
COUNTRY IN FLAMES

Proceedings of the 1994 symposium on
biodiversity and fire in North Australia

Edited by Deborah Bird Rose

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The poem 'Firestick Farming' by Mark O'Connor is taken from his collection, *Firestick Farming: Selected Poems 1972-90*, and is reproduced courtesy of Hale & Iremonger Pty Ltd and Mark O'Connor.

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The Biodiversity Series

This is the third paper in the Biodiversity Series, published by the Biodiversity Unit of the Department of the Environment, Sport and Territories. The series intends, for the first time, to collate and make available information relating to all aspects of the conservation of Australia's biodiversity – why it is globally significant, the conservation status of its components, threatening processes, current levels of knowledge, and the adequacy of conservation measures. In addition the series will make available results from selected projects undertaken with the support of the Biodiversity Unit.

The Country in Flames symposium, which was organised by Dr Deborah Bird Rose of The Australian National University's North Australia Research Unit, is one of these projects. The Biodiversity Unit was pleased to support this symposium as it offered an important opportunity to address critical issues relating to fire and biodiversity in Northern Australia. The strong presence of Aboriginal people was invaluable in clearly indicating both the long history of fire as a management tool in the region, and the role of fire as a determinant of biodiversity. The legal perspectives on Aboriginal burning are also timely and important considerations for future management approaches. Clearly, there is a need to develop and maintain good channels of communication. These papers will do much to stimulate awareness of fire as a major tool for the maintenance of biodiversity in Northern Australia, and of some of the critical issues in its management.

In addition to providing support for this symposium, the Biodiversity Unit is funding a number of other projects on biodiversity and fire. These projects, which cover a range of issues, and were supported in order to help fill key gaps in our knowledge, are:

- a two day conference *Biodiversity and fire – the effects and effectiveness of fire management* (in temperate Australia). This conference was held on 8–9 October 1994, and the proceedings are expected to be published in March 1995. It was organised by the Victorian National Parks Association, and funded jointly by the Department of the Environment, Sport and Territories and the Victorian Department of Conservation and Natural Resources;
- research into the long-term effects of repeated prescribed burning on forest invertebrates, being undertaken jointly by NSW State Forests and Macquarie University;



- research into the impacts of fire on invertebrate biodiversity in savanna woodlands, being undertaken by Dr Penelope Greenslade (now CSIRO Division of Entomology);
- a review of the effects of fire on birds in Australian environments being undertaken by John Woinarski of the Conservation Commission of the Northern Territory;
- a synthesis of the effects of fire on plant biodiversity in Australia, being undertaken by Dr Malcolm Gill, of CSIRO Division of Plant Industry.

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Foreword

HC Coombs

The symposium on biodiversity, of which *Country in Flames* is a report, is evidence not merely of the growing importance now being given to that concept in both scientific and policy contexts but is part of a process of growing awareness of the complexity and interdependence of the elements which compose that diversity.

In her introduction, Dr Rose emphasises that every day more is known among scientists in various disciplines, but the lack of effective communication between the specialist groups which compose those disciplines and others whose knowledge overlaps with theirs continues to inhibit the growth of public awareness and of policy necessary to protect biodiversity. That communication failure affects particularly the understanding of the complex inter-relationships between the many species and non-biological elements which make up the total diversity.

This symposium directed attention to the dramatic impact of fire on biodiversity in lands like Australia where fire is a natural occurrence and where it must be taken into account in the social policies of environmental management.

Current controversy about initiatives by the Commonwealth and State Governments to change the emphasis and direction of savanna and forest management adds to the evidence the symposium provides that humankind, as a dominant part of nature, largely determines whether savannas and forests can continue as habitats for a wide range of species (upon which humankind may depend in unexpected ways). In these and other regions on which the economic system makes powerful and continuous demands, it is vital that human behaviour control the impact of those demands and associated pollution: not merely to monitor but to set and enforce effective limits. Growth without limit is as impossible a target as perpetual motion.

Humankind must take note that there are other species which also have had periods of exponential growth in their populations. These populations do not continue to grow: rather in due course they approach a maximum where the population does not just flatten out to stability or decline gently to safer levels but collapses, in some instances into extinction. About two hundred years ago Malthus predicted that if we did not learn to control our population, it would be controlled by famine, pestilence and war. Despite



the horrifying evidence of mass starvation in some third world countries and gross poverty in the 'under classes' of the great cities of the world, of the threat of AIDS, and of wars of every kind in almost all continents, we continue to think, plan and act as if we can ignore this evidence and leave these problems for the next generation.

This collection of papers urges that we must accept fire as an integral part of the Australian habitat; that we learn from Aborigines, from local experience and from the knowledge that science can provide – to live with fire and to use it wisely as a tool in environmental management. These are sound words and the book should be essential reading for policy and decision makers at all levels.

More generally this book emphasises the need to fill the communication gaps among the specialist groups of scientists who hold 'large domains of information' of which policy and decision makers have need, and between the holders and potential users of that information. To achieve this object enormous change is required in the institutions of our society. At present many of those institutions have purposes and agendas which are incompatible with such sharing and thus are inimical to the preservation of the earth as a viable habitat for living things, including humanity itself. Furthermore, those who make decisions for the majority of public and private institutions are committed to these incompatible purposes and agendas and believe themselves to be accountable only within their limited purposes.

The reform of these institutions must, I believe, begin with the members of the institutions themselves, especially those concerned with the accumulation of knowledge and wisdom derived from experience. These institutions constitute the domain of the intelligentsia – independent, responsible and triply accountable: to its own professional standards, to the society within which it functions and to the living systems of which it is a part.

Introduction

Deborah Bird Rose
North Australia Research Unit

'Country in Flames' was inspired by my awareness of the increasing urgency of the need to understand and promote biological diversity, and by my desire to learn more about how biodiversity and fire are related to each other and can be managed together in North Australia. From conversations with ecologists, social scientists, Aboriginal people, lawyers and others, I realised the extent to which my concerns were shared by many other people who rarely get an opportunity to exchange knowledge and expertise with each other, and I decided to organise this Symposium. The Biodiversity Unit of the Department of the Environment, Sport and Territories made a timely intervention with funding and a commitment toward publication.

The Symposium was a public event attended by about eighty people. It was held in Darwin and was organised to coincide with a conference on use and management of fire, organised by the Conservation Commission of the Northern Territory. Invited speakers and discussants represented a range of interest groups: archaeologists, anthropologists, legal people, Aboriginal land owners, fire ecologists and land managers. The whole of the Symposium was taped, and the proceedings are presented here in their entirety. I have edited the discussions to remove a few conversational asides, but I have made no attempt to smooth contention or to reconcile differing points of view. Some of the most insightful statements about the state of Australia's ecosystems and about our social responsibilities toward our world and our future were made in discussions, as participants challenged each other to clarify their views.

Taken together, the papers and the discussions illuminate the paradoxical quality of this period in the life of the nation and the world. In one respect, so much is known by scientists and by observant people who interact with ecosystems that it is no longer possible to say that there is not enough information on which to base the decisions now facing us. In another respect, large domains of information are held by discrete groups of people who have little interaction with each other, so that there is a communication void amongst precisely those people who should be interacting with each other. I refer most specifically to Aboriginal natural ecologists and university-trained scientific ecologists. In yet another respect, considering the degree of agreement about what is known to be happening with Australian ecosystems, there is a lack of communication with the general public. Concomitantly there appears to be remarkably little social action toward containing or



curtailing the spirals of loss which are having such a dramatic and irreversible impact on the present and future biodiversity of this continent.

The main points arising from the day's proceedings can be briefly summarised:

1. The savannas of North Australia are highly flammable ecosystems which have developed over millions of years under the influence of periodic burning. Prior to human occupation of the landscape (now believed to be some 60 000 years, at least) lightning-ignited fires were a natural, indeed formative, part of the system.
2. The controlled use of fire by Aboriginal people has a long tradition in the landscape. This continues to the present.
3. As well as use of fire by Aboriginal people in traditional land management, the controlled use of fire is a vital management tool employed by pastoralists, bushfire control authorities, and conservation authorities.
4. The ecological, social and cultural uses of controlled fire (particularly Aboriginal) are widely misunderstood in the community at large, including the media, who continue to equate North Australian fire management activities (eg fuel hazard reduction) with the potentially catastrophic fires of temperate Australia. This community perception is very far from the truth. Fires in North Australia are grass borne and generally involve little risk to human life, whereas fires in southern Australia have the potential, under severe climatic conditions, to grow into life threatening firestorms raging in the treetops.
5. Changing systems of land tenure in North Australia are resulting in changing legal status of Aboriginal people's right to burn. At the same time, the increasing use of land for conservation and reclamation purposes is requiring an increasingly sophisticated use of fire as a land management tool.
6. Land management involving knowledgeable and controlled use of fire is essential to preserving ecosystem diversity and biological diversity in North Australia. A diversity of fire regimes is best suited to generating the diversity of habitats which enable biodiversity.
7. The knowledge necessary to the creation and maintenance of habitat diversity is local and detailed. Different domains of knowledge notably Aboriginal domains and scientists' domains, approach these issues in different and often complementary ways.

The presentation of papers in this volume follows closely their presentation in the Symposium. The first panel, which I chaired, includes an opening address by Wali Fejo, a Larrakia (Darwin region) man, who took the opportunity to remind us of the important relationship between fire and sociality, and the importance of fire as a metaphor in human culture. The papers address the intellectual history of scientific interest in 'firestick farming' (Rhys Jones); the challenges that management of biodiversity pose for an Australian sense of identity (Tony Press); the centrality of fire for the Yanyuwa Aboriginal people of the Gulf of Carpentaria in their history and memory, their relationships to the dead, and in the complex interlocking relationships and rights among the living (John Bradley); the Northern Territory Bushfires Council's approach to fire management (Russell Anderson); and an examination of Aboriginal people's legal status with respect to burning country (Camilla Hughes). Discussion following this panel focused on relationships between Aboriginal land owners and the Conservation Commission of the Northern Territory and on other aspects of the legal status of various stakeholders' rights to burn or not burn. As evidence of the extent to which the concept of Aboriginal land management, denoted by the term 'firestick farming', has become part of mainstream Australian cultural knowledge, Rhys Jones read out Mark O'Connor's poem 'Firestick Farming'; it is reproduced in this volume with permission.

The second panel, chaired by Kathy Deveraux, comprised Aboriginal speakers. April Bright offered a detailed discussion of her people's burning strategies, types of fires and land forms, and concerns for biodiversity in the Finnis River region of the Northern Territory; Patrick Green spoke briefly to issues of Aboriginal people's attempts to exercise traditional rights to burn in the Kimberley; and Joe Yunupingu spoke of his concerns about improper use of fire, and was especially eloquent on his concerns about the European practice of killing animals for sport as is happening in east Arnhem Land. Discussion following this panel brought out further information on policies and practices associated with Aboriginal burning.

In the third panel, chaired by Jeremy Russell-Smith, ecological scientists spoke to their particular domains of expertise: complex changes in Queensland ecosystems owing to the absence of fire (Peter Stanton); the complex interactions of a range of factors leading to loss of biodiversity in Central Australia and the need to get university-trained scientists in communication with Aboriginal natural scientists (Peter Latz); the effects of different kinds of fire on frillneck lizards (Tony Griffiths); differences between temperate zones and wet/dry tropics, and the importance of maximising habitat diversity (Dick Braithwaite); and the centrality of fire to



management of biodiversity in North Australia, and some of the philosophical issues posed by a realistic assessment of current knowledge (David Bowman). Discussion following this panel followed up some of the regional comparative issues raised by the different papers. In this discussion, too, participants and members of the audience began to grapple with some of the social and philosophical issues facing us.

In the final discussion I invited each chairperson to offer a few comments for discussion, and then I opened the discussion to the whole audience. The conference participants called upon local and national communities to:

- properly address Aboriginal people's traditional and legal rights to be consulted and involved in decisions on fire management programs on public and leasehold lands;
- undertake programs to document Aboriginal people's knowledge of fire as a land management tool, and to provide greater employment for Aboriginal people in land management programs;
- properly address perceived and/or actual deficiencies in current legislation affecting the practice of fire management, for example in the NT Bushfires Council Act;
- properly address the self-defeating 'no burn' fire management practices currently employed by the urban-based NT Fire Service; and
- properly address, through a process of formal public education commencing with the primary school curriculum, contemporary societal misunderstandings concerning burning.

At the broadest level, the issues we face in North Australia are similar to those faced elsewhere in Australia and in the world. David Bowman, in his paper on the skillful use of fire, states (p 107):

In a sense science has met a boundary, as further refinement of ... [scientific analysis] will do little to improve things in the North Australian landscapes. Of course applied research is required to determine what are the most effective fire-management strategies to achieve particular ends, but this is technological rather than scientific research... Fundamentally the problem of how to manage fire to conserve biodiversity is not a scientific matter. The difficult choices regarding what will be managed and what will not, need to be made by society ...

This volume is a contribution from a range of experts in North Australia and is directed toward the nation: the moment is urgent, the knowledge is in place, the decisions are difficult, but there is a wealth of expertise provided there is a national commitment.

* * *

David Bowman kept me on the ball, Jenny Green helped with the organisation, Sally Roberts taped the whole Symposium, Greg Miles assisted ably when the slide projector went berserk, Darrell Lewis attended to innumerable tasks, Jeremy Russell-Smith helped summarise the results of the symposium as discussed above; Sean Heffernan transcribed the tapes, Ann Webb attended to the preparation of the manuscript for publication and assisted with the editing; Jenny Green put the book together, and Neal Hardy provided a range of consultations, advice and assistance. The contributors were eloquent on the day, and most were prompt in finalising their contribution; those who engaged in discussions contributed immensely to the liveliness of the Symposium. I thank them all for making possible this timely, empirical, detailed, impassioned, multi-voiced book.



Welcome address

Wali Fejo

Larrakia spokesman, Nungalingya College

It looks as if everybody's all fired up! I'm just one of the many of our Larrakia speakers and so, this morning, I'm privileged to be here. And thank you for the many who've come from different States. You've come to this place, the Larrakia country setting for this symposium and the weather's just what you want it to be.

My nickname, one of many, that my parents gave to me was 'firebug'. Of course, already you know what it's all about. I just loved playing with matches until I burnt the mosquito net and that stopped it.

For us as Larrakia people, and I think it is true of other Aboriginal people, the fire has great meaning. For us here it meant when we needed to call our people for various ceremonies we'd light a big fire. Today, you pick up a telephone. And telephone cost money. But we were able to just collect wood and make a fire and everybody knew that there was a calling for a special time. And that related to others to get the message across to be able to come and have the ceremony and meetings. With a special place! And it was a controlled place where the fire did not get out of control.

Larrakia land is a very special land. I think as you would want to express it in your own terms of where you come from, your homeland's very special. This country means a lot to us. As we say thank you for you coming and having a time of this 'explosive issue' we're asking that you be cool. We're asking that as you debate, as you talk about it and even have a good hot argument – be cool. Because when it's all said and done and you go home, we Larrakia cop the flak. And we don't want that! We've got too much of that! You take back some of your own flak with you. And if need be, you make your little fire at home.

As given to us as we grew up as children of the Larrakia people, it was around the fires at night that many, many of the things of reality became meaningful. There was dance! There was song! There was story! And one thing that interests me all the time is I like to watch the shadow of the storyteller as the fireflames flicker up, up into the trees at night. It's good. Because there my imagination just runs away from me.



Stories, dancing and songs came about because it was life, it was meaningful. There was good laughter. And today you've got to get entertainment just to have a bit of a laugh, hey? You've got to pay for it too! And some comical person will get up because they had some special kind of intrigue that they thought they could relate to others, and doing that they made their dollars.

Round our campfires we enjoyed laughter. Laughter to the extent that you almost cried. Hey, when did you start laughing so that tears ran out of your eyes? Not seldom? Just recently? Last year? Not ever? You're missing out somewhere!

With that part of joy, that laughter, that good feeling, the fire also brought to us the warmth when we slept next to the fire. Just so the cool of the evening didn't dampen too much of the things. That's why many of us have burns. Because of being too close to the fire.

I wanted to go to my uncle on the other side and we had a big fire. The ashes were there but the live coals burning were still there. I was just crawling. And so in my determination I said to myself, 'My uncle's there, and that's the direction I'm headed for.' I went through the fire. I have a big scar on my leg. That's going to last for a lifetime. But it cautions me every time now, tells me a couple a things that's very vital important. Not only don't go and step into fire, but also that you can control it.

And as I look at my left leg and my little stubby toe without a toenail I laugh to myself sometimes. I can see part of the funny side of life because as I grew up I was too ashamed to wear shorts. Not that I got bony legs. I got beautiful legs! Come on! (laughter from audience) It's just that I had a scar there that I just didn't want anybody else to see because having scars you felt, you know you're way out. You're not somebody. A drop out. Those terms you know. You just don't fit in. But I've got long ones on today because it's a bit cool in here. A few time I've come to this place and it's always cold but seeing your issues for this day, you're going to be warmed up.

Fire brought to us the means by which we can bake, cook, bake and eat our food. So, there was firewood to collect. Each one of the families had their designated calling and their work to do. So, they collected the firewood and were able to have, yes, stew and rice, damper, tea. Well, you know, all those things that you have today, but you put it on a stove, don't you? Turn on the electricity or light the gas.

As we look back in relation to the meaning of fire for us, it cautions us that it needs to be in control. It cautions us because out of control it becomes damaging, threatening, destroying and could cause death. But we'd like to

harness that natural thing, give it meaning. Keep it right where it is, in control:

Some of the things that have happened in the past to the Larrakia people have been fires out of control. Many of our people in the past died because of the influx of people outside of the country. Devastation, not only because they were poisoned, shot, raped, but also the flames that came our way were destructive. You see, today, we are still building our fires. We are still calling our people to come together. For as you come together, at this time, it's for a great and real purpose. And as you share together and talk together you're going to get to know each other a little bit better. I mean just eardropping this morning I heard a lot.

I'm grateful then for this special kind of coming together that's here in Larrakia country. And as one of its many spokesmen, I welcome you. Usually our way is with dance and song but, you see, some of the fires that were out of control destroyed some of those things that belong to ours. We're starting to build up a new flame. A fire that's controllable. To bring warmth to people of all races, to begin to appreciate that you can control the flames.

I like your theme and the program – country in flames. To me at the back of my mind it tells me a little bit politics but, you know, that's no worry to you guys.

The flames I feel here need attention because of the diversity of people who come now to have a look at the things that are really destroying not only plant life, animal life, but the environment as well. Keep that fire in control.

May our ancestors' spirits be with you, guiding you, helping you, opening your mind, helping you to speak but also understanding each other in your diversity. May the presence of our Larrakia people who are still alive feel with much depth things that you will be talking about as part of what's happening to them. And our creator God, who gave us all things to enjoy, walk with you today. Thank you very much.



