and a threat that must be controlled. The media's effective use of fantastic metaphors contributes to the portrayal of a landscape that is uncertain, capricious and hostile to people. Reality is transformed into the realm of nightmares.

Contradictions to the myth of conservation

An important contradiction of the myth concerns the distortion of scientific knowledge with ideological conflicts stemming from factions of pro-conservation (labelled as 'greens') and those who criticise conservation who are framed as 'knowing better'. The uncertainties and fear concerning fuel management are distorted by the green labelling of ecological knowledge, which then stymies decision making.

"...we've laid the ground work for our own subsequent failure, because ...as everyone who works in the fire knows, there's lots of aspects of fire fighting as well as fire prevention over which you have little or no control; ... so ...it doesn't matter how much planned burning you do, you can never guarantee any outcome, except that a planned burn will burn. But you cannot guarantee that 'll stop wildfires next year..." VLM5 ecologist

Policies aimed at controlling vegetation provide a false sense of security for residents living in high risk areas. The increased measures to control native vegetation introduced following the major bushfires not only contributes a false sense of security, but exacerbates planning and community environmental awareness issues associated with those who live in areas classified as high risk. This scenario sets up the expectations of being protected at all costs with further disconnects to environmental risk. In Victoria, the perverse outcomes are associated with a phase of unauthorised tree removal. Consequently proponents of the myth and those who fear vegetation are absolved for their illegal actions, and their choice for remaining in high risk areas; seeking to change the environment around them rather than neces-

sarily seeing their environment as radically dynamic and at times, metaphorically acting inhumanely.

The contradictory storyline, of how amended policies create a false sense of security, exposes how elements of the environment cannot be controlled. Nor can we control the very fears which stimulate the initial government responses to alter policies. These misleading attributes identified in the risk and control paradoxes show that the more risk is mitigated and controlled, the more risks are perceived as part of the attempt to control the uncontrollable.

According to the myth of conservation, if governments amend native vegetation legislative and policy controls to help alleviate community anger and angst about the contribution of vegetation to bushfire threats, actively doing something validates public concerns as real. Learning something that contradicts the perception of the controllable environment— in this case bushfire and native vegetation— would be terrifying during such a time of chaos. As the purpose of myth is to provide a sense of order following such dramatic moments of change, in this case it is enacted through the authorised permission for individuals to take charge of one's immediate physical environment, symbolised through removal of native vegetation.

In the ACT, policy changes include the introduction of Asset Protection Zones (APZ) managed in conjunction with a 5 yearly Strategic Bushfire Management Planning process (see Emergency Services Agency, 2014). Asset Protection Zones have been established in high fire risk reserves adjacent to suburban areas following the 2003 ACT bushfire inquiries. The management of these zones stipulates vegetation removal via a range of measures. The role of Asset Protection Zones has become disputed by some within land management agencies because of impacts on threatened species and biodiversity, since the reserves are now managed as fire management zones.

Paradox of trying to control the uncontrollable

A number of fire management interviewees described how only more moderate fires can be 'controlled', but how they start cannot be controlled. The science of planned burning is evolving, albeit with some dedicated investment and effort by land management agencies. Yet the myths fail to assist communities to understand the likelihood of uncertainty and loss of control, hence setup reprisals and blame of agencies when things go wrong. A consequence is that blame is an important theme of this paradox, used to reaffirm the lack of ability to control the uncontrollable, such as catastrophic fires. The mythic storylines conflate domestic space risks with those associated with bushfire and native vegetation management across the much broader landscape, confusing scale and risk perceptions.

Another consequence, with serious ramifications identified in the paradox, is that agency staff are omitted from the highly valued mythic roles of heroes in the fire fight and rescue phase of these bushfires. Since these people are aligned with agencies who undertake 'conservation' measures, they are therefore implicated in the myths for causing the harm, since native vegetation uncontrolled, has burnt, harmed and killed numerous communities. Aligning this

understanding of the mythic roles with themes of blame, it is then possible to understand the sequence: of blaming governments, calling for redemptive actions, and thus, reactive policy making ensues. While the trauma experienced by communities is well publicised, the trauma of agency staff is not part of the cultural narrative in these myths.

Conclusion

As a result of some reactive policy making and conflicted perspectives of responsibility, native vegetation has an important but contradictory role in the paradox of attempting to control the uncontrollable: firstly as an element in fire management, where native vegetation, described as “fuel”, is the only controllable element available to control fire; and secondly in conservation management, native vegetation requires regulatory controls to ensure it is protected. Within such a policy context, the myth of “conservation” legitimises societal behaviour to assert the need for (albeit reactive) native vegetation management policy amendments that serve another purpose; to help people manage their personal fears when their own sphere of reality is out of control.