Mindjongork

Legacy of the firestick

Rhys Jones

Research School of Pacific and Asian Studies, ANU

The title of my talk is from the Gidjingali language, which is spoken at the mouth of the Blyth River. The term *Mindjongork* means 'a wild fire'. The other part of the title is a reference to a paper which was published exactly twenty-five years ago. It was in *Australian Natural History* in September 1969 and I called it 'Firestick farming'. That title has been used sometimes with inverted commas and sometimes with an ascription, but I am very pleased to say that it's actually slowly becoming accepted and it hasn't got the inverted commas, for example, in Russell Braddon's wonderful book about Thomas Baines, the artist on the North Australian expedition in 1855 to 1857, talking about the Victoria River. 'It was for the natives a time of plenty' is what Braddon says. 'The time also when they practised the firestick farming, that is as old as their rock paintings which were older than the pyramids.'

Very recently there has been a book of poems by the Canberra based poet, Mark O'Connor. It's called just 'Fire-stick Farming' and if you like I'm quite happy to read the poem at the very end of the session (see page 57). It is very interesting the way in which what was, initially, a scientific idea has drifted into a much broader philosophical concept.

I will go back to a period of twenty-five years ago that was at an initial stage in the development of our knowledge of Australian prehistory. There were about eight or ten dated sites in the whole continent. My firestick farming paper was written about four or five years after John Mulvaney had initially discovered radiocarbon dates beyond 10 000 years BP. But what was very interesting is that even at that stage questions were being asked. As soon as you started to 'discover the ancient history of people on this continent' there were fundamental questions to be asked about the nature of the relationship between people and the landscape.

In 1969 there was an idea of 'the natural landscape': that Australia was a 'natural place'. Part of that idea of a 'natural landscape' is Aboriginal people. If you look at, say, the iconography of paintings of Sydney Cove in the late eighteenth century – lithographs – there's a picture of the 'natural landscape' with all the rocks and the rock shelters and trees, the banksias and so on. In the middle is civilisation which has been built in George Street. And then



somewhere to the side, watching it, uncomprehending, and it depends how sympathetic the artist is, there are a couple of people with spears. They are looking, and they are placed among the *Banksia* trees. They are part of nature. And here is culture being placed upon this land.

My first professional archaeological work was done in Tasmania. And for me one of the turning points of my professional life was the ANZAAS Conference in 1965 in Hobart. There were several marvellous papers given at that conference and one was by a person called Joe Jennings, who's a geomorphologist. His paper was called 'Man as a Geological Agent'. There was this idea that there was geology, the natural world. To what extent have humans interacted with the landscape? And Joe began the talk by dismissing the first 99.9% of human life, and he talked only about agriculturalists. In fact, it was a very fine paper because he wasn't just talking about the western world or the industrial, he was talking about early agriculture in New Guinea. He was talking about deforestation and so on. And his view was that humans had a very large impact upon the landscape and that this impact only started with farming.

At this conference a second paper was given by Bill Jackson who later became the Professor of Botany at the University of Tasmania. His paper was absolutely brilliant, and what he talked about was how to explain the floristic diversity of western Tasmania, particularly the relationship between so-called rainforest (the wet sclerophyll forest) where you have eucalypts on top, and you have rainforest forms and heaths underneath. He had this very complex mosaic and he showed photographs, some of which had been done by the Hydroelectric Commission and, of course, that was the great debate about the damming of Lake Pedder which was about to occur. This was the land he was talking about. And what Jackson said is that you could only explain this diversity through one factor and that is the frequency and intensity of fire. He also said that in his opinion this was not just a natural regime, but that what we were looking at in western Tasmania, particularly on the coast of north-west Tasmania, was a legacy of a major impact of fire-induced vegetational diversity. And this itself was the result of, and could only be the result of, not natural forces but human forces. In other words, that the Aborigines in the late 18th century and really from post-glacial times onwards, had themselves, through the use of their firesticks, affected the land so that this landscape was not a natural landscape. It was, to some extent at least, a cultural landscape.

That paper was probably one of the most important papers that I ever heard and later Jackson developed his ideas which contain two very simple concepts but, I think, very profound concepts: you could only explain the present day distribution of floristics in Tasmanian forms with two factors. One was the frequency of fire or, more sophisticatedly, the probability that a fire will occur in any one place. The other was the intensity of that fire. So, you have the intensity on one axis and you have the probability of a fire occurring in any one place on the other. And you look at these two axes and you can then see a whole fluid set of successions as you change along these two axes. You can go from one set of floristic associations to others. And within this nexus of those two axes, of course, humans are present or, at least, have been present since Aborigines first arrived on this continent.

Now, that paper stimulated Betty Meehan who was at that time writing her BA Honours thesis. At that conference we also learnt about the journals of George Augustus Robinson, which had not been published at that time. We had access to the manuscripts of Robinson's journals, and they contained another revelation. Because, here was Robinson in 1829 and 1832 actually walking along the west coast of Tasmania recording the landscape he was observing. This was detailed stuff, day by day observations. The landscape he was observing was utterly different, utterly different from the situation if you and I were to go to western Tasmania in 1965 or 1967 or even now. To go to places like Point Hibbs, for example, south of Macquarie Harbour, would take you days, quite literally days, to walk two or three kilometres, through dense ti-trees, huge high *Banksia* growths and so on. It's very dense country. And, in exactly the same place, Robinson observed open sedgeland, basically, and he also observed the Aboriginal people with him with their firesticks, applying the firestick to little bits of bush. Indeed, this was not just randomised, as Mervyn Meggitt once described Aborigines, 'peripatetic pyromaniacs'. But the Aborigines who, with Robinson, were walking through little groves separated by open country, they not only applied the fire to the open country but they also tried to put the fire out as it got close to the groves. And Robinson actually makes the statement that this was a landscape formed, in some ways, by them.

There is the very famous quote by Thomas Mitchell which I probably don't have time to quote in full. In 1848 Mitchell, going across western New South Wales, said: 'Fire, grass, kangaroos and human inhabitants seem all dependent on each other for existence in Australia. Fire is necessary to burn the grass and form these open forests in which we find the large kangaroos.' And so on. He then says the fires are applied in certain seasons.



Some of the more perceptive of those first European observers in the landscape saw that landscape to be intimately tied in with what the Aboriginal inhabitants of that land were doing to it. It's also very interesting that some observant people also noted that there were great differences once Aborigines had left that country. For example, Mrs Louise Meredith, a very interesting poet and ecologist writing in 1840–1845 in eastern Tasmania says: 'I don't understand what's happened!' When Charles Meredith, her husband, first arrived here she says: 'Look, this open parkland. This looked like a great romantic English scene, like a great park with these trees and open country. Terrific! And now, look at it! Terrible bloody stuff! Thick bush everywhere and these terrible fires coming through every now and then.' And she makes the comment that what has happened in this part of eastern Tasmania is that the Aborigines had stopped burning and she was now observing thirty years after the event. And she observed a great change.

In this paper 'Firestick farming', I was thinking about what was happening in the so-called Black Friday, you know, those great fires in Victoria. This huge catastrophic thing, or even the fire in 1967 in eastern Tasmania. The energy equivalent of atom bombs is involved. Let's take the case in Victoria: the fuel load had so accumulated through a fire suppression policy that when the fire did go off it went off with explosive force.

The point about calling the paper 'Firestick farming' was not entirely innocent. I am an archaeologist, and my thinking is archaeological, and in the thinking in the late sixties there was a great debate about 'farming'. 'Farming' was seen to be the landmark of the neolithic (which is actually an archaic term which means 'ground stone' as opposed to just flaked stone which is palaeolithic). This has been the great divide in human history: on one hand, the neolithic, the farmers, the people who use the landscape, who affect the land and are civilised. On the other hand, you have the palaeolithic, the hunters or people who have no impact upon the landscape. They were thought to be almost irrelevant to the landscape.

Then there was the whole idea of botanical succession following the last ice age. I had the idea that through fire people were suppressing the succession of some species. In other words, that in Tasmania they were knocking off these 80 metre trees so that they could actually encourage the fire weeds, for example, bracken fern. They were disturbing the soil, they were getting sunlight into the area so that they were, in fact, increasing the food they as hunters could obtain. So, when I use the word 'farming', it isn't just a tongue-in-cheek term. I meant to indicate that through the use of fire people were affecting the land in such a way as to increase the food available to them.

One thing which I'm happy to talk about later because I don't have time now, is that this whole issue of affecting the landscape is very deep in western ideas about ownership of land. You don't have to go any further than John Locke's famous two treatises on government which form the basis of our ideas about ownership of land and connect that to 1970, when Mr Justice Blackburn was presiding over the famous Yirrkala case which revolved around the issues of whether Aborigines actually own land. The discussions went right back to Locke, right back to 1860, straight back, there were no short cuts. It went straight back to Locke. And Locke said that as much as a man tills, plants, improves, cultivates and can use the product of land, so much is his property. And the distinction is made between the person who changes the land and the person who uses it. The ideas were coming from North America, the Mohawks and Iroquois and so on. Locke says that where somebody, for example, grows fruit and consumes it, of course, the fruit is their property but they don't actually own the tree. If you get a fish, you eat the fish, of course, that's your property but you don't actually own the river. You could only own the tree if you use your labour. In other words, if your labour affects the land, that produces a form of ownership. It was in that sense, according to Mr Justice Blackburn, that Australian Aborigines did not own land. Hence the term *terra nullius*, which in Latin means land belonging to nobody. It does not refer to unoccupied land. It refers to land that nobody owns.

I thought that the ethnographic evidence and the ecological evidence were quite contrary to that. I thought that through the firestick, people had affected that land. They had formed, to some extent, that land through their interaction with that landscape. I'm not saying that it's a perfect interaction with the landscape. I am saying that through the firestick, people actually formed the land which they were in. The land was not *terra nullius* in the sense that Locke and Blackburn intended. As a side issue I think it's very interesting that Eddie Mabo came from that one tiny part of the present Commonwealth of Australia which was actually occupied by gardeners. You know, these people are Papuan gardeners and, perhaps it's too difficult to discuss these days because there's so much politics attached to any discussion of these issues, or any dissenting view. But it is interesting that the Mabo case was in that part of Australia that was occupied by gardeners, and I still wonder – had the test case been a place occupied by hunters and gatherers, would you have had the same result? Would you have the same sort of arguments?

It is interesting that my ethnographic encounters with people came after I had written about firestick farming. These papers were written before I was



lucky enough to spend about fifteen months with Betty Meehan with the Gidjingali people, on the mouth of the Blyth, hunting. As close to hunting and gathering as anybody European is ever going to do in the last part of the 20th century. Between 1972 and 1973, for fifteen months solid. That was at the very beginning of the outstation movement and people were back in the country. They'd left the country in about 1957 and until 1972 they went back just for holidays. But now, they were actually occupying it on a continuous basis, and Meehan and I were able to document what people did every day. What was very obvious was that fire was used in a quite systematic and continuous way, and from our records, there were only about two months at the height of the wet season that fires were not lit. And sometimes there might be 20 or 30 fires lit continuously on this land.

The speaker before me [Wali Fejo] talked about control of fire. In the Gidjingali language, people distinguish between domestic fire and other fire, and of course firing was not a random thing. The firing often occurred very early in the dry season. In general, the fires were controlled, and people knew there was a wind shift coming on. There's a north-easterly wind here. So, they'd set one fire and they'd know that the wind would be changing in the afternoon and would drive the fire out. People were very careful when there were things like bone poles – carved wooden containers holding bones of deceased people – in the landscape. They used to burn around the bone poles to make sure these were not burnt. We also observed areas which we call 'the jungles' which have vine thickets and often lots of yams and other foods. These are often places where ancestral spirits are believed to exist. For these and other areas, we observed very hard-edged decisions being made to stop the fires burning into those places.

After the 1972–1973 period, Chris Haynes, who was a forestry officer in Maningrida, wrote a very fine series of papers which gave some of the ecological background to the fire regime which he observed. It is paradoxical that he was at that time initiating a fire suppression policy in order to maintain the *Callitris*. But he then found out that having the fire suppression policy meant an increase of fuel. When the fire went through, it burnt the trees which had survived, say, during a hundred years of the Aboriginal regime. And Aboriginal people used to say to Haynes: 'What are you doing? Listen, you want that, do you want that tree? What are you doing? Why did you? You're an idiot because these flames are as high as this roof.' And then Haynes had his own Damascus change. What he found, so he said, was that he was actually an instrument of the destruction of the *Callitris* in the area between the Blyth and the Liverpool Rivers.

Fires were systematically lit by Aborigines and were an integral part of their economy. Their firing massively affected the land. And this presents an important question. What do we want to conserve? We've got a choice. Do we want to conserve the environment as it was in 1788? Or do we yearn for an environment without humans as it might have been sixty or more thousand years ago. If the former, that is, as it was in 1788 at the time of contact, then we must do what the Aborigines did and burn at regular intervals under controlled conditions. The days of firestick farming may not yet be over.



Fire, people, landscapes and wilderness

Some thoughts of North Australia

*Tony Press
Australian Nature Conservation Agency*

Introduction

There are many similarities in the papers that Rhys Jones and I are presenting at this forum. Rhys can take most of the credit because much of what will be said was raised by Rhys some 25 years ago.

Earlier this week I was listening to David Malouf speaking of the need for a form of Australian studies to be taught in schools. I agree with Malouf: the need to explore Australia and Australianness should be pursued in schools and among all walks of life. In recent debates on, for example, immigration, everybody proffered singular views of Australianness. In this room are indigenous people of Australia who have quite different feelings of Australianness than I do; different too than those of David Malouf or Geoffrey Blainey.

What has fascinated me about these discussions is that in the 1990s, Australians appear to be insecure about themselves, their place in Australia, and their knowledge of what Australia is. I thought, when I was at university, that by the time I reached this age Australia would have a stronger sense of identity than it had in the streets of Sydney in the 1970s – but I don't think it has.

One of the things that we are attempting to do here today is to tease out in a very concentrated way some parts of those issues about Australia and Australians. Some may dress it up as anthropology, or ecology, their own personal views about the fire. Whatever it may be, it is part of this process of trying to understand where we and other people fit into the world.

I was originally asked to talk principally about fire in Kakadu but I am not really going to do that. Most of the things I am going to say have a general application across all Australian landscapes, particularly those of North Australia. There are people in this room who know a lot more about the intricacies of fire management and ecology than I do.



What I want to do is explore three themes. The first is 'fire and the landscape'; the second is 'people in the landscape'; and the third 'wildness and wilderness'.

Fire and the landscape

The scientific tradition within which I was taught and in which I have worked half of my life is generally most comfortable exploring cause and effect; teasing out correlations; erecting hypotheses; doing experiments; knocking hypotheses down; and writing learned papers. Description and speculation have their role in this scientific tradition but they sit uncomfortably to one side of the main game: speculation is variously shunned, vilified or in some cases fetishised, while back in the mainstream, 'real' scientists do 'real' experiments.

One of the good things about this meeting is the chance for scientist and non-scientists to throw around some ideas and test each other out. There is nothing wrong with the scientific tradition: it has got us a long way; we know a lot more now about fire in the Top End than we did 20 years ago. But to the outsider, to those who know very little about scientific efforts and tradition, the speculations of scientists regarding fire provide a baffling cacophony of different ideas, contradictions and 'facts' which people find very hard to digest and make sense of.

One of the things that is often raised, and was alluded to by Rhys, is: 'if it wasn't for fire the whole of the Top End of Australia would be covered by rain forest'. Some people believe this, and it has entered the lingua franca of some local tour operators.

Rhys Jones's original construction of firestick farming was profound, but based essentially on speculation. After 25 years of discussion, much of what is said on this subject is still speculative, although some of it is well and reasonably argued. What we do know is that Aboriginal people do use fire, did use fire and were using fire in the millennia before the arrival of the Macassans, Ludwig Leichhardt and Captain Cook. We know also that vegetation has changed significantly over the past 50 000 years. We know also that the climate has changed dramatically as well.

When we look out the window this afternoon we will see the grey and orange sunset, smell the smoke and know we live in a fire prone environment. We know that some species of plants and animals are sensitive to fire and will become locally extinct through the effects of fire and that the distribution of some plant communities can be changed by fire. Some species are favoured by fire and some disadvantaged.

What we do not know is that humans were directly responsible for gross changes in vegetation associations. It is much more likely that it was climatic change that drove gross regional changes to vegetation. Humans as a contributing factor adapted their lifestyles to the new environments and changing climate and helped produce the landscapes we see today.

Even if we could stop humans causing fire in the landscape, the very climate that we have now – the wet/dry tropical climate with intense annual periods of drought for half the year – would prohibit the spontaneous generation of a rainforest. I could spend a lot of time fossicking through various theories about whether the vegetation associations of the Top End are driven by water or by drought. In summary, it is my view that they are driven by drought and not rainfall. Even though the wet season rainfall is intense and spectacular, for half the year there is no rain at all. For the plants and animals sitting on laterite in the shallow soils of the Top End, it isn't the rain that they get in the wet season that affects the distribution of those species, it is the intense drought of the dry season.

People in the landscape

I think human beings have a very stubborn habit of considering that what they see around them today is what has always been.

Today's generation of children will be the first, with the marvels of technology, to be able to historically document their world. They will be able to see that the world that they live in isn't the world that their parents remember and grew up in. I think that this is going to have a profound effect on the way we look at issues like landscape in Australia.

Recent research has shown that Aboriginal people were in Kakadu 60 000 years ago. If 60 000 years is a provable date, then, by all probabilities, Aboriginal people occupied the landscape tens of thousands of years before then. When Ludwig Leichhardt came down the gorge near Jim Jim Falls and headed toward the coast through what is now Kakadu National Park, he found the landscape populated with a prosperous people. What he saw and what he had been travelling through in his entire journey was a landscape that had been fashioned as much by the hands of those Aboriginal people he met as by the forces of wind, spontaneous fire and drought.

The flora and fauna of Australia at the time of European colonisation was either there because of, or in spite of, the hunting, gathering and social practices of Australia's Aboriginal occupants. The landscape and its contents are partly a cultural landscape: one of the immense privileges of living here



in Northern Australia is that most of that cultural landscape is still largely in place along with its associated flora and fauna.

Last year I drove through the Kimberley and its 'sense of place' was powerful. For me, this compared to the first time I saw Mt Brockman over the savanna, or Jim Jim Falls, or travelled for the first time through the South Alligator River valley. This sense of place is somewhat ephemeral and difficult to define, but for me at least, it relates to the cultural features of the landscape as well as the natural features and flora and fauna in that landscape.

One of the things that fascinated me about travelling through the Kimberley was what seemed to me to be a conscious effort not to recognise Aboriginal people in that landscape. In what appears a denial of its Aboriginal heritage, Aboriginal place names are not apparent and tourism maps for the whole region use them sparsely. Although I was driving through this fantastic cultural landscape (one of the most beautiful drives in the world – I think as beautiful as the Rockies), I felt that Aboriginal people were being left out of the equation.

The more I learn about the natural environment, the more I am interested in its cultural context. One thing that is certain is that fire was and still is an important component of the ecological, geomorphological and cultural landscape.

Wildness and wilderness

I want to finish by talking a little bit about wilderness. In the ongoing debate about nature conservation the issue of wilderness has been both controversial and confused. The reason I raise this issue is that I believe that the ongoing conservation of flora and fauna in the wet/dry tropics requires the *active* management of, among other things, fire.

In the debate over wilderness there is confusion between nature conservation and recreational values; that nature conservation benefits by the declaration of wilderness is, essentially, opportunistic: an area does not have to have any special biological value to be wilderness, and conversely, wilderness does not necessarily contribute to the overall conservation estate. We should be very clear on this. We shouldn't mix up our efforts to sooth heart and soul by providing places where we have a wilderness experience and equate that with doing a good job to preserve the environment and biodiversity.

Similarly this discourse regarding wilderness has been often mistakenly or inadvertently contemptuous of Aboriginal aspirations. The classic North American notions of wilderness are fashioned out of a notion of landscape

devoid of human beings and their artefacts, a landscape that is left to itself to be managed, or should I say left to manage itself.

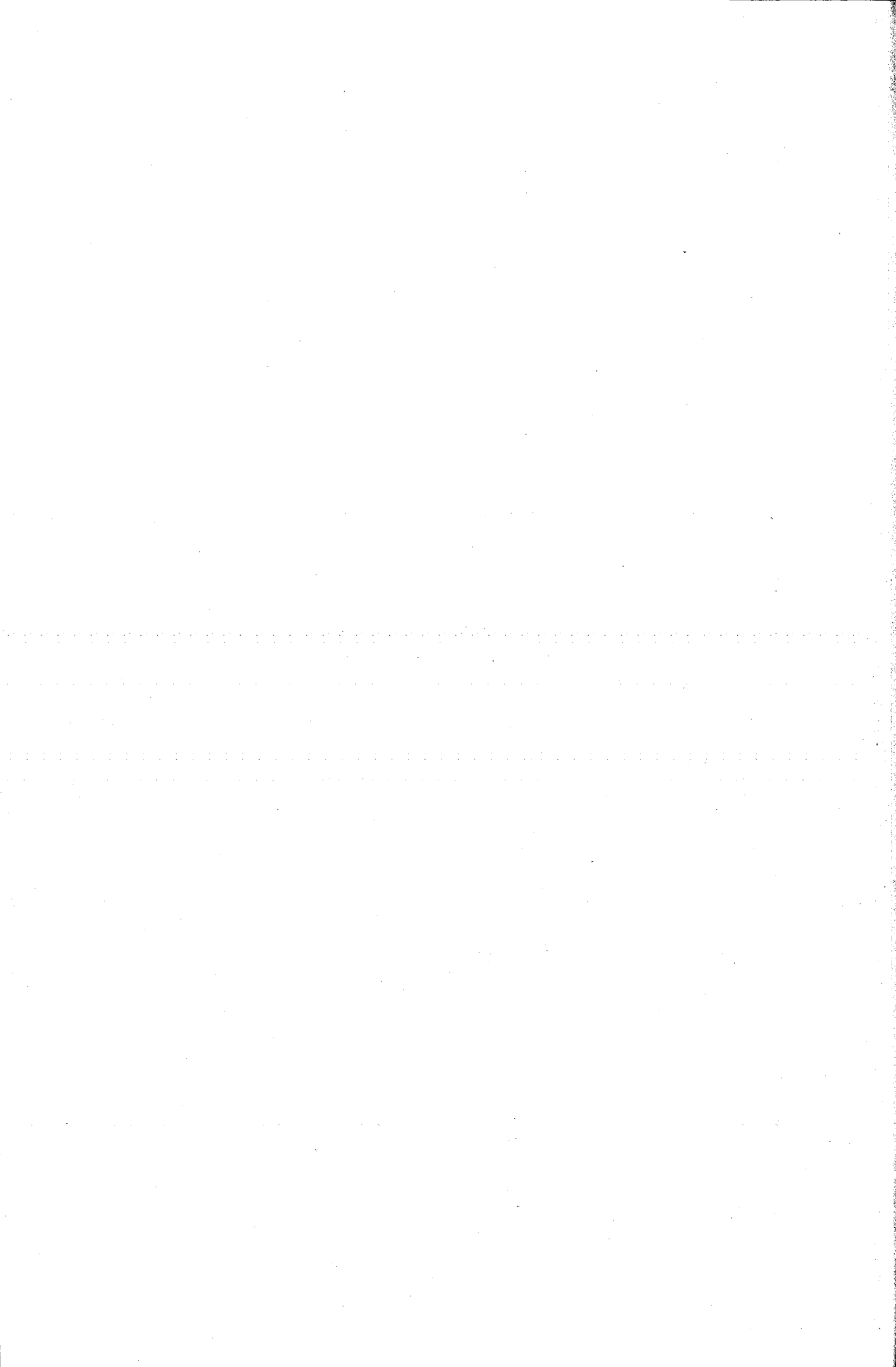
This view has pervaded Australian attitudes to wilderness and it is essentially a racist viewpoint derived from a period of American history that saw European settlement in the wild west in a landscape in which indigenous Americans had been driven out by disease, force or slaughter. Like Australia, the wild west was not *terra nullius*. When the first white man got into the wild west it was not empty. What was there was a cultural landscape that lasted for only a short time before conquering Americans occupied that landscape.

Australia, for the most part, is no different: there can be no part of the Australian mainland or Tasmania that has not manifested the results of Aboriginal stewardship, at least as close as the last century.

The irony is that the further that one goes from the obliteration of that stewardship in the cities and large towns, the closer we get to the managed landscape, the visible manifestation of Aboriginal ownership. Travel through Central Australia to Uluru: the Pitjantjatjara and Yankunytjatjara people of Central Australia haven't really left that part of Australia, and that landscape is as much a managed landscape as the market gardens next to the airport in Sydney.

I will finish by saying that fire is probably the most visible expression in the landscape of Aboriginal land management: fire is an essential ingredient in the proper management of flora and fauna in Northern Australia.





Fire: emotion and politics

A Yanyuwa case study

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In this paper I wish to briefly discuss some other issues, some other responses which are associated with the use of fire by indigenous people. I wish to move away from the concepts of fire as a tool by which people care for country, and of the biological implications associated with this burning, and seek to explore some of the responses associated with the burning of country, as people observe smoke rising in the distance or as they seek to prepare for the coming burning season. In some instances the responses are quite evocative, while at other times, depending upon circumstances, the responses to the burning of country and burned ground are highly charged with political argument and accusation.

The literature on the indigenous use of fire contains little which speaks of personal and group response to the burning of country except in passing, and yet fire is a social and cultural power as well as a biological and physical power.

This paper is a case study of the Yanyuwa people, who inhabit country in the south-west Gulf of Carpentaria, including the islands of the Sir Edward Pellew Group. Today most of the Yanyuwa people live in and around the town of Borroloola on the McArthur River.

1 This paper would not have been possible without the support of the Yanyuwa community over the last 15 years. In particular the following people have been very important in regard to the information recorded in this paper: Eileen McDinny Manankurrmara, Dinah Norman Marrngawi, Roddy Harvey Bayuma, Jemima Miller Wuwarlu, Annie Karrakayn, Mussolini Harvey Bangkarrinu, Pyro Dirdiyalma, Dinny McDinny Nyilba, Steve Johnson and Johnson Timothy Rakawurlma. The following people are now deceased and I record their names not to offend, but in memory of the work that we did together and of their prodigious knowledge about their country and Law: Ida Ninganga, Nora Jaldirduma, Bella Charlie Marrajabu, Don Miller Manarra, Old Tim Rakawurlma.



Emotion: the individual response

During times when I have been travelling over the coastal and mainland country of the Yanyuwa people, they will give resonance to the country by recalling past events which have occurred on that country. Once when camped on Kangaroo Island, which is formed by the delta of the McArthur River, smoke was observed rising from the islands which lay to the north, and one of the elderly women present spoke in raptured and passionate tones concerning the viewing of the smoke rising in the distance. She stood up, and looking north to the billowing smoke, she exclaimed, partly to us, and partly as her own personal commentary:

*Oh, all of the islands, they would once be burning, from north, south and east and west, they would be burning, the smoke would be rising upwards for days, oh it was good, you could see the smoke rising from here and also from Borrooloola, you knew where all the families were, it was really good, in the times when the old people were alive.*² (Ida Ninganga 1986)

Smoke provides for people a way of seeing that the land is still being cared for, it tells people that there are other people who are moving over the landscape and that by the use of fire they are maintaining the integrity of the landscape and the people associated with it. As Jones (1975, 25) comments in his work with the Gidjingali who live on the northern coast of Arnhem Land:

...far out to the southeast, the horizon would sometimes fill with smoke haze, and people would point to it and remark that Djingang men or even the further Ritarrngu were moving across their countries.

In 1992 the sight of burning country managed to draw peoples' attention and arouse comment which was derived from a pure emotion. The following comment came during the concluding moments of a land claim held over the Sir Edward Pellew Group, during which the Yanyuwa had travelled to the islands and burnt the country as they travelled from island to island. On the final day a woman stood up in the boat in which she was travelling, and with the assistance of two other women the following statement was exclaimed to the others travelling with them:

Look all around, this is Yanyuwa country, these islands and this sea it is Yanyuwa country. Look! All of you, look to the distance, look north, look east, look west, the islands are burning, this is how it should be, this is how it was when the old people were alive, look this country is burning it has been lifted up, we have embraced it again. (Dinah Norman Marrngawi, with Annie Karrakayn and Bella Charlie Marrajabu)

2 The statements have been translated from Yanyuwa; a number were reconstructed for me by the speakers just after the event, while others were written down immediately in the field and others have come from taped interviews.

The above two examples highlight that for the Yanyuwa, the often 'taken-for-granted' fire, smoke and burning of country can arouse emotion, set memories in motion, memories of the past and of long dead people. At the same time fire, smoke and burning provide an important symbol of continuity, that the country can be, and is still being burnt.

The Yanyuwa possess a number of words to describe certain types of fire and smoke. Some of them are listed below:

bathuntharra/warrmayinmantharra: setting fire to the country

buyuka: fire

kambambarra: bush fire, a wild fire

mankulmanya: a fire which burns on and over the vast savanna grasslands

mukunkarr: smoke seen in the far distance

ngarrki: badly burnt country, dry and scorched

rrumarri: smoke billowing upwards and appearing as a cloud in the sky

rumalumarrinjarra: lighting small fires in a row, when beginning to burn a beach front, or a large plain

warrman: well burnt country, which is good to hunt on

wurnngarr: smoke

As part of their tradition of oral literature the Yanyuwa have and still continue to compose short songs, which I have called song-poetry. They are short glimpses of past and present human activity and thought, of events which are of the everyday and mundane which at the time of their occurrence had moved people to compose them. One such song was composed some 60 years ago, by a woman whose boyfriend had travelled to the mainland to attend a ceremony. Later in the day she looked south, to the mainland, and saw smoke billowing up from the savanna grassland which had been set alight by the people gathering together for the ceremony. She composed this song:

*Oh, I wish that I were a bird,
And I would fly,
And maybe see you,
at the fire,
burning there in the south.*

(Harriet Johnson Mambalwarrka, in Bradley 1994, 61)



For the Yanyuwa the burning of country is an important way of demonstrating a continuity with the people who have died, their ancestors, or *li-wankala*, 'the old people'. The spirits of these people are said still to inhabit the landscape; they still hunt, sing, dance and are said even to still burn the country. Indeed it is spoken by the contemporary old people that before the coming of the white people, the spirits of the deceased kin would set fire to the country themselves for hunting, and up until quite recently, country that was burnt was left for several days so the spirits of the deceased could hunt first. The spirits of the deceased are considered 'cheeky', they are cantankerous, and can respond to the living in ways which are not always benign.

Country that has not been burnt for a long time is described as being 'shut up'. Visually this can be seen by the increase in the understorey vegetation, and on the islands by the increase of choking vine thickets. The Yanyuwa say it is the 'old people' who close up the country. They close up the country because they are angered by the living people who have been remiss in their responsibility towards the firing of the country.

In contemporary times tourists, pastoralists and other non-indigenous people who own country are also described as shutting up country, and not just because the Yanyuwa cannot fulfil their obligations towards their country. The country is described as getting poor because the old people have 'shut it up'. Thus new land uses are seen to be altering the landscape in radical ways. Conversely the burning of country by people who are not Yanyuwa is seen to be wrong. The country may be burnt, but the people who are burning it are seen to lack the sensibilities required to do it in a manner which will not offend the spirits which inhabit the landscape and the living people responsible for the country. There is an almost implicit belief that living people, too, will become 'weak' if the country is not burnt in a proper manner.

As one old Yanyuwa man has commented, 'This is the most important thing, to burn the country, to burn the bones of the animals we catch on the country... to make the smoke come up, so we smell it and they smell it' (Mussolini Harvey, pers comm, 1994). The use of the pronoun 'they' in this comment relates to the spirits of the deceased. The sense of smell would appear to be important to the Yanyuwa in regard to the burning of country. In Yanyuwa the term for smell is *wurrungkayarra*. It is an intransitive verb; it is the object under discussion which offers its smell, not the observer smelling it. Country that is burning well offers a pleasing scent to the people and the spirits of the deceased. If the country that is burning also burns

offensive matters such as garbage left on country by tourists or other travellers across Yanyuwa country, and the resulting smell is offensive, then the country may indeed close in on itself. The country shuts itself up so that people will not find any food on it. An example was when a fire that had been burning well reached the wreck of a car and the air began to fill with the acrid smell of burning rubber from the tyres. People became concerned that the 'country was smelling', and the 'old people' would not like it. A number of women who had planned to go hunting that day decided it would be useless because they would not get anything as the country would have shut itself up because of the polluting smell.

Even at death the issues associated with the burning of country become important. It is said that one part of a person's spirit leaves the body and travels to the spirit land in the east. As the spirit comes closer to the spirit land it is approached by a number of crows with long sharp digging sticks who intend to kill the spirit by piercing it many times. These crows call out to the spirit, 'Go away from here, when you were alive you called us the eaters of faeces, and you chased us from your camp!' As the crows get closer, the 'followers of the fires over country', the hawks and falcons, come forward with their fighting sticks. Shouting out, they fight off the crows, calling out, 'Leave that spirit, when it was a living person, it burnt the country for us, it enabled us to eat.' The hawks and falcons thereby achieve for the spirit its entry into the spirit world. Thus even at death the obligations incumbent on people to burn country become a focus.

Politics: the rules for burning country

Jungkayi that's the one has to say yes to burn, he has to do it or give permission to do it... otherwise big argument. (Annie Karrakayn, pers comm)

Burning country is visual evidence that an area of land is being utilised, or is most likely soon to be utilised by a group of hunters. If country is seen to be burning, and ownership of the fire cannot be ascertained, people will endeavour to find out who has lit the fire. If an owner cannot be found for the fire then people will pursue the event until an owner is found, and if found the lighter of the fire will be challenged in relation to that individual's right to burn the country or use the resources that may be gathered off the burnt ground.

Towards the end of the wet season, people begin to turn their thoughts towards the burning of country. As soon as the tall spear grass can be burnt, people begin to approach the people who are related to various tracts of country through their mothers, to seek permission to burn. At a very simple



level these people are called *jungkayi*, which can be loosely translated as guardian. They have the right to burn country, or to give permission to others to burn the country for them. The rights to burn country and to receive a share of what has been gathered from the burnt country are still jealously guarded. Even if a *jungkayi* cannot travel to the land of his or her mother, they will often ask those who are travelling their 'mothers country' to burn it for them to 'make it good'.

Smoke from country that is burning tells the observer that everything is good, the people on that land are well and doing what is required of them. Country that is not burning, especially where it is known that people are present, is not good. It means that something may be worrying and people should go and visit. This view is remarkably different from European-origin culture where smoke seen in the distance or the lighting of fire is seen as a signal of distress.

The infringement of such manners as who can hunt on burnt country or who has the right to burn country can still arouse arguments and fierce passions. Comments such as, 'They have no shame, they just went like a thief and burnt that ground, they hunted on it and we never saw any blue tongue and goanna from that country' are typical of the beginning responses when an infringement has occurred. Postures of feigned or real anger still occur, people still issue challenges using digging sticks and crowbars as weapons, to people who have hunted on land without permission. People who have not been associated with the burning of country must be invited to hunt on the country. The burning of country requires method, not just in relation to when and how the country will be burnt, but also in relation to who will burn, hunt and gather.

Some country is burnt and left, and is not hunted over. This is especially the case with sites where Spirit Ancestors may reside, or at burial places. The country is burnt and left because at such places the presence of the old people is most powerfully felt, and the country is burnt for the spirits of the dead. If such country is to be hunted on, only the most senior male *jungkayi* may do it, and only they may eat the food. On other country a widower or widow may not light country that belonged to their spouse, and the country is said not to burn well because it is too sad. Only after the country has been 'smoked' or burnt after one or two years of being left alone would such people consider interacting with the country again.