Exploring these myths suggests that:

- Myths appear to be unequivocally accepted as a means of sharing the sense-making of crises. Myths are retold over time and place and provide guidance in the power of their storylines, symbols and language. Myths provide prescriptive roles, with known conclusions. These bushfire-related myths accommodate the contradictory and intensely emotional responses to bring communities, leaders and agencies together in a groundswell of action. The impacts however, have serious repercussions for policy making and trust of agencies, and how people seek to live within and learn about the Australian environment.
- Land managers can benefit from understanding the confluence of myth, paradox and multiple perspectives/social constructs of ‘reality’, that are particularly potent during the chaos of major bushfires. As an additional strategic and analytical tool prior to the crisis, greater awareness of language, mythic storylines and prescriptive roles in these powerful narratives and deeply ingrained cultural values expressed in myths can assist, and complement, current approaches for bushfire preparedness and risk management.
- There are very real psychological impacts on staff, yet broader public responses fail to acknowledge their need for greater support and public recognition as community members of fire affected regions. When considering policy changes and government responses, the welfare of staff must be considered, and the realities of implementing policies once the focus of the fires shift to other policy arenas or disasters. Active confrontation of blame in a more neutral, facilitated setting that considers community and agency roles as presented in myth, compared to those described by active participants, could assist in communities reacting and relying upon divisive and defensive representations of the tragic events.

Using a facilitated process to confront myths and the roles they prescribe as narrative constructions, rather than personalised attacks, could create new mythic structures to guide collaborative responses to contemporary social-ecological issues relating to bushfire in our 21st century landscapes. Reframing of myth, symbol and prescriptive roles would help both agencies and the communities impacted directly by catastrophic bushfire achieve greater respect for the challenges confronting agencies, their staff and affiliated communities in a changing climate. These re-framed myths would also better reflect the themes being promoted by government for sustainable and resilient ecosystems, responsible and resilient human communities and responsive departmental actions.

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Between a rock and a hot place: volunteer rural fire brigades and the “wicked problem” of fire management.

Australia is a continent of fire. Fire is a fundamental part of the Australian ecological landscape, however how it is managed is intrinsically a social issue. Fire has not only changed the ecological landscape in Australia, it has become part of who we think we are as a nation. Bushfire represents what it is to be “Australian” – a courageous fire fighter, communities pulling together – heroes, mateship, a fair go, tough, Aussie battler. It also represents the disharmony and angst in Australian society – conservation versus prescribed burning, inquiries into bushfire disaster – distrust, anger, blame, “who’s responsible?”. As Paul Collins wrote in his 2006 book ‘Burn’, “when I started research for this book I very quickly learned that fire is one of those things that everybody has an opinion about...”.

Many of us have had an experience with bushfire. Images in the media of huge towers of flames and billowing smoke, residents in thongs and T-shirts hosing down their roof or fleeing for their lives, and fire fighters covered in soot, dwarfed by the flames and staring in disbelief at the carnage before them. Every local community has its own fire history; stories of survival, disaster, recovery and heroism. Some of these events, such as the 2003 Canberra Firestorm, are etched in the memories of Australian society. Other smaller, localised bushfire events have long lasting impacts on the residents of local communities but are relatively unknown elsewhere. Many of these fire events were catalysts for change and volunteer rural fire brigades are an essential part of any discussions about any changes to fire management practices and policies.

Rural fire fighting began in Australia when residents joined together to provide a united front against the uncertainty of bushfire and to help one another as neighbours to fight and suppress those fires. Although it was often an ad hoc system, it provided a bottom-up community-based mechanism to help protect and support the local community. Changing societal expectations and other external pressures are now driving the professionalisation of fire management practices, and thus formalised and increased the number of functions that rural fire brigades are expected to perform.

Brigade functions are becoming more standardised, centralised and specialised. Brigade volunteers are expected to have specialised knowledge about fire mitigation, suppression and recovery, within a set of formal operational guidelines and standards. Brigade administrative functions have been corporatised, also within a set of formal guidelines and standards. Brigade functions have expanded to include other aspects of emergency and disaster support, outside of the core goals of fire suppression and community protection against bushfire. Senior brigade volunteer members are now expected to provide a professional level

of service, particularly field officers (captains, deputies) and senior executive committee members (president, secretary, treasurer).

It could be argued that these changes are a positive step forward; providing an enhanced level of service for volunteers and an enriched level of protection for the community. So, why is there an issue?



A rural fire brigade does not operate in isolation nor is it homogenous. It is made up of the members from the community who volunteer their time to perform these functions, some of which are driven by the needs of the agency (fire service) and others that respond to the needs of the community. A brigade volunteer is a member of their local community but they are also a representative of their fire agency. A brigade volunteer has a level of responsibility to their agency as well as a level of responsibility for their community. When those responsibilities and needs are not shared due to differing values and expectations, volunteers become wedged “between a rock and a hot place”.

Fire management is no longer only about putting the “wet stuff on the red stuff”. Societal expectations about fire management are continually changing due to a variety of external factors and pressures. Fire management should be reframed as a complex issue or a ‘wicked problem’. A ‘wicked problem’ defies complete definition and for which there can be no final solution; resisting the usual attempts to be solved (Brown et al., 2010). By unpacking the many layers of the ‘wicked problem’ of fire management and acknowledging the duality of rural fire brigades, we can begin to “critically examine the relationships and interactions between formal disaster management institutions on one hand, and social capital and community resilience on the other” (McLennan, B., 2011). Fire management is as much about managing differing values and expectations as it is about putting out fires.