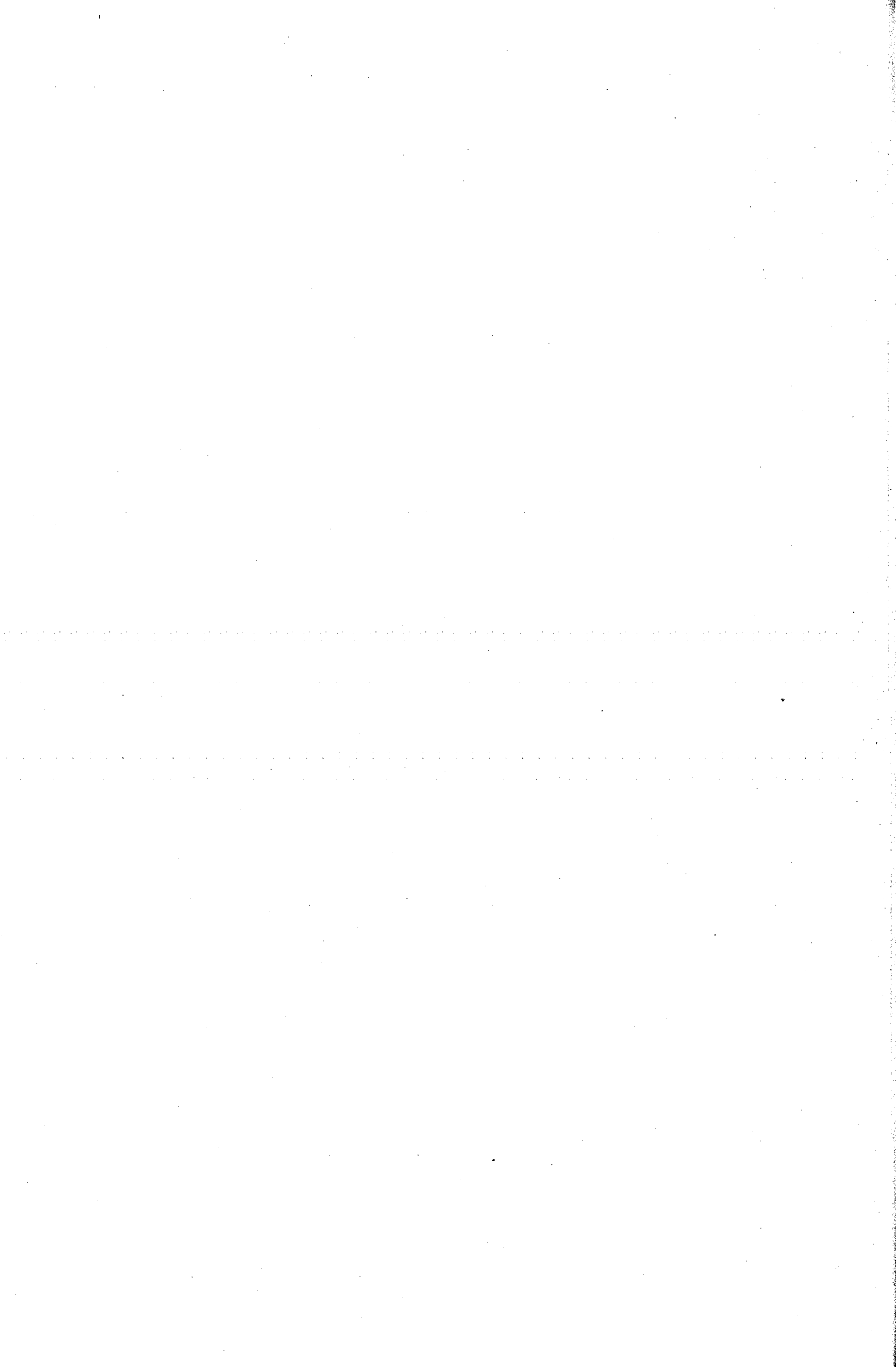
Concluding comments

It is important to note that burning country is not just fire, smoke and blackened vegetation. Firing country involves people who have ways of interpreting their place within the environment where they live, on the country they call home. Their relationship with fire at its most basic is as a tool, but fire is also related to events associated with the past and the future, events which to the outsider may not be considered that important, but to the indigenous community are very important. Fire, then, can be seen to be a part of an ecology of internal relations; no event occurs which stands alone. An event such as the lighting of country is a synthesis of relationships to other events. Fire is but one event which is related to many others.

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Bushfires Council, the community and you

*Russell Anderson
Bushfires Council of the NT*

Introduction

The Bushfires Council (BFC) as a land management agency has the responsibility to advise on 'best practice' for bushfire management. Current control measures include advances in fire research that maintain biodiversity and which are within the constraints of resources, legislation and community demands.

Bushfire prevention and control within the Northern Territory is the responsibility of individual landowners. The NT legislation ensures local community involvement and allows for both prescribed burning and Aboriginal traditional practices. This paper discusses the issues of fire management while at the same time meeting the needs of rural residents.

Bushfires Council

BFC clients can be identified as the managers and owners of rural and pastoral land of the Northern Territory. These include Aboriginal Land Trusts and Associations, block owners, Territory and local government, pastoral, mining, tourist industries, volunteer fire fighters and bushfire brigades.

Because of the differing physical and social environments of the above clients, their response to fire protection and management tends to differ. Neither is totally right nor totally wrong in the wider Territory context, although they all understand the environments in which they work. For example, 'traditional Aboriginal fire regimes' (Haynes 1985) are still practised in the Territory and Aboriginals have granted or under claim 49% of the 1.3 million square kilometres of the Territory (Department of Lands, Housing and Local Government 1994). In built-up areas, exclusion of fire is a legitimate objective provided other means of fuel reduction are used, for example slashing.

The Bushfires Council of the Northern Territory was set up as a result of the passing of the Bushfires Ordinance of 1965. In introducing the Bill to the



leader of the house, Assistant Administrator Allen Atkins homed in on these principles, which were debated and supported by members.

- The Bushfires Council was to direct operations relating to the fire control in the 'Bush', in areas outside the main towns where fire services were already operating.
- Its aim was to give a boost to the self help endeavours which were taking place on pastoral and agricultural properties and be responsible for fire control in vast areas of sparsely settled Crown land.
- To succeed it had to give support and gain cooperation of the NT pastoralists who would be well represented on the Council. Representatives would be appointed from most government departments (branches) having a role in the administration of the Crown land and from experts who were involved in the existing fire service (Lovegrove 1993, 4–5).

The physically large area of responsibility and insufficient funding ensured the drafted legislation identified land managers as being responsible for fire prevention and management of their land. The Council was to be a proactive support structure for these land managers.

The Bushfires Council and its Regional Committees consist of 59 statutorily appointed members. The majority are land managers or owners of properties throughout the Territory. Four government bodies are represented: Department of Primary Industry and Fisheries (DPIF), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Bureau of Meteorology and NT Fire Service.

The nine Regional Committees consist of five community members and the Regional Fire Control Officer. The Chairman of each Committee is on the 14 member Bushfires Council. These statutory appointments ensure a diverse representation from the rural sector of the Territory. Therefore the Bushfires Council and its Regional Committees are fully aware of the clients' needs and are able to ensure implementation of programs and objectives to meet these needs.

The Council has adopted policies and guidelines designed to achieve its fire management objectives. They include:

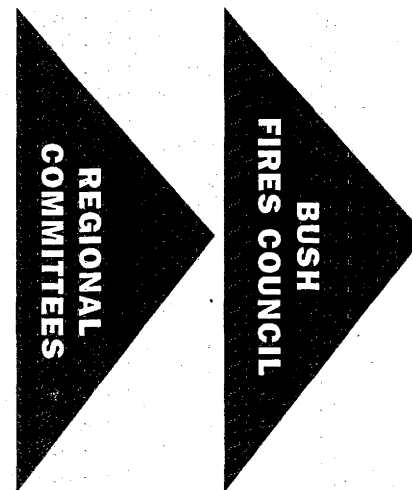
- protection of life, assets and the environment from the effects of uncontrolled fire;
- maintenance of natural resources, including native ecosystems and productive lands, by the use of appropriate fire regimes.

RELATIONSHIPS BETWEEN LANDHOLDERS AND THE BUSH FIRES COUNCIL

LAND AND LANDHOLDERS

Pastoral land	Owners/managers)
Agricultural and rural land	Volunteer Bush)
Urban/rural Interface	Fire Brigade)
Aboriginal land	Land Councils)
Parks and reserves	CCNT/ANCA)
Other government lands	Depts/Authorities)
Road reserves	T & W, Local Govt)
Other land users	Leaseholders)

BUSH FIRES COUNCIL



Policies

Fire Management
Plans for Bush
Fire Control
Regions

Fire Action
Plans at land
manager
level

CCNT – Conservation Commission of the Northern Territory
ANCA – Australian Nature Conservation Agency
T & W – Department of Transport and Works

Figure 1. The Council's role in fire protection and management, emphasising the importance of landowners and managers in the overall scheme

The policy stresses the need for individual landowners, be they public or private, to have fire management plans in place which are in the main devoted to the prevention of large intense fires. Direct fire suppression measures are used only when human life, assets or environmental values are threatened.

The Bushfires Council sees its primary role as one of coordination of pre-suppression work to achieve consistent levels of practice most suited to the differing areas of the Northern Territory.

The implementation of such 'best practice' is dependent on research into the effects of fire on the environment.

The fire manager

Since my appointment in May 1992, a large part of my time has been spent addressing community concerns. For example, the largest voice against the use of fire as a land management tool comes from the urban dweller or 'towny' who considers fire is destructive and pollutes the atmosphere, smoke being the main issue that surfaces. Prescribed burning has received constant criticism with petitions and 'letters to the editor'. No distinction is made, nor understood by most of the protesters, between prescribed burning early in the dry season and out of control fires late in the dry season.

Persons who write to the press and provide their name and address are invited to my office to discuss their problem. The results are not always what they expect. They provide their problems, I provide my problems, then I offer them my job, seat and desk, and then we seek jointly to resolve all the issues. They soon discover their problem becomes a lot harder to manage on the other side of the desk. Touch wood, this method has reduced a large number of 'letters to the editor' and I still have my job.

Fire management strategy

To address community concerns regarding fire management in the NT, the Bushfires Council recently released *Bushfire Management in the Northern Territory*. This document was developed from public comments on a discussion paper to formalise a Northern Territory Fire Management Strategy.

The primary purposes of the fire management strategy are:

- to prevent and control wildfires,
- to manage fire in non-urban areas in order to maintain diversity of species and ecosystems,

- to manage fire so as to improve future rural productivity,
- to reduce the total area burnt by wildfires in the Northern Territory,
- to achieve greater community involvement in bushfire management on freehold, leasehold and public land, and
- to achieve a balanced use of fire on natural, agricultural or pastoral lands to achieve specific management objectives.



Figure 2. A visual representation of my view of the fire manager: a person in control while juggling and walking a tightrope



A number of factors were taken into consideration:

- high intensity fires during severe weather cause most damage to the environment, as well as providing the greatest potential threat to human life and property.
- fire protection and control measures should be undertaken to minimise the impact of uncontrolled fires.
- landowners have primary responsibility for fire management of land under their control.
- fire management in pastoral areas is designed to limit the amount of damage by fire to productive land and to prevent late dry season fires from running unchecked through less productive country.
- certain species of flora and fauna can be threatened by inappropriate fire regimes, or by fire exclusion.

Fire management and control

The aims of the fire management strategy may be achieved in part through the following actions:

Fire management plans should be produced for all significant areas of vegetated lands. Such plans should:

- (a) address:
 - the identification of assets and values including flora and fauna.
 - the ecological role of fire in relation to the particular ecosystems involved.
 - protection or management objectives and their priorities.
 - maintenance of the assets and values identified, together with the species and communities represented.
- (b) prescribe the most appropriate strategies required for the prevention, detection and suppression of wildfire damage and to meet other stated fire management objectives.
- (c) consider environment impacts, aesthetics and smoke management in fire management proposals.
- (d) consider other appropriate fuel management measures and specify the most appropriate.
- (e) complement plans relating to adjacent lands.
- (f) be monitored and reviewed regularly (AFAC, 1994).

Access trails and fire breaks

Access trails are strips of country cleared of fuel in accordance with soil conservation standards to provide access for fire control equipment to areas threatened by fire. Wider burnt buffer zones, often up to two kilometres wide, are used to protect productive land from fire originating on unproductive country. Access trails, firebreaks and buffer zones break country up into areas more manageable for fire control purposes.

Preventive burning

Preventive burning is the most economical and commonly used method of fuel reduction, best carried out early in the dry season when fire weather is mild and fires are more likely to self-extinguish.

Aerial controlled burning

This function is carried out by the property owner using Bushfires Council's incendiary capsules dropped from either fixed-wing aircraft or helicopters, mainly in the Top End. The cost to property owners is 50% of operational time over the property.

Knowledge of local fuel types and weather conditions is important in determining the timing and extent of this type of burning.

Intense fires for specific land management objectives

Very hot fires may control or eradicate woody or noxious weeds and are best achieved during the fire danger period. However, they require far more stringent fire control measures.

Late season burning

The opportunity may present late in the fire season after early rains to burn rank foliage and achieve desired changes in grass composition.

Roadside verges

There is a wider need to reduce late, hot, dry season fires on road verges. For aesthetic and safety reasons, early roadside burning is essential to avoid adverse visitor reaction and to ensure adequate buffers/firebreaks.

Fire suppression

The Bushfires Council regards fire suppression as a measure to be adopted only when life and property are in imminent danger.

It has adopted a policy to establish and assist with training of volunteer bushfire brigades in closely settled rural areas of the Northern Territory.



In more remote areas, the Council encourages cooperation between adjoining landowners and supervises fire suppression operations on large or complex fires.

Given that water is seldom available in the Northern Territory in sufficient quantities for fire fighting, back burning and dry fire fighting are necessary where preventive measures have been unsuccessful in containing a fire.

Smoke management

The Bushfires Council assists in and promotes a program of early preventive burning consistent with periods of safe weather and optimum fuel conditions. Often these conditions result in poor smoke dispersal or accumulation over urban centres.

The Bushfires Council has undertaken to develop more accurate smoke dispersal and trajectory prediction models with the assistance of the Bureau of Meteorology.

Current preventive burning practice is consistent with low intensity fires of short duration. Typically, only a small percentage of available fuel is burnt and smoke emissions contain a high level of moisture and particles of ash.

Late season fires burn more extensively, more completely and smoke emissions contain a wider range of gaseous material.

The Bushfires Council is mindful of these findings which it has incorporated in current policy and practice.

The harmful effects of smoke and levels of environmental acceptance will continue to be monitored and recommended guidelines will be observed.

Monitoring research

The NT is fortunate to have extensive research conducted into fire and the effect of fire on the biota. Research and data collection continue into fire behaviour and ecology. This is a long-term exercise and includes work done by the DPIF, Northern Territory University (NTU), the Conservation Commission of the NT (CCNT) and CSIRO on burning patterns and biological effects, including the contribution gasses from grassland fires may have on the Greenhouse effect. Other fire management bodies in Australia could benefit from these scientific findings, particularly in north Queensland and the Kimberley region of Western Australia.

Promotion

Annual public awareness campaigns emphasise the responsibility of land managers in fire management and the need to take preventive measures.

While the farming and pastoral community is generally well versed in fire management practices, the need remains to increase the level of awareness among urban and rural-fringe dwellers. Increased public awareness is therefore concentrated during the months leading up to the fire danger period.

Training

The Bushfires Council aims to increase participation by the rural community and other land managers in 'competency-based' training courses it offers throughout the Northern Territory. Recently completed competency-based standards should unite fire prevention methods Australia wide.

Certificate courses are run on both a formal and an opportunistic basis and consist of a balance of theory and practical work integrated with actual fire fighting, hazard reduction exercises and equipment maintenance.

Education

There is a need to educate the community about the prevention of bushfires, using prescribed burning and the role of fire in the environment. The Council is developing a package to introduce fire ecology and management into the NT school curricula.

Key issues for bushfire control in the NT

- Experience of applying fire suppression in the NT has proven wild fires can occur beyond the resources of control. These fires generally occur during severe weather conditions from July to November in the northern half of the NT and December to March in the south.
- Studies in Australia and America have found 'important ecological relationships among plants, animals and fire' (de Golia 1989). NT experiments of 'annual early and late dry season and biennial early season fires resulted in little floristic or structural differences after thirteen years of treatment in the forest and twelve years in the woodland' (Bowman, Wilson & Hooper 1988). Alternatively there is fire sensitive vegetation such as cypress pine (*Callitris intratropica*) and monsoon forest. Conflicting research findings continue to challenge the fire manager.
- Indigenous people have burnt off grass for hunting, clearing, signalling and various other reasons. This practice still exists in the NT and Haynes (1985) notes reports of a 'compulsive mania' to



burn where Aboriginals have lived for some time away from their land. Just as Aboriginals use fire for specific purposes, land managers and the community need to recognise fire as a legitimate tool in bushfire control. In stating fire is a legitimate tool, there must be careful consideration of fire on the biota married with rural community needs.

- The *Bushfires Act 1985* under section 48 provides a maximum fine of \$1000 for a person found 'setting fires'. The difficulty in achieving prosecutions is reflected in so few successful fines. Legislation changes of increased penalties would fail as a deterrent due to the vast remoteness of the NT.
- The community's knowledge of rural fires is one of conjecture. An assertive effort of researchers, practitioners and interested knowledgeable persons promoting the positives of fire management is an ongoing necessity!
- Now is the time for you to go forth and inform the multitude.

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Fire management in the Northern Territory post-Mabo

The legal basis for Aboriginal burning

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The Bushfires Act 1980 (NT)

Outside urban areas in the Northern Territory fire management comes under the Bushfires Act.² This paper considers the application of the Bushfires Act to various land tenures, namely:

- Aboriginal land under the Land Rights Act;
- native title land; and
- pastoral land

for the purpose of ascertaining the law that governs Aboriginal burning.

The Bushfires Act would appear on its face to be a complete statement of the law, but in relation to Aboriginal burning the picture is more complex. In the legal landscape of the Northern Territory we have Aboriginal law about burning, then Northern Territory law (the Bushfires Act) and also in the picture is Commonwealth law such as the Native Title Act, and finally the common law (or judge-made law). Specifically, the Mabo decision is important here.

We need to consider the impact of the Bushfires Act on Aboriginal burning. Does the Act ban Aboriginal burning? The answer is no, and in fact the Act says absolutely nothing about Aboriginal burning. The Bushfires Act does not ban Aboriginal burning but it does impact on Aboriginal burning.

1 The author would like to thank Dr David Bowman, Martin Flynn, Dr Lesley Head, Kerry Mulqueeny, Dr Deborah Bird Rose and Peter Whitehead for their comments on earlier drafts of this paper. This is a modified version of a more detailed and technical paper which will be published in *Environment and Planning Law Journal*, February 1995.

2 Fires in urban areas are controlled by fire services established under the *Fire Service Act 1983* (NT).



Under the legislative regime of the Bushfires Act, Northern Territory landowners are able to burn their land except (i) on fire ban days, (ii) in fire protection zones and (iii) in fire danger areas. Landowners also have a responsibility to take reasonable steps to prevent a fire spreading to neighbouring land.³ Therefore not all burning by Aboriginal landowners would be prohibited under the Bushfires Act, however, the Act would impact on burning practices in at least two major ways. Firstly, Aboriginal landowners whose land fell within the relatively extensive fire protection zones would require a permit for almost all burning. Secondly, permits would be required for some Aboriginal burning, and other types of burning would be prohibited outright during fire danger periods, which may continue for 5–7 months.

The declaration of fire danger periods is probably the most significant impact of the Bushfires Act as it means that for large parts of the year Aboriginal landowners would need to get a permit every time they wish to burn. This is quite a significant impact particularly for people living on outstations and away from towns.

Two types of land tenure are particularly important for analysis: Aboriginal owned land and pastoral land – we're not just talking about small pieces of the Territory, we are talking about some 87% of the Territory. So the legal situation on those two land tenures is important.

Does the Bushfires Act apply to land owned pursuant to the *Aboriginal Land Rights (Northern Territory) Act 1976 (Cth)*?