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Extreme bushfire development

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Jason graduated with a BSc in 1995 and a B. Math. (Hons) in 1996, both from the University of Newcastle. He then completed his PhD in pure mathematics and mathematical physics at the University of Canberra. In 2001, Jason was appointed as a postdoctoral fellow at the Centre for Resource and Environmental Studies (ANU) where he worked on the spatiotemporal analysis of climatic variables such as rainfall and evaporation.

In 2006 Jason moved to the School of PEMS where he worked on the Bushfire CRC's HighFire Risk Project.



Between 2008 and 2011 Jason worked as a research associate on the ARC funded project entitled “Analysing instabilities in complex combustion models for different geometrical configurations”. In 2011 Jason was appointed as Lecturer in Mathematics in the School of PEMS, where he works as part of the Applied and Industrial Mathematics Research Group.

Jason recently (May 2017) prepared a report on bushfire standards for the new Gininderry development which attracted considerable media attention such as via the Canberra Times.

Forests, not fuels

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Abstract

For decades, forest flammability has been linked to fuel load – the weight of fine twigs, leaves, and bark in a forest. Accordingly, the paradigm of fuel reduction by burning has pervaded Australian thinking, providing a single answer to every question of fire risk reduction. At its core however lies only a rough theory described by the author as potentially “subject to drastic change as more data becomes available”.

In the 50 years since the publication of this leaflet, peer-reviewed science for forest fires has focused exclusively on West Australian Jarrah, until the publication of the Forest Flammability Model (FFM) in 2016. Unlike the earlier models, the FFM uses a mechanistic approach, mathematically determining the influence of every component on fire behaviour, rather than limiting the drivers to those already assumed to be important. This has the effect of allowing the more influential drivers to become visible. In the first validation of flame height predictions ever performed for an Australian bushfire model, the FFM demonstrated seven times greater predictive power when it considered the species of plants present, compared to using fuel load alone.

The implication of this is that the solution to fire risk is not fuel reduction, but ecosystem management. Different species respond differently to fire, so fire can have positive or negative effects on flammability. Further modelling work using the FFM to predict flammability dynamics is presented, and comparisons are made with dynamics measured from fire histories, demonstrating the need for ecological underpinnings of fire management.

Introduction

Frequent fire is a key threatening process to more than one third of threatened wildlife species, and more than half of the threatened plant species in NSW [1]. Coupled with the impacts of fire and smoke on human life and infrastructure, there is a clear need to understand the factors that drive bushfire risk. These factors can be either external such as weather and terrain, or internal drivers of ecosystem flammability. It is our understanding of flammability that ultimately determines management practice.

The importance of this has been highlighted by the onset of objective techniques for measuring prescribed burn effectiveness. Prescribed burning is the primary tool used to reduce landscape flammability, yet the largest study of it to date found that it was associated with only a slight reduction in wildfire area for four of the 30 bioregions covering SE Australia. In all others, there was either no measurable effect, or it was implicated with an increase in



wildfire. In all areas, prescribed burning produced an overall increase in fire (planned + unplanned), as even in the most effective locations, roughly three ha of prescribed burning was necessary to reduce wildfire area by one ha [2].

Although this technique has weaknesses, such findings suggest that our current approach to managing flammability needs to be improved. Doing so requires a better understanding of what determines it, and that is the subject of this paper.

Flammability

Flammability has three components – the ease and therefore often the frequency at which something can ignite (ignitability), how well it will burn (combustibility), and how long it will burn for (sustainability) [3]. Combining these into a single measure is not straightforward. Is a grassy woodland more flammable because it ignites easily, or is dense forest more flammable because it produces larger flames? Different components of plants and forests also have different levels of ignitability, combustibility and sustainability. Is the flammability of the whole system a sum of its parts, or is it more complicated than that?

The scientific method for understanding such things is to generate a hypothesis or model, then test its predictions against observed reality. A model can vary widely; at one extreme, it could incorporate every possible factor to produce an accurate but unusable tool. On the other, it could be limited to only those potential drivers that are easily-accessed, producing a user-friendly model that is wrong. Somewhere in that range, we could hope for one that is accurate enough to be useful, yet still practical. A scientific approach must however accept that this may not be possible. If reality is just very complex, then we need to adjust to it. In Einstein’s words: “make things as simple as possible, but not simpler.”

Fuel loads

At the core of the Australian understanding of flammability is the concept of fuel loads – the weight of fine twigs, leaves and bark in a forest. Fuel load is a relatively simple thing to measure, although the collection, drying and weighing of fuels is time consuming. The issue has also been confused by debate over exactly what fine fuels should be measured. The traditional approach has been to

limit this to surface leaf litter [4], however some are now adding in the fine materials in low vegetation and bark [5].