Briefly, what the Land Rights Act says is that Northern Territory law can apply, with an important caveat, to Aboriginal land as long as it is not inconsistent with other parts of the Land Rights Act. The Land Rights Act 'does not affect the application to Aboriginal land of a law of the Northern Territory to the extent that law is capable of operating concurrently (with the Land Rights Act)' (s 74).⁴

Many provisions of the Bushfires Act will no doubt apply across the Territory, however, it is not clear that the Bushfires Act and Land Rights Act can operate concurrently in all respects on Aboriginal land. Rights to use Aboriginal land in accordance with tradition are preserved by s 71(1) of the

3 *Bushfires Act 1980 (NT)* s 49.

4 *Aboriginal Land Rights (Northern Territory) Act 1976 (Cth)* s 74(1).

Land Rights Act.⁵ Aboriginal land use in the form of burning practices therefore has protection under Commonwealth legislation if they (the burning practices) are in accordance with tradition.

There is legal space, in other words, for Aboriginal burning. Northern Territory law (the Bushfires Act) can only operate to the extent that it does not impinge on Aboriginal law about burning. So Aboriginal law has quite significant legal protection under the Land Rights Act, and Aboriginal land is clearly a very large proportion of the Territory (about 36% at this time).

Does the Bushfires Act apply to native title land?

An initial point to make is that, in one sense, what happens on Land Rights land is more important in the Northern Territory than the law relating to native title land. The Mabo decision and Native Title Act have not had the same impact in the Northern Territory that they have had elsewhere in Australia simply because most of the land that could otherwise be claimed under the Native Title Act is already owned by Aboriginal people. Furthermore, the Native Title Act says that pastoral land can't be claimed.⁶ We are unlikely to see enormous native title claims, except over areas that are already Aboriginal land.

However, the 1993 decision of the Federal Court *Pareroultja v Tickner*⁷ established that native title has not been extinguished on land granted under the Land Rights Act.⁸ Accordingly, Aboriginal owned land granted under the Land Rights Act may also be claimed as native title land. By provision of the Native Title Act Aboriginal owned pastoral leases may also be claimed.⁹ Owners of land that has been granted under the Land Rights Act and is native title land will retain their rights under the Land Rights Act¹⁰

5 *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) s 71(1).

6 Native title is extinguished on pastoral land pursuant to the *Native Title Act 1993* (Cth) at least to the extent of preventing claims of title approximating freehold title. Insofar as the grant of a pastoral lease in the Northern Territory may be an act attributable to the Commonwealth, see the *Native Title Act 1993* (Cth) s 15(1)(a), 229(3) and the definition of pastoral lease in s 248. Section 19 of the Native Title Act enables the Northern Territory government to 'validate' pastoral leases in the same way, see the *Validation of Titles and Actions Act 1994* (NT) s 5.

7 *Pareroultja v Tickner* (1993) 117 ALJ 206, also known as the second Lake Amadeus case.

8 *Ibid*, at 214 per Lockhart J. Special leave to appeal this matter to the High Court was refused on 13 April 1994.

9 *Native Title Act 1993* (Cth) s 47.

10 *Native Title Act 1993* (Cth) s 210 provides that the rights or interests of a person under the Land Rights Act are unaffected by the Native Title Act.



including the right to continue traditional land use practices such as burning. Their position as native title holders, and the position of native title holders generally, is now considered.

The Mabo¹¹ decision's contribution is to say that traditional law about land use is part of native title. In other words, the content of native title is determined according to the laws and customs of the title-holders:

Native title has its origin in and is given its content by the traditional laws acknowledged by and the traditional customs observed by the indigenous inhabitants of a territory. The nature and incidence of native title must be ascertained as a matter of fact by reference to those laws and customs.¹²

For native title holders, land use practices such as burning the land in accordance with traditional law and custom are an integral part of their title and have the protection of law.¹³

The question of how general environmental legislation is to apply to native title land is a difficult one, and the impact of the *Native Title Act 1993* (Cth) ('the Native Title Act') adds another layer of complexity. In the case of Aboriginal burning and the Bushfires Act, the difficult question of the extent to which burning by native title holders must be exercised subject to the Bushfires Act is to some extent bypassed by s 211 of the Native Title Act.

Section 211 of the Native Title Act provides that native title holders may carry out activities including hunting, gathering and cultural or spiritual activities¹⁴ without a licence or permit, where others may carry out the activity only if they have been granted the requisite licence or permit.¹⁵ The section would protect Aboriginal burning regimes on native title land to the extent that (a) burning the land is a component of hunting, gathering, cultural or spiritual activities, and (b) burning is prohibited under the Bushfires Act except under licence/permit.

In relation to (a) it appears that most Aboriginal burning would come under one or other category. In relation to (b), permits to burn land may be granted under the Bushfires Act. For example, lighting fires in a fire protection zone is authorised in accordance with a permit,¹⁶ and some uses of fire are authorised in a fire danger area in accordance with a permit.¹⁷ The effect

11 *Mabo v Queensland* (No.2) (1992) 175 CLR 1.

12 *Mabo v Queensland* (No.2) (1992) 175 CLR 1 at 58 per Brennan J.

13 *Ibid* at 61 per Brennan J.

14 *Native Title Act 1993* (Cth) s 211 (3).

15 *Native Title Act 1993* (Cth) s 211.

16 *Bushfires Act 1980* (NT) s 35 (a).

17 *Bushfires Act 1980* (NT) s 39 (a). There is an additional requirement in s 39 (b) that at least 48 hours notice be given to neighbours.

therefore of s 211 of the Native Title Act is that native title holders do not require the usual permits under the Bushfires Act to undertake burning. In situations that fall outside s 211 the law is more difficult to interpret. Section 8 of the Native Title Act is the key to establishing how native title interacts with State/Territory legislation such as the Bushfires Act:

This Act is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with this Act.

The section is similar to s 74 of the Land Rights Act, and similarly to the Land Rights Act there is a legal space created here for the operation of Aboriginal law about burning. Laws such as environmental laws will operate on native title land only if they are capable of operating concurrently with native title rights and interests.

In other words, the Bushfires Act will apply generally to burning by native title holders, but only insofar as it can operate concurrently with, or in other words is consistent with, the continuing exercise of native title rights such as the right to burn in accordance with traditional law and custom.

Application of the Bushfires Act to Aboriginal burning on pastoral land

Pastoral leases in the Northern Territory are held subject to 'a reservation in favour of the Aboriginal inhabitants of the Territory',¹⁸ permitting Aborigines,¹⁹ inter alia:

Subject to any other law in force in the Territory –

- (i) to take or kill for food or for ceremonial purposes animals *ferae naturae* (wild animals); and
- (ii) to take for food or for ceremonial purposes vegetable matter growing naturally, on the leased land.²⁰

Burning the land is arguably permitted under the reservation as a method that may be employed by Aboriginal people to hunt. For example, land may

18 *Pastoral Land Act 1992* (NT) s 38 (1)(n).

19 *The reservation, pursuant to the Pastoral Land Act 1992* (NT) s 38 (2) (a)–(c), is in favour of those Aborigines who:

- (i) ordinarily live on the pastoral lease;
- (ii) ordinarily live on a piece of land that has been excised from a pastoral lease since 1979; or
- (iii) are entitled to use or occupy the pastoral land according to Aboriginal tradition.

20 *Pastoral Land Act 1992* (NT) s 38(2)(f).



be burned to expose animal tracks and burrows,²¹ to hunt tortoise,²² to hunt large macropods with a 'fire drive',²³ to bring on growth of young grass shoots to attract macropods to a particular area,²⁴ to maim or stun smaller animals²⁵ or flush out small animals.²⁶ There is also evidence to suggest that particular burning regimes were employed by Aborigines to encourage or preserve particular plant communities. For example forest margins may be fire managed to protect yams that grow there²⁷ or in the desert spinifex might be burnt to encourage edible ngaru (*Solanum eremophilum*).²⁸ There is evidence that northern cypress pine (*Callitris intratropica*) which has various Aboriginal uses²⁹ goes into decline without maintenance of Aboriginal burning regimes.³⁰ There is a good argument that particular burning practices are part of the process of utilising plant materials for food or ceremony, and are therefore permitted under the reservation.

So the proposition is a straightforward one: that burning is simply a methodology used in hunting and gathering, and therefore is permitted under the reservation. That is a significant conclusion to draw, meaning that Aboriginal people are also able to burn on pastoral land.

There is a further difficult question of whether if Aboriginal people can burn on pastoral land, can they only do so pursuant to the Bushfires Act. If that were so, Aboriginal people could in most cases still use fire on pastoral land for the purposes of hunting or collecting plants, but the restrictions of the Bushfires Act already discussed would apply.

The *Criminal Code 1993* (NT) provides that a person is not guilty of an offence if the act constituting the offence was authorised.³¹ Therefore an

21 Head LM, O'Neill AL, Marthick JK & Fullagar RLK, A comparison of Aboriginal and pastoral fires in the north-west Northern Territory, in Moffat I & Webb A (eds), *Conservation and Development Issues in Northern Australia*, North Australia Research Unit, Darwin, 1992, p 132, Rose DB, *Dingo Makes Us Human: Life and Land in an Aboriginal Culture*, Cambridge University Press, Melbourne, 1992, pp 100-101 & 106, and Gould R, Uses and effects of fire among the Western Desert Aborigines, *Mankind* 8, 1971, p19 for an account of mouse hunts in the desert.

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24 Haynes, op cit, p 210.

25 Haynes, op cit p 210.

26 Gould, op cit, p 19-20.

27 Haynes, op cit, p 68.

28 Gould, op cit, p 22.

29 See for example Brock J, *Top End Native Plants: A Comprehensive Guide to the Trees and Shrubs of the Top End of the Northern Territory*, John Brock, Darwin, 1988, p 108.

30 Bowman DMJS & Panton WJ, Decline of *Callitris intratropica* in the Northern Territory: implications for pre- and post-European colonisation fire regimes, *Journal of Biogeography* 20, 1993, p 379.

31 *Criminal Code 1993* (NT) s 23

Aboriginal person burning pastoral land in apparent contravention of the Bushfires Act, may have a defence that the act was authorised by the reservation in the Pastoral Land Act.³² A circular argument arises because the reservation only applies subject to any other law of the Territory. An Aboriginal defendant would appear to be disentitled from utilising the authorisation defence. However in a 1982 case before the Supreme Court of the Northern Territory, Forster CJ found in favour of an Aboriginal appellant who was caught in a very similar circle. In that case an Arrernte man successfully appealed against a conviction under the *Firearms Act 1979* (NT) ('the Firearms Act') incurred while shooting kangaroos for food on pastoral land. At that time the reservation in favour of Aboriginal people on pastoral land was contained in a substantially similar provision under the Crown Lands Act. The Firearms Act itself contained an authorisation provision. In order to resolve the conflict between the two sections, Forster CJ examined the legislative history of both. The relevant provision of the Firearms Act had come into operation after the relevant provision of the Crown Lands Act and his Honour held that:

(The relevant provision) of the Firearms Act was passed against the background of permission of the appellant and people like him to take wild animals on their own country and must be read subject to that permission.³³

Forster CJ traces the legislative reservation on pastoral land in favour of Aboriginal people back to the *Crown Lands Ordinance 1927* (NT),³⁴ and the current wording has been essentially the same since 1978.³⁵ The Bushfires Act was passed in 1980. It would therefore appear that the same reasoning would be applicable, that the Bushfires Act was passed against the background of the reservation in favour of Aboriginal people and must be read subject to that reservation. However, the argument is clouded by the fact that in 1992 the Crown Lands Act was re-enacted as the Pastoral Lands Act, so the Bushfires Act was technically passed earlier in time to the Pastoral Lands Act.

In the end result it is somewhat unclear whether burning on pastoral land in contravention of the Bushfires Act would be authorised by the reservation under the Pastoral Land Act. There is a further argument, which turns on

32 Pursuant to the *Criminal Code 1993* (NT) s 26(1) an act is authorised if it is done, inter alia, in the exercise of a right granted by law, in conformity with the law, or pursuant to a permission lawfully granted.

33 *Campbell v Arnold* [1982] 56 FLR 382 at 385.

34 *Ibid*, at 384 per Forster CJ.

35 Ordinance No. 107 of 1978 (NT), r 24(2) cited in *Campbell v Arnold* [1982] 56 FLR 382 at 385.



whether the Aboriginal right to hunt and gather on pastoral land is a native title right.

Although native title is generally extinguished on pastoral land by the Native Title Act (see footnote 6), any reservation for the benefit of Aboriginal people is preserved from extinguishment.³⁶ Accordingly the right to hunt and gather on pastoral land may be able to be successfully claimed as a native title right. The question then becomes, if the right to hunt and gather is converted from a statutory to a native title right, is the right still to be exercised subject to Northern Territory law such as the Bushfires Act? As discussed above in relation to native title land, it is probable that Aboriginal people do not require the usual permits under the Bushfires Act in order to undertake burning in the exercise of their native title rights. But even assuming that burning must be carried out within the confines of the Bushfires Act, the substantial point is that on most pastoral land and for most of the year, Aboriginal people may burn land when hunting and as part of the process of utilising plant materials.

Conclusions

Consideration of the interaction of Commonwealth law, Territory law and the common law in relation to Aboriginal burning practices on various land tenures in the Northern Territory shows that those practices are given considerable legal protection. Although the Bushfires Act applies across the Territory, space within the European-origin legal system has been created for traditional law and custom relating to burning on Aboriginal land under the Land Rights Act, and the result will be the same on native title land. On pastoral land, whether or not the reservation protecting continued Aboriginal hunting and gathering is characterised as a statutory or native title right, burning would appear to be sanctioned as a method of hunting and gathering.

Since pastoral land and Aboriginal owned land together makes up approximately 87% of the Northern Territory,³⁷ these conclusions are significant. Given the legal reality, it is anomalous that Aborigines have little involvement in fire management decision-making at regional or Territory levels. For example, there is no Aboriginal representation on the Bushfires Council.

36 *Native Title Act 1993* (Cth) s 16, *Validation of Titles and Actions Act 1994* (NT) s 11.

37 Calculated from information tables provided on the map AUSLIG (Australian Surveying and Information Group), *Australia: Land Tenure*, Edition 1, 1993.

Translating the law into fire management policy and practice would appear to necessitate an Aboriginal/government joint management approach,³⁸ and a tripartite approach among Aboriginal people, pastoralists and government with respect to pastoral land. There are certainly challenges ahead in adopting a cross-cultural joint management approach to land management but the operation of joint management principles in the Northern Territory's Aboriginal owned national parks (eg Kakadu, Uluru/Kata Tjuta and Gurig National Parks) show that they are not insurmountable. In one sense this is not a legal problem but a land management problem. It is not going to be solved by battalions of lawyers or by litigation. It is not going to be solved even by new legislation. What needs to happen is at an administrative and policy level, for people on the ground to be talking to each other and working out approaches. Hopefully some understanding of the overwhelming fact that Aboriginal people have considerable legal standing may propel us into a situation where negotiation begins to happen.

Much may be gained from cross-cultural cooperative land management. For example there is the benefit of Aboriginal fire management expertise. The possibility of putting traditional knowledge back into practice should be seized when so little is known of Northern Australian landscapes, and the land management challenges are so enormous. Knowledge has certainly been lost in the process of population decimation and dislocation of Aboriginal people since colonisation. Of knowledge retained, little has been documented. The realisation that Aboriginal burning practices have legal sanction in many parts of the Territory should provide an impetus for cooperative studies to record those practices.³⁹

Some Aboriginal burning practices will never be reinstated, being labour intensive and requiring mobile peoples.⁴⁰ However in the Northern Territory, comparatively more Aboriginal people and Aboriginal knowledge have survived than in some other parts of Australia, and exciting possibilities for advances in land management exist – combining traditional expertise plus western ecological knowledge and technology. As in the area of joint

38 See discussion and recommendations by Head L, 'Aborigines and pastoralism in northwestern Australia: historical and contemporary perspectives on multiple use of the rangelands' forthcoming in *Rangelands Journal* and by Young E, Ross H, Johnson J and Kesteven S, *Caring for Country: Aborigines and Land Management*, Australian National Parks and Wildlife Service, Canberra, 1991, particularly pp 175–6.

39 Interestingly the anthropologist Gould made a call for ecological studies of the effects of Aboriginal burning as far back as 1971, in Gould, op cit, pp 22–23.

40 See discussion by Haynes, op cit, pp 69–70.



management of national parks, the Northern Territory has the potential to be an Australian and world leader in implementing joint indigenous/European land management structures.

Fire management is integral to Aboriginal conceptions of land management. Research seems increasingly to be discovering the benefits of Aboriginal burning practices, for example in habitat management for rare species.⁴¹ It seems an appropriate time for consideration of land management through cooperation rather than by conflict.

41 See for example Reid, J, Baker, L, Morton SR and Mutitjulu Community, Traditional knowledge + ecological survey = better land management, *Search* 23 (1992), p250.

Discussion 1

Bill Freeland

*Wildlife Division,
CCNT, Darwin*

I'd like to ask Camilla a question. One of the things that has been intriguing to me over the last couple of years has been the potential of using the existing NT Acts as a vehicle for promulgating Aboriginal practices, or laws, into our legal codes in the form of either management plans or regulations under various Acts. What sort of capacity do you think exists for the fire management question? I can see potential within the Territory Parks and Wildlife Conservation Act in the form of management programs. Are there any other avenues that you can envisage for fire management?

Camilla Hughes

I think it has to be done on a regional basis. We're talking about different Aboriginal people and different Aboriginal laws. We're not talking about one monolithic law to apply across the Territory. But certainly that's the way it needs to be looked at, on a regional level, but management plans, I assume, do cover particular regional areas. Is that right? That might be a good way to do it.

I guess the other point I want to make is that integrating Aboriginal law doesn't necessarily mean writing it into law all the time. A lot of these things happen, actually, at an administrative level, don't they? The things that change don't necessarily have to be codified.

Tony Press

Could I make a comment on that, in terms of general issues of nature conservation and park management planning, in particular. My organisation – the Australian Nature Conservation Agency or, as it was then, the Australian National Parks and Wildlife Service – submitted a report to the Australian Conservation Foundation. They had commissioned that study which has just been published, called 'Bridging the Gap', about Aboriginal people and nature conservation. We advocated that the various State and Territory conservation authorities should involve Aboriginal people and other key stakeholders, in the process of erecting management plans, particularly if those management plans have some statutory base, and that would apply in this instance. If plans for fire management over various regions of the Northern Territory did have the power of a statutory instrument then that would be a good way of doing it.

Phil Cheney

*RO Division of Forestry,
Canberra*

To Camilla and others: how legally can we get fire accepted as a natural thing rather than a dangerous thing, in the law. At the moment, it's considered as a dangerous animal which charges across the countryside whereas, in fact, it's as natural as the rain spreading across the land.



If you don't want to get wet you put a roof over yourself. If you don't want to get burnt you remove fuel before another person's fire comes. Is there any hope of legally getting more sense into the situation so that litigation by lawyers is not perpetuated?

I don't know that there's been a lot of litigation, but it's a good point that you make. The Bushfires Act is overdue for a rewrite, not so much from the point of view of Aboriginal burning, but for other reasons. And, certainly, when you look at the Bushfires Act the whole language is about preventing fire and controlling fire and certainly doesn't recognise fire as a natural part of the landscape. So, the whole Act is written in that kind of language and I agree with you that it would be appropriate for it to be rewritten because what's happened is that there is, in fact, an enormous gap between the language of the Bushfires Act and the practices of the Bushfires Council.

Camilla Hughes

I'm sure if you come to my office, I think we can discuss this even further than in this forum. But I'd like to make a couple of points. The Bushfire Council is motivated by, as you said earlier, the Council and that Council is appointed by the Minister. It has 59 members across the Territory, I might add.

Russell Anderson

Is that including regional Bushfire Councils?

Camilla Hughes

Regional committees across the Territory. Fifty-nine individual people who live on the land. Now, you brought up the content of the Council and I must admit that Aboriginal membership is lacking, although we have two members on the regional committees. The Act itself, I believe, is a very workable tool, in the sense that it motivates the community. Only recently the Act has been used to enforce preventative fuel reduction in the closer urban areas of Darwin and Katherine. Prior to two years ago that wasn't the case. The Act was not used in that way. Coming to the point of permits to burn, to my knowledge – and perhaps someone else in the room could enlighten me – to my knowledge, Aboriginal people have never had to obtain a permit to burn. It is up to the regional committees for that part of the Act to be enforced. The Act was originally drawn up by a 1965 Ordinance. That Ordinance was put together so that Aboriginal traditional burning could be part of the landscape.

Russell Anderson

Well, thanks Russell. I'm not sure if any response is necessary to what you've said but I think it would be useful to re-examine the Bushfires Act simply because there is this enormous gap between what the Bushfires Council is actually doing, and I know that they are trying to do a lot of innovative things, and what the Bushfires Act actually says. Anyway, it'd be interesting to talk to you.

Camilla Hughes

Bill Panton

*Wildlife Division,
CCNT, Darwin*

I suppose anyone that's read the paper or noticed smoke everywhere in the last week in Darwin would know about the fires. There are some really important issues about fire management going on here. Uncontrolled fires are annually ravaging the remnant vegetation around Darwin, having a major impact on the biodiversity of the area.

We are here talking about the maintenance of biodiversity while it is currently being threatened around us by these wildfires. There are two fire management authorities in the Northern Territory. The Northern Territory Fire Service has jurisdiction over the Darwin area and has a policy of fire bans to achieve fire exclusion. This objective is probably appropriate for urban areas to stop backyard incinerators and rubbish burn-offs, but it is also applied to natural areas where fuel loads accumulate and uncontrollable fires result. Conservation agencies with responsibilities for managing land around Darwin are prevented from undertaking controlled burns by this policy. There seems a legal contradiction here where the policy of one government department affects the ability of another department to do its job.

Camilla Hughes

There is another set of issues in the Darwin metropolitan area but, as you say, it goes out to the urban fringe and it comes under the Fire Service Act. There are problems there. It's not just a management problem, is it? I think that legislation is very restrictive though I haven't looked at the Fire Service Act in any great detail.

Bill Panton

It is quite encouraging to see here today the wide range of representatives from the community as well as experienced research people. Perhaps the opportunity exists here to get a resolution from this conference to urge that the appropriate authorities work together to develop a fire management strategy to conserve the biodiversity around Darwin. We need something that includes the use of fire but reduces the extent of high intensity late fires which we know to damage sensitive vegetation.

Dick Braithwaite

*CSIRO, Division of
Wildlife and Ecology,
Darwin*

Just to take up one thing, there's probably nothing intrinsically wrong with some late fires. That's part of the diversity. And also the factor of putting control on the landscape through early dry season fires ensures that there are unburnt areas which are also very important, and that's part of maintaining the diversity.

I think there's been a great shift of opinion. There's an American term we use – paradigm. And I can remember a conference, I think it was organised by CSIRO, about 1968, 1969, might have been 1970, and the paradigm was quite different to some of the views discussed here. This was the scientific paradigm. It was a statement that fire had very little natural role in the management of landscapes.



It was a view which was probably dominated by foresters, I think, in those days. And, obviously, influenced by a terrible fear of catastrophic fires which had seared people's personal experiences. Those who were arguing about fire management were seen as heretics. Either seen as heretics or seen as idiots. Or both. And I think there has been a change of views. It's very largely the kind of scientific work that you've heard from Dick Braithwaite and other people in the room here.

I'd like to pose a question. Is there a conflict of interest with burning the national parks in that the national parks, like Litchfield Park, are still considered to be traditional Aboriginal areas and the Northern Territory Conservation Commission burns the park, but it's not necessarily in agreement with Aboriginal people?

Can I make sure I have the question right? My understanding of the question is that what we're doing in Litchfield Park, in terms of fire management, is not, although some of our rangers think it is traditional in some sense, it's not what you would class proper fire management? Is that correct?

Yes.

I think what we need to do is to start talking more. Okay? I'm really serious. And we'll have to get you in touch with the regional management and see what we can do. Some of the problems nowadays are a bit different because we have lots of people camping in funny places, which necessitate certain different kinds of management but it seems to me we need to talk.

I might add that one speaker who couldn't get here today was going to make a very similar point about the park in his region. It doesn't need to be raised here in detail but I might just let people know that it is not just one park where Aboriginal people are experiencing a sense of not having enough communication with the rangers who are, in effect, managing land that Aboriginal people still regard as their own.

April Bright

Mak Mak

Marranunggu

Bill Freeland

April Bright

Bill Freeland

Deborah Rose

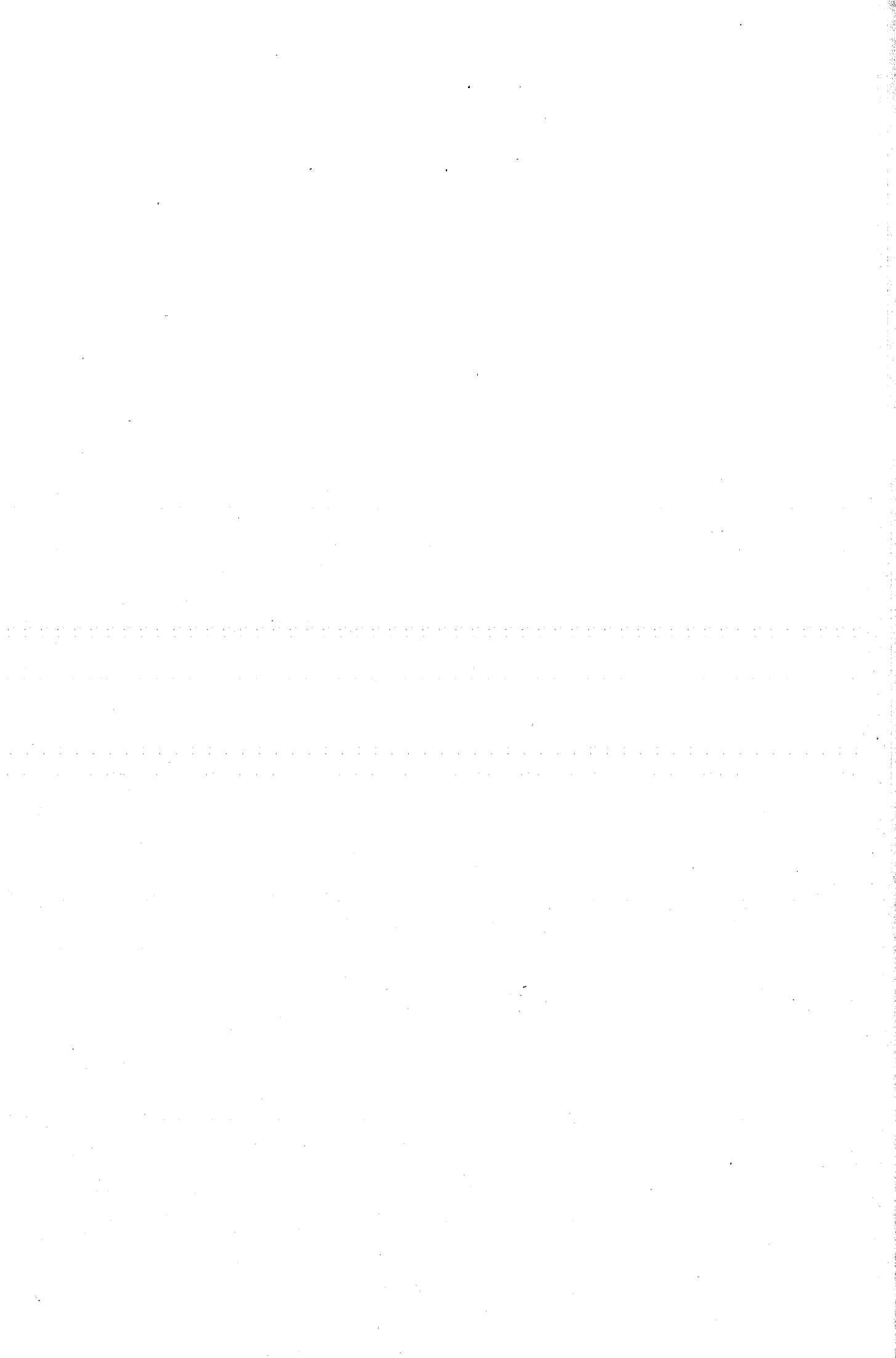
Fire-stick Farming

To grow flowers in Blackheath, Australia,
set fire to your field. Let flame
sing the delicate dust-seeds
of native shrubs. Soon they sprout,
a thin patchwork of tufts, nameless and mixed,
on ground bare, as if hoed.
Bright petals follow, as if you'd scattered
fifty packets of English seed; but not one
has a name Shakespeare knew: scarlet waratah
crowning its upright stake, flannel flower,
a grevillea in honey-and-orange
with juniper-mimicking leaves,
three nameless bulbs in cardinal shades,
and a heath whose giant blooms
seem threaded on grey wires.

The yellow dillwynia conjures blue moths that endure
their deaths from pale-lemon flower-spiders
whose grape bellies swell with eggs
to feed the thread-leg spider-wasp.
A huntsman in the open disdains escape,
dodging, faster than eye-blink, each lurch
of the sting – a game of hare and hound
among plants like moss with snowdrop flowers
and just a wisp of snake-slither.
In the hot calm the bees are loud,
working wings and elbows with an angry sound,
as you leap the tussocks, amazed
at your ignorant creation,
the shapes and passions hidden
in a sheet of flame.
And above them all
a new forest rising.

Mark O'Connor, 1990. *Fire-stick Farming: Selected Poems 1972–90*,
Hale & Iremonger, Sydney, p. 132.





Burn grass

*April Bright
Mak Mak Marranunggu*

Hello to everybody. My name is Yinirrakun, better known as April Bright. We have a few of the members of our family here that have come along to this Symposium out of interest as well as support for me. I'd like to say thank you to Debbie for inviting us to be able to participate in this Symposium. I hope you can understand me – I'm a bit nervous.

I am representing my people, the Mak Mak Marranunggu from Kurrindju. *Mak Mak* is our name for the white breasted sea eagle and Kurrindju is our traditional country. Shown on the map, our country is bordered by the Finnis River, Reynolds River, northern Litchfield Park and the western part of the Wagait Aboriginal Reserve.

I'd like to present to you one of the many important issues of fire to our people. My talk to you will be on 'burn grass'. This is what we call the procedure of burning off our country. We call it, simply, 'burn grass' or 'burn grass time'. This is the time we burn our country. It is part of our responsibility in looking after our country. If you don't look after country, country won't look after you.

'Burn grass' is as ancient as time itself. The burning of country was handed down to our people from the Dreamtime. To our people the Dreamtime is the time of creation.

I won't go into the Dreamtime story in depth, but very briefly. The chickenhawk – *a-titit* – took a firestick from a fire that was lit for a big ceremony and flew across Kurrindju, and as he flew across the country he burnt it. His flight path gave us significant areas and his actions began the handing down of one of our responsibilities – burning country.

'Burn grass' takes place after the wet season when the grass starts drying off. This takes place every year. The country tells you when and where to burn. To carry out this task you must know your country. You wouldn't, you just would not attempt to burn someone else's country. One of the reasons for burning is saving country. If we don't burn our country every year, we are not looking after our country. Right across our country we have very dense grasses, even in the ranges and timbered areas. If our country wasn't burnt,



then speargrass, anything up to ten feet high, other dense grasses, leaves and fallen branches would form a thick underlying mat of mulch, even in as little as three to five years. If a fire was lit either purposely or through natural causes, especially through the height of the dry season, it would do untold damage to the flora and fauna. The ecosystem would suffer. The country would be burnt to a crisp.

After our 'burn grass' the country comes alive. It's rejuvenated. New, fresh grasses grow. New foliage takes place. This will take place in one to three weeks in wetter areas and four to six weeks in drier areas.

Hunting and access – 'burn grass'

'Burn grass time' gives us good hunting. It brings animals such as wallabies, kangaroos and turkeys on to the new fresh feed of green grasses and plants. But it does not only provide for us but also for animals, birds, reptiles and insects. After the 'burn' you will see hundreds of white cockatoos digging for grass roots. It's quite funny because they are no longer snow white but have blackened heads, and undercarriages black from the soot. The birds fly to the smoke to snatch up insects. Wallabies, kangaroos, bandicoots, birds, rats, mice, reptiles and insects all access these areas for food. If it wasn't burnt they would not be able to penetrate the dense and long speargrass and other grasses for these sources of food.

Noxious plants

Fires help to control noxious plants. These are introduced species such as horehound, *Sida* weeds, etcetera. Now these names are just what we know it as local names. I don't know what the scientific names or botanical names are. And the worst enemy on the rivers and wetlands is *Mimosa* which is a rapidly spreading bush.

Patterns of burning

I mentioned earlier that country tells you where and when to burn. Some observations are:

Water

We follow the receding waters over our country. As the water dries up on top of the soil and the grass is dry enough to ignite, we burn. These areas are usually the low lying areas between hills and ridges. We call them 'flats'. The fires bring the moisture to the surface from under the soil, drying up the land for access and to feed the grass and plants into new growth.

Winds

Winds are very important to fire burning. There are different winds for different burns.

i) Big winds

Big winds will spread the fires rapidly, burning dry grasses, leaves and some dead wood. The fire being pushed by these winds does not allow for severe damage to take place on the grasses, plants and trees. The effect would be like passing your hands through the flame of a candle. You'll feel the heat but your hands will not blister.

ii) Slow winds

This is very little wind. Just enough to keep the fires burning. We call this 'slow burn' or 'colder burn'. These burns take place around areas you want to protect like areas of significance or also areas like the rainforest. The floors of these rainforests are dense with rotting vegetation and if burnt with hot fires or at the wrong time they will burn and smoulder for weeks causing extensive damage to the undergrowth and the life forms in it.

The slow burns usually take place very late afternoon knowing that as night approaches the wind will cease and the fires die out. These can be lit during the day if no winds are around at all. The most important thing with this burn is you are able to control the fire. It is easily put out with leafy branches when you don't want it to burn.

Hot burns

Hot burns are later. These are lit when the ridge country is dry. The hot fires sweep hard and fast over these areas. The trees and plants in these areas are protected by their bark and they're usually hard timbered. The nut fruits are also very hard, where you need a stone to crack them open. The hot fires assist them to burst, allowing the seeds to regenerate. A lot of the trees produce suckers, regrowth of the roots. We refer to them as suckers.

Flood plains

A good portion of our country is flood plains and paperbark swamps. These areas are the last to dry up after the wet. These areas are burnt like the 'flat areas'. There's still a lot of water under the soil.

Some areas that look like land are really masses of floating grass. These areas are burnt hotly before it becomes too dry. The burning takes place before the turtles hibernate. As the billabongs and channels drop their water levels the turtles bury themselves in the mud. This takes place only in certain areas. The grasses on these plains are very dense.



There are also large patches of cane grass on the edges of the billabongs. The rivers and creeks inland peter out and form series of billabongs and channels. During the wet they flood the plains country. This land type is also between the freshwater Finnis River, and the coast where the freshwater Finnis River ends and the saltwater meets the fresh.

Hibernating turtle places

Turtles normally hibernate on the edges of the river system further inland than the banks, or in the billabongs, on the edges of the billabongs or in channel type areas. Great care must be taken when burning those areas. You don't burn the areas when the turtles are hibernating. We hunt for these turtles by poking in the mud with a crowbar (*nin-nin*), locating them and digging them out of the mud.

On one occasion we discovered that people had driven out to the area and lit fires, burning the cane grass. We began to hunt for turtles and located a large number. But for each one that we located and went to dig up, all we pulled out was rotting pieces of turtles. The hibernating turtles were cooked and had rotted.

The burning of the cane grass caused the water temperature to become too hot. The fire was lit by Aboriginal people who did not know the country. They did not have any consultation with our people for the country. We call this 'indiscriminate burning', regardless of what persons they are.

The food chain

Patterns of burning mean that certain areas are burnt at different times. This is important to the food chain. Smoke brings on flowering. For example, areas that are burnt early provide early hunting and foraging for both man and animal life. We follow the burns. For example, with the fruiting of, for instance, the apple trees and the plum trees. Those that have been burnt earlier, their fruiting comes on earlier, and as the fruit is on its way out in one place, the next patch of 'burn' will then produce plums and apples that can be picked. So, it continues our food chain. When these are at the end of fruiting the next burnt area will be in fruit, thereby providing an ongoing food source.

I have spoken quite briefly on our 'burn grass' techniques. I could go on and on, believe you me. But time won't allow it. But my cousin here – Pulum, Kathy Deveraux – has written in-depth material on country in flames.

I'm sure you will find listening to her will not only be informative but also a learning experience from Mak Mak Marranunggu's age old tradition of 'burn grass'. Thank you.

Fire in the Kimberley

Patrick Green

Junjuwa Association, Fitzroy Crossing, WA

To speak about the fire in the Kimberleys, as with all Aboriginal areas throughout Australia, you don't speak widely of a specific area like the Kimberley.