The basis for using fuel load is the work of McArthur – often seen as the pioneer of fire research in Australia. McArthur however considered his work to be at an infant stage, and his assertion that fuel load was the primary driver of flammability was based on only nine data points measured in West Australian Jarrah forest, published in a leaflet without the standard quality control of peer-review [6]. As he warned: “...many of my observations and comments are tentative and may be proved wrong or subject to drastic change as more data becomes available” [7].

Regardless of the definition of fuel load that is used however, the implications for management are the same. The greatest weight of fuel is in the layer of leaf litter, and this accumulates over time until eventually reaching a point of equilibrium [8]. Consequently, the flammability of a forest can always be reduced by burning the forest, and this paradigm of fuel-reduction burning has underpinned Australian fire management for more than 50 years [9].

Published science however gives little reason to accept this hypothesis [10]. When McArthur’s experiments in Jarrah fuels were repeated formally, fuel load was found to have no effect on rate of spread, and only a very minor effect on flame heights [11,12]. By this time however, the concept of fuel load had become a paradigm, and such contrary evidence has been widely dismissed.

At the level of management application, CSIRO’s “Project Vesta” found that flammability did not consistently increase with time since fire, but varied between different stands of Jarrah forest depending on the life-history of understorey species [13]. Where this was dominated by a short-lived shrub, the median rate of spread was less in older forests than in regenerating stands. Such findings suggest that prescribed burning could be ineffective or

even counter-productive if applied in stands with an understorey of this shrub.

A methodical approach

Since 2004, the NSW NPWS has worked to both build a model that was not exclusive to Jarrah forest, and to gain a clearer understanding of ecosystem flammability. This required support of a research program involving four universities and the Bushfire Cooperative Research Centre. The model constructed from this (Forest Flammability Model FFM [14,15]) integrates the known influences of flammability into a mechanistic framework, to scale from leaf traits into full fire behaviour.

By considering all possible influences rather than focusing on those assumed to be more likely, the FFM has identified the main drivers of forest flammability in those areas studied so far. The simplest and most significant observation is that flammability is not driven by fuel loads, but by the species of plants present. Large flames only occur when plants ignite (Fig. 1), so the central question in fire behaviour is whether those plants will ignite or not. There are three aspects to the answer for this: *the gaps between plants* (how far away is the plant from the flame?); *the flammability of the plants* (how large is the flame from those plants burning, and how ignitable are the next plants?); and *the sheltering effect of plants* (will the plants overhead slow the wind down?).

All of these factors are affected by the species of plants, and their conditions for growth. For example – the Black Saturday fires in Victoria had the most severe fire weather ever recorded in Australia, yet crown fire was rare in mature Mountain Ash (*Eucalyptus regnans*) forest during that event [16]. Fires are rare in these to begin with because the lower plants have high moisture contents (plant flammability) and the surface fuels are shaded and moist (overstorey shelter). These factors were overcome by the severe drought, but while the forest was then able to burn, the gaps between the lower plants and the canopy were too large to ignite a crown fire.

To test how well the model worked across different forests and conditions, we compared its flame height predictions with the flames that were measured in the Brindabella Ranges during the 2003 fires. The forests ranged from low, dry formations to Alpine Ash and subalpine woodlands, but the FFM predicted the results with an impressive level of accuracy [15]. If it predicted a 10m flame height for example, the actual flame height would be between 10 and 10.4m in height about 50% of the time [17]. For perspective - Project Vesta [18] predictions of a 10m flame corresponded to actual flames of 2.3 to 10m, and predictions from the McArthur Meter [19] corresponded to flames of 14 to over 30m height.

The reasons for this come down to the questions of plant ignition just described. Neither of these models have information on the important drivers of fire behaviour, so both made numerous, large errors (Figs. 2 & 3). When the FFM used only surface fuels, it was only able to explain 11% of the variability. When it included plants and their species-specific traits, it explained 80% - a seven-fold improvement.



Figure 1. Large flames only occur when plants ignite.



Figure 2. Site 94 – a *Eucalyptus dives* forest burnt downhill, with very little near surface fuel. For these reasons, Project Vesta predicted 40cm flame heights. The FFM however calculated that, despite the light fuels, the canopy was low enough to ignite, and correctly predicted passive crown fire.



Figure 3. Site 67 – a *Eucalyptus dives* – *E. dalrympleana* forest with an *Acacia dealbata* understorey burnt downhill and against the wind. Due to dry conditions and a heavy (15.4t/ha) surface fuel load, the McArthur Meter predicted 4.4m flames. The FFM however calculated that given the steep angle of the backing flame, the *A. dealbata* would not ignite. The result was a correct prediction of surface-only fire that killed but did not ³⁸ ignite the wattles.

Forests, not fuels

The implications of this for fire management are significant. As already mentioned, fuel loads in mature forests are heavier than those in recently burnt forests, so if fuel load was the driver, then burning would always reduce the flammability. Plants however have multiple responses to fire. Some are burnt or scorched; others are germinated. Some recover from epicormic shoots along the stems, but others regrow from basal sprouting or seed. Fire may reduce the immediate flammability of a forest, but it also sets it on a trajectory that is determined by the ecology of that ecosystem.

The first effect of a fuel-load paradigm is that the impacts of growing fire frequency on ecosystems are underestimated. Alpine Ash (*E. delegatensis*) forests illustrate how this works.

Like Mountain Ash, mature Alpine Ash forests are unlikely to experience crown fires due to the height of the tree canopies above the ground (Fig. 4). Canopies are however readily scorched and killed, and the species then recovers from seed. If that regrowth is re-burnt before sexual maturity at around 20 years, the Ash trees become locally extinct. The combination of more frequent dry periods where fire can spread, with the advent of massive widespread lightning ignition events in the Australian Alps such as 2003 and 2006 has so increased the frequency of fire in Ash forests that some projections expect a massive loss of the forests this century [20].



Figure 4. Mature Alpine Ash trees are rarely subject to crown fire due to the separation between tree crowns and ground fires.

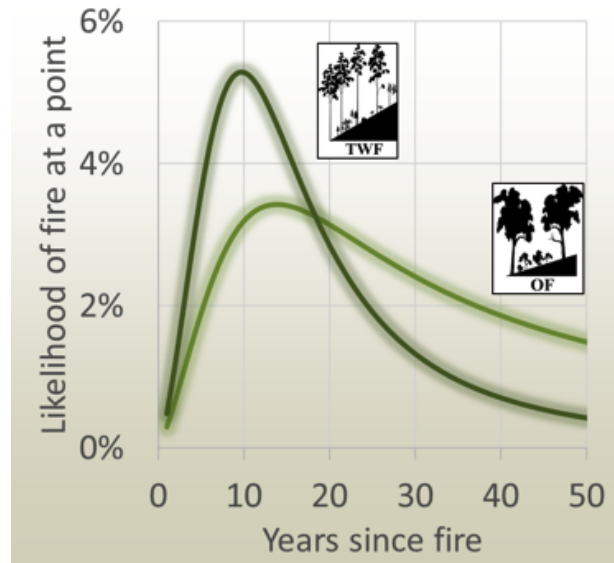


Figure 5. Annual likelihood of fire at a point in Tall Wet Forest (*E. delegatensis* dominant, dark green) and Open Forest (resprouting eucalypt dominant, light green), showing change with time since fire.

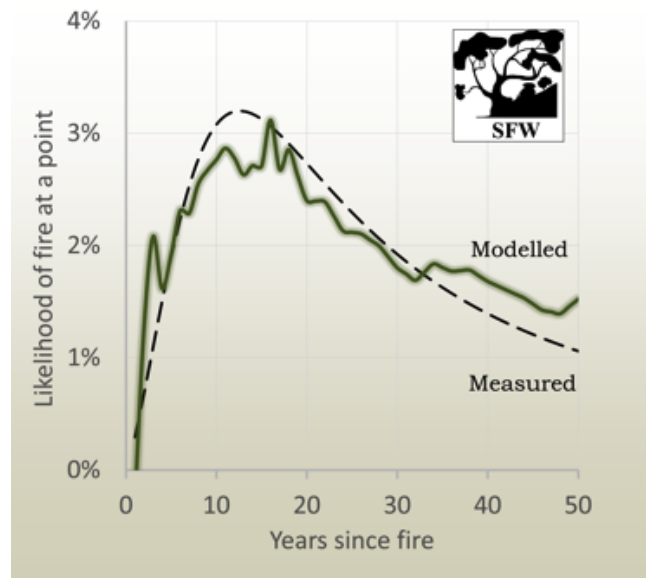


Figure 6. Measured (black line) and modelled (green line) annual likelihood of fire at any point in Snowgum Forest and Woodland, showing change with time since fire.

If flammability was related to fuel loads, then more frequent fire would reduce those fuels and have a mitigating effect on climate change, but unfortunately this is not the case. For the past 58 years of mapped fire records across the Australian Alps National Parks, regenerating Ash forests have burnt more than eight times as often as have mature forests (Fig. 5, [21]). This means that the period when regrowing Ash is most vulnerable to fire corresponds to the age when it is most likely to burn.

More frequent fire therefore creates more flammable Ash forests and increases the spread of fire in the landscape, while causing localised extinctions. But the effect has even

more far-reaching implications. Regrowing Ash forests are temporarily more flammable, but still have the capacity to develop into mature, fire-resistant forests. If they are re-burnt too soon however, loss of *E. delegatensis* as the dominant canopy tree can convert near-pure stands into much more flammable heathland formations. If on the other hand, the forest contains a significant proportion of other tall resprouting species such as *E. dalrympleana*, *E. viminalis* or *E. rubida*, these will gain dominance and the ecosystem will collapse from a tall wet forest of obligate seeders into an open forest of resprouters. This has much longer-term effects on landscape flammability, as the ecosystem loses its capacity to form a fire-resistant mature forest. In the past 58 years across the Alps, mature open forests burnt twice as often as mature Ash (Fig. 5, [21]). Loss of Ash forests represents what is effectively a permanent increase in landscape flammability.