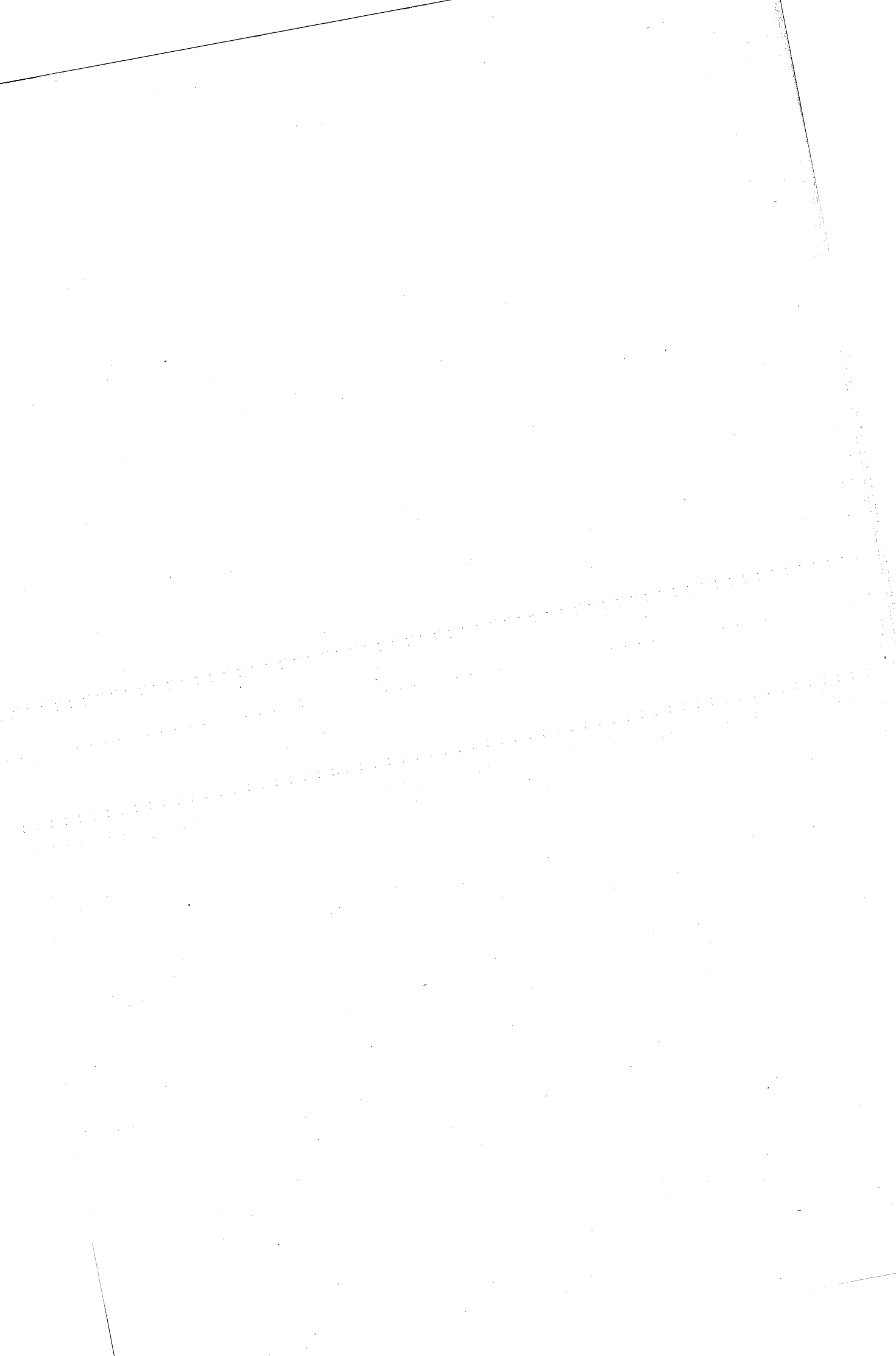
I'm a Bunaba person and I don't speak for all of Bunaba land other than my family area, like you've heard from previous speakers.

I don't think there's really all that much for me to say other than, I think you've heard a lot of stuff from a lot of people, even the archaeologist who's probably taken a few words out of my mouth. And the archaeologist working in our area.

Fire is an important tool to the Aboriginal people and we will always continue to use it, but our State (WA) doesn't allow Aboriginal people to even wander onto other people's land even onto our own traditional land, to even carry out our activity. So, one of the ways we've managed to get around that was to buy up Aboriginal pastoral land for us to have access to, to continue our traditional use of the land.

That's all I've got to say. Thanks.





Fire in Arnhem Land

Joe Yunupingu

Dhimurru Association, Nhulunbuy, NT

Welcome to you people. My name is Joe Yunupingu from Nhulunbuy, Dhimurru management land care at Nhulunbuy. I'm a land management ranger working around there at Nhulunbuy.

Nhulunbuy is a very big place, at a bauxite mine, you know that. So, they can damage country very badly. Yolngu people, like Yolngu we call Aborigines. I'm a Yolngu. What I learn, what I want to care about the land, my traditional land care, all around that country, that East Arnhem Land. And, with thirteen clans, Aborigines movement to homeland. I'm running around the country, and I support the people work, homeland.

Even I care of the fire. The fire burnt only traditional way. Because we look after the animals, birds and land. The land is real important for us. Our lands. If we want to go make a fire, to burn, every year not to fire, every year. Take about two, three year for the right time got to be burnt. Got to look for animal. Kill animal, few, not much. We look after the animals, eat them not to waste it, kill them, waste them. Not for fun, that business. That's the law for the Yolngu people. That's their ceremony ground, ceremony area, traditional way.

All right, we look after around the country, all around the beach. At the time turtles coming out, lay eggs, don't take the eggs. Let them grow. Eggs, turtle eggs. Any fish, fishing, fishing don't fun – waste it, throwing out the fish. That's why we look after the land. The land's very important. Don't, don't fishing and throw the – you know the people coming tourist, any kind of the fun fishing, they throw it. But we must look after every animal and every fish or crocodile. They might shoot them and throw them out, leave them lying there.

We take care of the all animals from sea to bush. That's why we look after, that we run it, the landcare, all around Dhimurru country, our country. Some people going to be a camping, recreation area, fishing, throw the fish, make a stink, lying like [in the] sun. And we must look after the country, we must look after animals.

Fire – the fire burnt only traditional way. Two or three years it burnt. And the traditional people say: 'Yes, you can burn.'



And around that every country, I been to Queensland. I saw people out there, poor, no work, ranger not much. Not much money, not much support there. Only couple, only council way. We establish our office by own money, when we get the royalty way. We put it in a one place. All Aboriginal people; and white people, they help support us. And we run the country out there. Look after the country and no burnt. Fire, no burnt: no killed animals, no killed anything. Only Yolngu people look after for they eat, that's all. Eat the animals, eat the fish or stingray, shark, whatever you caught. That what we look after, for Yolngu. That's Yolngu land.

You know, different ranger mob, from the Top End country, they still want our help. They ring us, send the letter. I don't know what we are going to do with them. We still going to help them, we support them. We put one heap of money and we run [the country]. Some of them ranger, ranger like other country, you run [your country], we run this way to look after the country, to look after the fire and to make sure traditional way for fire. That's what we've done and what we're doing up there.

And that's all I say. Thank you very much.

Discussion 2

Rhys Jones

I'd like to ask Patrick a question. I've just been to the Kimberley, working with Sue O'Connor, and afterwards I went on a journey, a bit like the journey that Tony Press was talking about, north to the Drysdale River and then across the Pentecost sandstones back to Wyndham. And what struck me was that the Kimberley, now, is a bit like the Alligator River area was about twenty years ago. One of the things that struck me was that very little of the country was actually burnt. You have these kind of tall dry grasses and lots of notices saying 'cattle is grass' or something, although I didn't see any cattle, particularly.

So, there's obviously a different, a totally different culture of land management which, I think, possibly, is more influenced by Perth than it is by comparable northern experience. That's just an observation. You might like to talk a bit about that in terms of the attitude of the pastoralist to fire. But also, what's going to happen in an area like, say, the Drysdale River National Park? Is there going to be any attempt to involve Aborigines in the management of that park? In the same way as is happening more and more in the Top End?

Patrick Green

I think, I don't even have to remind most of you people, other than we've now just had the High Court hearings with Mabo and all that stuff coming on. And the WA State Government is now trying to challenge that, this month in the High Court. We're now in a position to negotiate with who can run the land and how it can be run. Now, the Conservation and Land Management [CALM] there is working with Aboriginal people who are the traditional owners of those parks. We've had a number of agreements. And there are others throughout the State but we're not getting the full say, or not even a very little to say, on how we can run the park other than what's in the legislation, as it is now.

Deborah Rose

Look, I'm just wondering, on the cattle stations that are now owned by Aboriginal people, there in the Kimberley, well, what are people doing? Are they burning those stations? Are they using fire to muster out the cattle? What's happening?

Patrick Green

With fire on pastoral properties, I might add that we do own one, we only use the fire to regenerate the land where we only do once a year and we do it with the season. So, and that really goes on to the bloke that asked the question earlier whether fire can be dangerous or can be used as a resource. If it's used at the right time of the year it can be used as a resource.



My coordinator is Mike Carmody and I apologise he's not here because he just went down to Alice Springs for another conference. But we are all here for the same reason, I guess, and fire is a big issue for us, for everyone. With my job, everyone down in Greening Australia, we do a lot of reproducing and propagation with natural environment and I would like to let you know that fire is a big thing. It's a problem for us, everyone down here and Joe Philomena and I do a lot of propagation work and it affects everyone, of course, with our job too. My people said that we do burn off at the right time of the year because burning goes with our culture, and our language as well, with everything with us. I'm trying to help everyone and, together as a team, I think we should work together about this big thing. Thank you very much.

April, I wonder if I could ask you a question. You talk, or everybody this morning has talked, about burning immediately after the wet season. Having some connection with the pastoral industry, I notice that some of the pastoralists burn during the early part of the wet season after the early storms or if there are early storms in the area. My question really is: does that sort of burning, in the wet season, or in gaps in the wet season, is that part of the traditional burning in the Top End at all, or is it simply not practical because it's never dry enough to burn or too wet to burn at the time? Further, in the Kimberley, certainly in the southern parts, sometimes they do burning in these gaps in the wet season. I'm just wondering if that's part of traditional burning in some cases?

Up in the Top End we're familiar with the pastoral side of things as well as our tradition of burning of country. The burning in the wet season, as you're referring to, when the rains have already fallen, even though the early rain, it does prove fruitless in that the grass is just going to grow again. So, therefore, you'll be having a second burn in the stages when it then does become dry enough to burn. So, during the wet season, you're defeating the purpose. With the Kimberley region, you mentioned; I'm not familiar with that area. So, I can only assume that, in those areas, it's according to the country there, because of the aridness of most of the country there. The areas that I refer to as gorges would be holding water, and by burning it in the dry season it causes the water to be drying out, possibly rapidly. By burning it in the wet season, they will remain fresh and alive and with plenty of water to feed them into the drier parts of the oncoming dry.

Down in Alice Springs where there's a lot of dreaming trails which cross over, these are really important places. They are so sacred you can't kill animals or even pick plants. And of course you don't burn them. You might burn around them in order to look after them. Do you have that sort of thing up here? Very sacred places?

Pauline Woodie
*Landcare Education
Officer, Greening
Australia*

Andrew Craig
*Department of
Agriculture,
Kununurra, WA*

April Bright

Peter Latz
CCNT, Alice Springs

April Bright

In my talk earlier I did refer to the burning off, in particular, I went into the rainforest because I steered away from going into detailed talk on areas of significance, as I called it. Because some of those talks are just for the ears of your own people. I'm not really sure in what context the Aboriginal people in Alice Springs would be regarding their animals as sacred. So, I can't really answer that question because I really don't know what context it's in.

Patrick Green

I think with that, it does differ from country to country and yeah, people do, do have sacred objects and places they do need to protect and it really depends on the season of whether they can burn or not and you will find in the desert regions, where probably on the edge of the desert region where during the dry the wind is so much there that a fire would destroy anything if you did try to light one.

Linda Ford

Mak Mak Marranunggu

I am a Mak Mak Marranunggu woman from Kurrindju which is where Kathy and April are from. It really amazes me about what perception people have of other people, and one of the things that has been quite outstanding here is that non-Aboriginal people look at Aboriginal people and think that we all have the same philosophy. Marranunggu philosophy is quite different to Patrick's philosophy over in the Kimberleys. Marranunggu philosophy is different to Joe's philosophy over in East Arnhem.

Until Aboriginal people are able to get their skills in western education, to be able to communicate to you about our philosophies, it's really going to be difficult for non-Aboriginal people and Aboriginal people to understand what we talk about for our own country.

When we, when April and Kathy talk about our country we go on that trip with them because we know that country, and there are a lot of things that they talk about that my family and I can relate to, but Joe and Patrick mightn't be able to come on that trip with us because their country is different. The terrain, the geographical area are completely different. The ways that we were taught by our elders are different. They might have some of the groundings that are the same but they are still different and this is what non-Aboriginal people need to understand. They don't blanket us all with the same brush. And that's all. Thanks.

Kathy Deveraux

Mak Mak Marranunggu

Are there any more comments or questions?



I just wanted to make one point in response to Rhys's comment about the Kimberley. He went as far north as Drysdale River. I don't think the gulf is quite as wide as Rhys's comment would suggest. If he'd gone a little bit further north, onto Theda Station, for example, we see a station where fire is being used in a very patchy way which may be similar to traditional patterns. And they are raising cattle up there quite satisfactorily on that basis. So, there are pastoralists up there who are willing to try and are, indeed, enthusiastic about the use of fire in pastoral operations. I just wanted to try and put that in as a slight balance to the idea that pastoralists are hostile to the use of fire. What some of them do worry about, further south particularly, is this indiscriminate burning we've all been hearing about, in that all their dry season feed can be lost in a matter of a few days. So, there's a great divergence about how to control that fire up there amongst the pastoralists but, in some areas, at least, the sort of patchy use of fire every couple of years is becoming a quite acceptable and, apparently, sustainable way of running cattle. Thank you.

Andrew Craig

It would be good if they could use a local Aboriginal knowledge when to use fire.

Patrick Green

My cattle down at the Nhulunbuy area near road highway from Nhulunbuy, to Nhulunbuy and some of them drive from Darwin to Nhulunbuy, and my cattle that last two or three weeks ago, somebody, the people, you know, that highway driving back and forward from Nhulunbuy to Darwin and my cattle, the grass burnt for the cattle. I don't know, somebody thrown out the fire on the grass and they burn, all sent the cattle running around. That bit I worry. I'm to protect that country nearly half way to Caledon Bay and to Nhulunbuy. That area belongs to the cattle and I worry about somebody lighting a fire and burning all over the place.

Joe Yunupingu

A tropical Queensland perspective

Peter Stanton
Queensland Department of Environment and Heritage

My perspective has developed from that of a grass-roots field operator, through that of minor research effort to senior administrator. These days my role is one of active field work once again. I will confine myself to the most pertinent observations of the last ten years of my career.

In tropical Queensland we are dealing with climatic zones changing from the arid to the super-wet, but I will largely confine my comments to the plus 1500 mm per annum zone of north-east Queensland, ie Cape York Peninsula and the wet tropics.

In the plus 1500 mm rainfall zone, massive habitat changes, largely related to decreasing fire incidence, have taken place in the last 100 years, with demonstrable widespread and massive change in the last 30 years. Grasslands have mostly disappeared under shrubs and trees, and open sclerophyll communities have changed to closed forest. It is the rate of change that is of concern here, not change itself, and management actions are directed at stabilising the situation to preserve future options. Of prime importance is to reintroduce fire to those systems that will still carry it.

These changes are leading to loss of biodiversity. Sclerophyll habitats are disappearing and, at least in the short term, simple closed forest systems are often replacing more species rich sclerophyll ones. Studies on two prominent bird species are indicating that they are likely to be disadvantaged by these changes, and no doubt there are other species facing similar problems. The palm cockatoo is losing the open nesting habitat it requires, and the cassowary utilises some sclerophyll habitats at critical times of the year.

Another significant change in the wetter belt, which is peculiar to northern Cape York Peninsula, and again the result of decreased fire incidence, is the invasion of sclerophyll forest by dense stands of cypress pine which often pave the way for a later expansion of rainforest.

The most difficult of all habitats to manage in north-eastern Queensland are *Melaleuca* communities of all structural types and species composition, and grasslands. *Melaleuca* habitats provide particular problems in relation to understanding their complex ecology. They can behave as a fire-sensitive community or an invasive woody weed. *Melaleuca* swamps can burn much



earlier in the season than surrounding drier communities, and even large trees can be killed by fires that burn when the ground is dry.

Most of the grasslands are under threat from shrub and tree invasion, and often the invaders are *Melaleuca* species. In Eubenangee Swamp, for example, the last remaining native grassland of the wet tropical coast is being progressively replaced by *Melaleuca* forest, and this process continues in spite of 14 years of active fire management. On the marine plains of Princess Charlotte Bay, and in many other places throughout the Peninsula, *Melaleuca viridiflora* woodlands are replacing grasslands at an enormous rate by a process of episodic invasion. Research has shown that this has severely disadvantaged the threatened golden-shouldered parrot.

At both Eubenangee Swamp and in the case of the golden-shouldered parrot, research and observation is indicating that the appropriate time to burn to halt this invasion is the early wet season. This, of course, is not a time of year we have favoured in the past, and creates logistic problems that we yet have to face. Certainly it is clear now that the golden-shouldered parrot requires these storm burns, in part, to provide access to seasonal food supplies.

It is possible to pass clear judgement now that throughout the 1500 mm plus rainfall belt our burning programs have generally been too early in the year and too mild to stabilise habitats against rapid change. To achieve stability this will require a change in style of operations to allow progressive burning throughout the remainder of the year after the wet season has finished, and there will have to be the determination to deal with the public relations problems that late season burning operations can bring.

Interestingly, research and observations indicate that the significant benefit of fires late in the year does not come from the heat they generate. Indeed they are likely to be very destructive of tree cover without influencing the progress of shrub invasion if they are carried out at low soil moisture levels. Their habitat effects are likely to come from the way they change the competitive balance between grass and sedges, and shrubs.

The complexity of the *Melaleuca*-grassland problem is highlighted by observations in the wet tropical ecosystems of Eubenangee Swamp National Park. There, the *Hemarthria*-dominated grassland community suffers large patch deaths after about three years without fires. These seem to be caused by a fungal disease that builds up in large accumulations of dead grass. The dead patches are then replaced by clumps of sedge, largely *Cyperus lucidus*, which develops to maturity with much bare ground between the clumps. This, plus the fact that the sedgeland is more difficult to burn, facilitates the invasion of *Melaleuca quinquenervia*.

The problems of the grasslands and *Melaleuca* invasion have highlighted that the key element in using fire to achieve habitat management aims is flexibility of operations. Rigid systems that prescribe time of year and style of operations must give way to those that give room for rapid decision and actions to take advantage of varying seasonal conditions.

This is particularly so in the wet tropics where any month can vary from very wet to very dry. Even in the drier part of the region where seasonal conditions are more predictable there needs to be room for much more late season burning than we have practised in the past. This can only occur if security is guaranteed by a mosaic of burn patterns built up progressively during the year.

Flexibility also means avoiding, where possible, reliance upon firebreaks and firelines. These can, apart from their relationship to rigid prescriptive burning, be very destructive to soil and habitat values. Indeed our monitoring of two large parks with similar habitats has shown that the less structured approach to fire management has had the same end result in terms of frequency of burn and the establishment of a mosaic as the more expensive, relatively highly structured approach based on extensive firebreaks and roadside burns. The extent and control of wildfire on both parks have had a similar history.