The second effect of a flawed understanding of flammability is that it can drive ineffective management, or even perverse outcomes. If mature, low flammability forests are deliberately burnt for fuel reduction, their natural resistance to fire contagion is temporarily destroyed.

Past flammability trends such as those in Fig. 5 are informative enough to provide broad guidance, but any statistical analysis is limited. The number of mapped fires and level of recorded detail is usually too small to allow an analysis that can reveal details about

- Specific plant communities. Often, communities need to be grouped to provide enough data.
- Effects of different fire behaviours. The angle of the flame, the time that it stays burning in one site and heating the soil, or the dimensions of the flames can greatly affect the impact on the ecosystem.
- Timing of fires. Plants are affected in different ways depending on their biology and the time of year when a fire occurs.

Consequently, these trends are able to provide broad trends regarding the average response of ecosystems to fire, but detailed modelling is needed to see what is hidden behind the averages and understand the details of a healthy fire regime for each community.

By explaining the drivers of flammability, the FFM provides a tool to achieve this. Specific details of plant biology and responses to fire behaviours can be integrated to predict the changes in the community, and these translate into concrete predictions of fire risk. Predictions of annual mean fire behaviour made using the FFM for regrowing Snowgum forest [14] closely fit the measured flammability dynamics [21,22], and with adequate ecological knowledge, these can be re-worked to predict what might occur under hypothetical conditions. Specific prescriptions can be developed to address targeted issues, and as more becomes known about the ways that future climatic changes will affect plant morphology or species' dominance, it will be possible to model this future and plan advanced strategies to mitigate the undesirable impacts.

Next steps

The FFM exists as a software tool, the only peer-reviewed bushfire model for SE Australia, and the first Australian bushfire model to have had flame height predictions validated. Putting it to work however will require investment in software development, collation of species' traits in databases, and integration with vegetation mapping and remote-sensing technology. These are all achievable goals if they are adequately resourced, however there exists a strong culture of conservative fire knowledge in Australia, and this has already resulted in aggressive attempts to circumvent the science and shift the discussion away from peer-reviewed literature. Progressing fire management into a field that is grounded in sound science will therefore also require significant social investment.

Conclusion

Increasing fire frequency alters the flammability of the landscape. If a forest is understood as a collection of fuels that accumulate over time, then the implication is that more frequent fire will reduce the flammability of that forest by limiting the build-up of fuels. If, however, the forest is understood as a dynamic interaction of species with different effects, then flammability dynamics will differ between every forest, and potentially, between different fires.

Some broad trends can be measured to partially explain this, but our response will be increasingly effective the more that we move away from generalisations and embrace the complexity. Our forests are not "the bush", they are ironbark, spotted gum; Snowgum with a *Bossiaea* understorey or one dominated by *Olearia* species. They don't love fire or hate it; they thrive best within specific fire regimes. Such a detailed understanding can only be gained through detailed modelling, and the FFM provides a tool with which this can be done. Further work is needed to put it into practice however, and this includes significant social investment to address the depth to which simplistic views have become entrenched.

Phil Zylstra is a fire behaviour scientist and ecologist who since 2000, has worked within the NSW National Parks and Wildlife Service, and the University of Wollongong Centre for Environmental Risk Management of Bushfires. Pioneering the first model to explain the mechanisms by which species-level plant traits influence fire behaviour; his work has challenged paradigms and provoked fierce controversy, yet remains the only peer-reviewed fire behaviour model for south-east Australian forests. He is a Visiting Fellow at the University of Wollongong Centre for Environmental Risk Management of Bushfires.

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A Victorian story

Philip Ingamells

Victorian National Parks Association
Park Protection Project
Fire Project

Abstract: Since Victoria's Black Saturday fires of 2009, a Royal Commission and a number of other inquiries have produced a wealth of solid research, and many conflicting opinions. Mainly, however, the discussion has focussed on the capacity of various levels of fuel reduction burning to protect the community, and the impacts of those management burns on Victoria's biodiversity. The robustness of that discussion has taken attention away from many other ways to help protect communities. These include control of ignition points through increased aerial attack capability; fire bug surveillance; improved building regulations; the effectiveness of well-designed private bushfire shelters; local power generation; and compulsory evacuation. The appropriate season, severity and patchiness of management burns should also be brought into that discussion. A more strategic policy and planning process, assessing the most appropriate mix of all strategies for reducing the impact of bushfires, region by region, could lead to greater public safety and better outcomes for biodiversity.



Phil Ingamells works for the Victorian National Parks Association on national park management policy and planning, including fire management. He has many years of experience in environmental education, having acted in that role for government agencies, NGOs and privately. He is committed to improving fire management in Victoria to achieve long term biodiversity objectives as well as increased public safety.

The National Burning Project

Deb Sparkes

National Burning Project Support Officer
National Fire Danger Rating System Project Officer



Deb has spent the last two years working with rural fire and land management agencies involved in prescribed burning to help deliver outcomes of the National Burning Project for AFAC and the Forest Fire Managers Group. Alongside that she is currently working in the Program Management Office for the National Fire Danger Rating System. She recently completed her Masters studying Forest Ecosystem Science and is captivated with the links between fire and landscape health. Her current roles draw on a convergence of her previous experiences in project management, stakeholder engagement, professional writing and service delivery.

Abstract: The National Burning Project is a major national collaboration to bring together inter-related aspects of prescribed burning across Australasia to design guiding frameworks and principles for a more holistic and consistent approach to prescribed burning.

Over the years, many enquiries have called for the development of national principles around prescribed burning. AFAC and the Forest Fire Management Group have undertaken to address these recommendations through the National Burning Project, funded through the Federal Government National Bushfire Mitigation Program.

Developing national frameworks and approaches has taken extensive consultation across agencies and jurisdictions and has fostered shared knowledge and networks amongst those that strategise and operationalise prescribed burning objectives. The project aims to aid in communicating these approaches to fire management practitioners and the wider public to gain acceptance of the science and practices that underpin prescribed burning programs.

The benefits of national frameworks and guidelines lie in developing consensus collaboratively, developing relationships, the improved strategies that come from accessing best practice, the ability to align varying approaches, a greater economy derived from using common standards and through achieving improved performance.

This presentation discusses the consultation that has brought together agency staff, not just from the public fire and emergency sectors, but also private enterprises, to produce best practice guidelines and frameworks including:

- The National Position on Prescribed Burning;
- National best practice guidelines for planning and implementing prescribed burns;
- National frameworks to address prescribed burning risks associated with ecological, fuel management, smoke, greenhouse and operational safety issues;
- Training manuals to support a range of prescribed burning competencies;
- Objectives and monitoring frameworks;
- Case studies; and
- Reviews of science, best practice and capability.

Does fire severity matter? Plant responses in montane plant communities after high intensity landscape fires

Michael Doherty



Michael Doherty is a plant ecologist based in Canberra. Born in southern Sydney, he spent much of his formative years botanising and bushwalking in the sandstone country of the Sydney Basin, and graduated with a science degree from the University of Sydney in 1986. For the past 30 years he has worked on a wide range of vegetation conservation and management projects in SE Australia with state and federal agencies and has a particular interest in vegetation disturbance dynamics. Michael is currently finalising his part-time PhD at the Australian National University on the effects of fire on montane plant communities in SE Australia.

Abstract: The 2003 fires in the Australian Alps provided an opportunity to investigate the effects of infrequent high intensity fires on a range of alpine, subalpine, montane and tablelands plant communities, many of which had not experienced significant fires since 1939. Ongoing research on 130 long term plots in the Brindabellas west of the ACT, established before the 2003 fires and monitored after the event, is showing no difference in vascular plant species composition or plant species richness between sites burnt at low severity versus sites burnt at high severity. Although there are changes in plant species richness over time, this has less to do with fire per se and more to do with fluctuations in rainfall. While vegetation structure is clearly different between low and high severity sites in the short term, it is nonetheless returning to its pre-fire state. I will discuss these results in relation to current concepts of vegetation dynamics and to fire management in the Alps.

Is prescribed burning reducing fuel hazard? A case study from Namadgi National Park

Kelly Dixon

PhD Candidate, Fenner School
Australian National University

Kelly has a background in wildlife ecology and a strong interest in monitoring and evaluation of native species and ecosystem processes within protected areas, particularly how monitoring data are used to inform management. Her PhD research encompasses interviews with protected areas staff worldwide, a global online survey, and an ecological case study within Namadgi National Park (ACT) investigating the management action of fire and its outcomes on fuel hazard and biodiversity. Kelly aims to produce guidelines for improving how monitoring data are used in protected area management for biodiversity conservation outcomes.

Abstract: Prescribed burning is used across Australia to reduce fuel hazard in our forests and therefore make bushfires easier to suppress. It is widely assumed that forest fuels continue to accumulate if not burnt and that frequent burning will reduce this hazard. We examined fuel hazard across Namadgi National Park at sites spanning 2 years since fire to >96 years since fire. We found that fuel hazard was highest 6-12 years after fire and lowest >96 years after fire. The likelihood that a forest would support a bushfire that cannot be suppressed in high weather conditions was highest 6-12 years after fire, only slightly lower 2 years after fire and zero 96 years after fire. Our results indicate that maintaining low fuel hazard in Namadgi National Park either requires burning on very frequent intervals (<2 years) or managing a greater proportion of the Park as long-unburnt forest. Any strategy between these options is likely to perpetuate high fuel hazard. The trade-off between burning frequently enough to reduce fuel hazard and leaving landscapes in a higher hazard state until fuel hazard declines is a challenge for managers. At the very least, sites that are currently long-unburnt should be protected from fire.

Bushfire, climate change and water supplies

Ian R. Falconer

Water Quality Consultant

Abstract: The 2003 wildfire burned through the Cotter catchment, and was followed by heavy rain. The consequence was that the water quality in the Cotter reservoirs was far too poor to be treated in the existing drinking water system, and was disconnected. Canberra - fortunately- was able to use the Googong dam as the supply, which had not been burned. Since that time the new Lower Cotter dam has been built at a cost of about \$400 million, much increasing water storage, so that the Cotter now holds 57% of Canberra's water.

With increasing temperatures and more intense rainfall due to climate change, the likelihood of both wildfires and floods in the Cotter catchment has increased, and risk of fires in the Googong catchment.

The Cotter is surrounded by forest extending into NSW, with fires from lightning strikes occurring annually. To reduce risk, the fuel load in the catchment has to be controlled by clearing and burning, with regrowth continually suppressed. Native grassland and eucalypt forest is the optimum combination for water quality, yield and risk minimisation, and this must be the aim for the area. It is critical that drinking water can be supplied, so fire risk must be minimised in any drinking water catchment.



Ian Falconer is a water quality consultant with an interest in drinking and recreational water, and in catchment management. He is also Independent Chair of the ACT and Region Catchment Management Coordination Group.

He has led a Community Fire Unit in Aranda and is a member of Friends of Aranda Bushland, which is concerned over the biodiversity effects of recurrent controlled burns. He will be leading the field trip to Aranda Bushland on Sunday, to see the impacts of burns over the last decade on dry eucalypt forest adjacent to the suburb.

Applying location based analytics and LiDAR to model Bushfire Attack Levels

Nick Lhuede

ACT Emergency Service Agency

Abstract: The ACT ESA has sought to find ways to assist both the community and government in understanding risk and guide mitigation activities for properties at the interface of urban and bushland areas.

Partnering with Esri Australia, a desktop solution was developed which combines spatial data with analytical tools to automate the assessment of the Bushfire Attack Level (BAL). BAL is defined in AS3959:2009 as a way of determining the radiant heat that would affect a structure.

Lidar was used to develop vegetation classification and building footprints to a high level of spatial accuracy. Using geoprocessing tools to measure distance and slope and applying the relevant BAL Table in AS3959, one of 6 categories of Bushfire Attack are assigned.

Over 17,000 properties have been modelled using Automated BAL modelling tool, limited only by the coverage of Lidar and extent of the BPA. A range of different assumptions were trialled and each model run take a matter of hours to process.

Validation of the model was undertaken. There was no difference between the modelled and site assessed BAL values for up to 73% of sites, depending on assumptions. Where there was significant variation, it could be attributed to the judgement of the assessor and the condition of vegetation (managed or unmanaged).

The tool can assist developers and homeowners in assessing BAL and may reduce requirements for site assessment.



It allows the ESA to undertake large-scale assessments of BAL to quantify the impact of policy changes by modelling different options and assumptions.

The information delivered through the tool can guide community awareness and the development of bushfire prevention activities.

Notwithstanding these benefits, challenges remain. The condition of vegetation can have a large effect, and the Automated BAL modelling tool cannot exercise the judgement that a human assessor can.

Nick Lhuede was involved in refocusing fire and emergency management policy following the 2003 Canberra fires. He led the development of the Strategic Bushfire Management Plan, focusing on partnerships across conservation organisations, fire and land managers, volunteers and residents to achieve targeted mitigation strategies in both the urban and rural areas of the ACT. Mr Lhuede has led major review and rewrite of the ACT Emergency Plan in 2012 with a significant focus on whole of government coordination arrangements during emergencies. He is currently working for the ACT Emergency Services Agency.

Bushfire protection and Community Fire Units

Ian R. Falconer
CFU 12, Aranda

Abstract: In New South Wales, Community Fire Units have played a major role in high bushfire areas such as the Blue Mountains, assisting in personal safety and in fire control. These units are recruited from local communities. Since the 2003 bushfires in the ACT similar units have been established here and are equipped and trained by the ACT Fire Brigade. Units consist of about 15 members who are supplied with personal protective clothing and a trailer equipped with hydrant stand pipes, hoses, a fire pump, fire hoes, knapsack sprays and radio communication.

There are currently 50 Units comprising 870 members across the ACT, located in high risk districts on the western edge of the suburbs or close to forested areas. Aranda has 4 units along the edge of the dry eucalypt forest of the Aranda Bushland, which has a history of fires arising from Caswell Drive and Bindubi St.

The role of the Units is to support the Fire Brigade in assisting in personal safety, and suppressing ember attack in a wildfire. This has been the major cause of houses burning down in bushfires, not the actual fire front. Our units can wet down in advance of a fire, put out ember fires after a fire front has passed and extinguish any residual fires. We do not enter houses or attempt to control bushfires. We also ensure that the roadside fire hydrants are fully operational. The units can self-activate if a local fire is seen, and go into action independently if there is no available Fire Service team.



Ian Falconer is a water quality consultant with an interest in drinking and recreational water, and in catchment management. He is also Independent Chair of the ACT and Region Catchment Management Coordination Group.

He has led a Community Fire Unit in Aranda and is a member of Friends of Aranda Bushland, which is concerned over the biodiversity effects of recurrent controlled burns. He will be leading the field trip to Aranda Bushland on Sunday, to see the impacts of burns over the last decade on dry eucalypt forest adjacent to the suburb.