The demands of flexibility will also mean that, where it is not possible to have access to a helicopter or aeroplane at short notice, then reliance on an aerial incendiary program for the bulk of our operations will have to be avoided.

Our easiest habitats to manage with fire are the heaths and spinifex grasslands. Both tend to behave in similar ways but as our experience with spinifex is limited, and there is little of it in the north-eastern tropics, I will confine my attention to heath. Unlike some of its neighbouring communities in the high rainfall belt, heath does not appear to change irreversibly with time, so the determination of a minimum frequency of burning, related to its regenerative capacity, is the most important long-term consideration. Except in relationship to controlling the extent of any one burn, it is pointless to worry too much about the severity of any particular fire. In terms of species regeneration, the cooler burns are likely to be inimical to diversity, and experience has shown that even in the severest wildfire events a relatively small scale patchwork with significant unburnt areas will result.

In terms of on the ground operations a quite unstructured approach can be used to create a mosaic pattern in heathland. Strong winds can be taken



advantage of to drive fires to produce almost linear breaks, and variations in fire intensity in relation to varying wind patterns, topography and diurnal changes are very productive of complex mosaic patterns of fuel.

The difficult side of burning heath communities is the political one, particularly in more settled areas. Heath fires can burn intermittently for a long time, and invariably result in a lot of smoke and total canopy scorch if not reduction of the community to bare ground and sticks. It is generally difficult to convince the community that they should accept such events with calmness.

Continuing on this vein I have come to the conclusion that the most desirable fire events from all aspects of management are those which are lit with the minimum of fuss, and then proceed to trickle around for days, or even weeks. I would qualify this by saying, however, that it presupposes an existing mosaic of fuel types, without large areas of heavy fuel load and an environment where weather patterns are unlikely to change significantly during the course of the burn. Such pre-conditions regularly exist in north-east Queensland where a humid easterly air-flow is predictable. I doubt, however, that it would be an option in southern Australia. Most particularly in rugged country, such fires can produce an extraordinarily complex mosaic of burn patterns influenced by changing time of day, topography and wind. I should also hasten to add that it assumes that all questions of possible threat to life and property have been dealt with.

The wet sclerophyll forests of the wet tropics of Queensland provide a fire management problem that is shared by equivalent communities throughout Queensland. It is a problem that many will deny the existence of, and to which we have no answers. I have not placed it in the same category of difficulty as the *Melaleuca* communities, because the options for its management are not as complex. It can be described as a narrow belt of very tall forest, usually dominated by *Eucalyptus grandis*, and fringing the rainforest. It demands the same soil as rainforest does, and in the absence of fire will eventually be replaced by it. Except where it has a grassy understorey, fire is not a regular feature of it, yet without fire it will not regenerate. A problem arises in that most of this community is in a condition where fire will only penetrate it under the most severe climatic circumstances. We cannot therefore easily conceive the circumstances in which the deliberate introduction of fire might be politically possible. This ecological community is vital to the survival of some species of arboreal mammal, and understanding its management requirements is perhaps Queensland's most urgent fire research problem. The passage of time, as it changes ecosystems irreversibly, is rapidly leaving us bereft of options in this community.

Where rainforest has a direct interface with dry sclerophyll forest, without a wet sclerophyll buffer, we began our fire management by assuming that we had a sensitive interface that needed particular care. We then, considering the huge length of such interfaces in the region, began the daunting task of guaranteeing their safety by lighting all our early burns along their margin and late in the day. Fortunately experience has proven that such care is not necessary as only the severest wildfires will penetrate the rainforest margin to destroy it. Most of our early fires are not effective in preventing an expansion of that margin at the expense of open forest where soil conditions are right.

Leaving the wetter country, it has been interesting to observe in the 600–800 mm annual rainfall areas that some *Acacia* communities are as sensitive to wildfire as rainforest, and that management to protect them from wildfire, preferably by intensive fire management of the intervening areas, is essential. The *Acacia* communities most at risk from wildfire are brigalow (*Acacia harpophylla*) and lancewood (*Acacia shirleyi*).

In most of the parks of north-east Queensland, the use of fire has been an essential tool, and sometimes the only option available to us, to control or eradicate a range of exotic weeds. In every case success has depended in part or whole on the absence of grazing pressure. In that regard it has been interesting to observe how the area occupied by some weeds has stabilised or regressed upon the removal of grazing pressure alone.

Rubber vine, arguably tropical Australia's worst weed, is gradually succumbing on Lakefield National Park where it has been possible to get enough fuel build-up after destocking to carry a hot late season fire. With regular fire management of an increasingly healthy ground cover since the removal of stock in that park, rubber vine has not occupied new areas in the last 10 years, and has actually shrunk in total range in that time. It remains, however, an intractable problem where fire cannot penetrate, such as large gaps in the margins of gallery forests.

The worst weed of the wet tropics is pond apple, a species of *Annona* from southern USA which is invading lowland *Melaleuca* forest. It develops as a heavy understorey and prevents the regeneration of the *Melaleuca* species as well as destroying many ground cover species. The fact that it is much more sensitive to fire than the *Melaleuca* species is used to control it. The timing and intensity of the fire is critical. In the presence of this weed, long exclusion of fire from *Melaleuca* forests to the stage where all ground cover species have been shaded out and fire will no longer carry through them, is their death knell.



The ubiquitous weed, lantana, will eventually dominate the understorey in many of the higher rainfall forests of coastal Queensland. Once there it eliminates other species and appears to change the soil environment in some quite radical ways. Once it dominates it will only burn under severe weather conditions and with an intensity that is very destructive to habitat. At earlier stages of invasion, however, while it is confined to scattered clumps, it can be removed by repetitive fire. Where this weed is prone to invade, the maintenance of a fire regime in the sclerophyll communities is essential.

Very little that I have mentioned to this point, it will possibly be noted, is drawn from the experiences of traditional burning practices. This is not because I do not value such practices, but because of the peculiar circumstance of high-rainfall north-east Queensland. The long withdrawal of traditional burning practices has allowed radical changes to occur in the structure and the floristics of large areas of habitat. The re-establishment of traditional practices is no longer possible. Even where fire can be reintroduced to the system it will not revert to an earlier state because of the loss of a majority of ground cover species in particular. It will change to something different again, but in an unpredictable manner.

Its evolution will also be influenced by the presence of exotic animals and plants. Their presence, in fact, will make the long-term continuation of traditional practices impossible, even where the habitat has retained much of its pre-European structure and diversity.

To travel the habitat management pathways of the future will require the best of both traditional knowledge and modern methods of scientific enquiry.

Fire in the desert

Increasing biodiversity in the short term, decreasing it in the long term

Peter Latz

Conservation Commission of the NT, Alice Springs

I hate machines, like this slide projector. I'd much rather be out in the bush showing you what's going on.

Peter Stanton and I met halfway between Queensland and the Northern Territory and when we first met we thought we were both quite mad! Because everything he said was the exact opposite of what I said; but, in fact, now we've known each other for quite a while we realise that what goes on in Queensland is almost the mirror image of what happens in the Northern Territory. Everything is opposite.

I guess it all boils down to grass. I mean, that's the only thing the desert and the Top End has got in common, and grass is bloody important when you're talking about fire.

I grew up at Hermannsburg. As a kid I was brought up by Arrernte women and I had Arrernte playmates and I learnt about fire. Fifty years I can say I've been lighting spinifex, so I'm a bit ahead of you Peter! And I had the world's best pyromaniacs to teach me. The unfortunate thing for the Arrernte people is that in the desert, short-grass is very precious! Short-grass in central Australia is very sweet and you can grow very fat cattle quickly. It's short, but it's sweet.

Aborigines learnt quickly that if you burn short-grass, pastoralists get very upset. So, they thought they could use that to get rid of the pastoralists but they quickly learnt differently. Natural selection took over because what happened is they got shot. So, any of the good Arrernte burners were shot out of existence and so there's really no good Arrernte burners left. Natural selection has taken care of that.

So overall, we have too much grass in central Australia and it's mainly a very beautiful plant, spinifex. The amazing thing, believe it or not, is that it can live on the smell of an oily rag. It can grow out of boulders. And that's how it survives. It beats everything else by somehow managing to live practically off fresh air.



Unlike the *Sorghum* up here, in the Top End, it doesn't go away. It accumulates. Even termites will only eat it when it's about fifteen years old. So, even though we don't get much rain you can get fifteen years worth of growth and fifteen years worth of fuel before it starts reducing. This is very different to the *Sorghum* situation. So, spinifex doesn't go away.

As I said, it hangs around. There's nothing will eat it except a little ant, although it doesn't eat it directly. The ant uses the sticky substance from the spinifex to cement sand grains together and make cowsheds. There's little sucking insects in here which are sucking the sap out of the spinifex and the ants feed off that sap. So, this is the only animal I know that lives entirely on spinifex. But there is one thing *that will* eat spinifex. The thing that'll eat it is ... fire. You can say that spinifex is dependent on fire for its very existence.

Now, I'll go through this photo sequence here. Here you can see recently burnt spinifex, straight after the fire – bare ground (Plate 1). The spinifex is totally gone. Here it is, six months later after we've had a good rain on it (Plate 2). Now, the important thing is there are lots of annual plants present. I'll talk about them in a second.

Two years later we end up with this situation where the spinifex is coming back in. You can see that the earlier plants are dying out (Plate 3).

And at eight years you're back to spinifex again and you can see that's ready to burn again (Plate 4). Just how soon it's ready to burn again will depend entirely on rainfall. It's got nothing to do with time. In the desert you cannot predict when you're going to have to burn. It's got nothing to do with time. It's got everything to do with rainfall because you can have thirty inches in one year or you can have thirty inches over ten years.

Okay, now, the Aborigines were well aware of this and they burnt the spinifex in such a way that they produced this fire-weed – desert raisin. Through firestick farming they managed things like this *Solanum*. This is the same family as the potato or the tomato. Bloody good tucker! And it comes up by the acre after a fire so that you can wander around here and collect this stuff very easily. The beauty about it too is that in the desert the fruit doesn't rot. You can come back a year later and that nice, dried fruit is still hanging on the bush. Okay? So, there is no doubt at all that Aborigines burnt spinifex to produce these wonderful gardens because not only do you get food but you get this thing here pituri (*Nicotiana*) – the native tobacco which gives you stimulation as well. One of the main reasons for burning a lot of the country was to produce drugs!

Yeah. It's a fireweed, pituri. You can trade anything with this, anything you like. It's even more valuable than grass in central Australia.

So, the Aborigines had a very good system. About a third of their food, I would say, came from this system of managing the land. Yes. So, they used firestick farming to produce this mosaic of country at different ages. On this photo you can see that this area down here has been burnt about a year ago (Plate 5). The area behind hasn't been burnt for quite a while. This recent patchy one was lit by Aborigines creating their garden, right. So, after the next rain you'll have new growth in this recently burnt area. You'll have two year old tucker back in here. Way back in the distance you can see some dark stuff here, some mulga, which is fire sensitive, it didn't get burnt and it produces a whole range of different foods. So, you end up with this lovely mosaic, giving you lots of different tucker.

The trouble is, as I said before, spinifex doesn't go away and you can get, as we have in the Tanami desert right now, ten years of accumulation of spinifex. We're talking about atomic bomb energy! Sitting there ticking away. Tick, tick, tick. Some of these fires are so big they have created their own cloud. When CSIRO were doing experimental fires, they managed to produce a hail storm out of a clear sky just using one match!

So, fire in spinifex can be very dangerous when it intrudes into other communities. In the hills, for example, the fires can be so hot that the rock will just explode, it's called exfoliation. You can tell where the hot fires were in the past just by looking at the rocks. The worst thing about a severe fire is that it bares the ground and after a hot summer fire you're likely to get a heavy rain afterward and the soil just washes away. Of course, soil is the most important thing for plants, and this is where the fire has its effect! It's not killing the plants. We all know that every plant that lives in Australia, except in the wettest parts near Cairns, has to be fire tolerant to survive because Australia is the driest, or second driest continent on this planet. When you lose your soil, you're in trouble and that's the main effect that fire has in central Australia and that's where the long-term changes occur.

After a big fire on the spinifex sand-plain country you'll get sand blowing all over the place. If you don't get rain for years afterwards that sand will eventually form into sand dunes! But the spinifex doesn't care, it is superbly adapted to fire. Just the same as your eucalypt grassland up here is. No problem with it.

But it's the fire sensitive species like mulga that die, unlike the mallee, which regenerates beautifully from the base. So, even though in spinifex country we



increase our biodiversity by this burning system, we are losing fire sensitive communities when the fire expands out of the spinifex into communities like this rare *Acacia* (*Acacia ammobia*) that grows near Ayers Rock (Plate 6). As you can see, this *Acacia* is happily growing on the sand dune crests and there's nice thick mulga down here in between the dunes. Lovely, thick vegetated country for a desert. We are looking at low rainfall country.

Another rare *Acacia* grows in the hills. *Acacia undoolyana* occupies only a few square kilometres of the desert. In the photo (Plate 7) you can see where a fire came through, came racing up the hill here, took away all but these few trees. You can see the dead stumps poking up here everywhere else. Regeneration is happening but the spinifex has got in and affected another rare plant that grows here – it's got a great name this one – *Ricinocarpus gloria-media*! Well, I'm afraid it's glory is short lived because it's on the way out. This plant is now extinct in that area in the photo. It's gone. The spinifex has just got rid of it.

But it's not just the plants that are suffering! Now, in central Australia we've had the world's greatest extinction of mammals. Nowhere else on this planet have more mammals disappeared. And we are talking about one of the biggest areas of wilderness left on the planet. Two-fifths to three-fifths of Australia!

In central Australia the brush-tailed possum is incredibly rare. Simpson's Gap, one of our national parks, is one place where the possum is found. The spinifex is lurking, just waiting to come in (Plate 8). You could call the area where the possum lives a bit of desert 'jungle'. You can see that there is a big mixture of plant species living here. It is a beautiful diverse bit of country! And, of course, if you're a possum, you've got a hell of a lot more choice of food here than you have in the spinifex. I don't think you need too many neurons to work that out. And, of course, that spinifex will destroy this given half a chance.

We have now burnt a firebreak to stop the spinifex taking over and to keep the possum safe.

So, what are we doing to stop spinifex taking over? We've got rangers who love burning spinifex, spinifex can be burnt quite easily, much more easily than the vegetation in Queensland. (Except for the heath, of course.) And what we're doing produces a situation where you've got a fire sensitive community protected by just burning firebreaks all around to keep the spinifex out.

Okay, what about traditional Aboriginal burning? Well, we can learn a hell of a lot. They are out burning the Tanami desert now. They know what they're on about. The trouble with watching Aborigines is that an expert makes things look easy. You know, to watch an Aboriginal burning, he does it in such a way it looks as if he's just throwing matches around. But we've heard earlier on about how you've got to know what you're on about. It's like watching a butcher! You watch a good butcher boning out meat, the meat just falls off the bone! But it's only years and years of experience that make it look easy. And it's the same thing with burning the country.

The only trouble is, as mentioned earlier, once your burning system has been stopped it is one hell of a job getting it back again! This is what Peter and other people have talked about. An area in the Mann Ranges in South Australia has now had three fires through it. This last one was lit by Aborigines but they didn't realise the problems that occur when the fuel had built up. They had been away from their country in the past and the system had broken down, so this hill got burnt three times in 20 years. A whole lot of figs, which are sacred in this country, were burnt out of existence and the rock wallaby which is practically extinct on this range, has lost some of its tucker.

The other problem, of course, is we've got all these bloody introduced animals in central Australia. The rabbit has taken over a huge amount of country. You see the burrows in this photo (Plate 9), the rabbits didn't dig these burrows! These were dug by a rat kangaroo. Rabbits are actually not really good diggers. These underground houses were made, ready-made for the rabbits, by this beautiful little marsupial and as the Aborigines said to me, 'The rabbits came along and said - 'can we share your house?' and the marsupials being good generous Australians said - 'yeah, you know, help yourself'. But the trouble is, rabbits are greedy and they took over - took over the whole lot.

Now, the worst thing is not only have they extincted this poor little rat kangaroo that initially made this warren. They are now fluctuating out of control. In many places where a bad fire went through and killed the mulga, plenty of young mulga came up afterwards. Okay? And Aborigines are used to that. They know that if a patch of mulga gets burnt just make sure it doesn't get burnt again during the next ten years. No worries, it'll come back. But the rabbits came along and they actually ringbarked the young seedlings. It's something to do with sharpening their teeth. Even when there's a tonne of tucker around they still kill woody seedlings. I think they just don't like shrub country. They like open country. So, the rabbits have completely stopped any regeneration.



And, of course, cows, well we all know that cows have changed things. And, of course the problem too is fences in central Australia. If Aboriginals want to do traditional burning on cattle country wooden fences will burn down. You've gotta have steel fences, don't you? But see, cattle, in fact, are causing the opposite to what happens with rabbits. Because they take away all the grass you rarely have any fires now. Because there's no grass left. And what we're ending up with is shown in this photo (Plate 10). I grew up here, this is my country. That's the Finke River, the oldest river in the world. I used to be able to stand on the bank here and look right up to the hills ten miles away. Look at it now. It's thicker than most of the bloody country you've got up here in the Top End with five times our rainfall! And this is because this hasn't been burnt for a hundred and ten years. The first missionaries that came up here said, twenty years after they had been into the country, they said – 'The country is now getting thicker because the cattle are eating away the grass and Aboriginal fires are no longer occurring.'

We've not only got introduced animals but we've also got introduced plants. There is buffel grass, another bloody invasion. This perennial grass is great for cattle but it produces twice as much fuel as the native species it's replaced. The river red gums which are the biggest and the most important trees in central Australia, many animals use them for nests and for shelter, buffel grass is now killing the tree. The native grasses would have only produced about half the fire intensity and the tree would have survived that fire. And buffel grass always thickens up after a fire – it loves it.

There has been another big change as well. The Arrernte people, for example, have important sacred sites where lots of Dreamings meet up with each other. These places were like, you know, the biggest, the most wonderful cathedral in Australia. And, of course, they were also the best places for recolonisation. There's a place called Running Waters, the best waterhole in central Australia, which was an absolute sanctuary. The waterhole runs for about four miles. Pelicans breed in it. It is now utterly stuffed! It was the very first place that white people came in and unwittingly put all their cattle. In other words, it's as if the whites came up here, found the cathedral and then went and shat on the altar! And burnt the vestments.

But this system of sanctuaries is now broken down. In the desert you've got to have this system because you have really bad droughts and so on. You've got to have a sanctuary from where your animals can expand back out after a drought. Not a single animal was allowed to be killed in this area. Not a single plant was allowed to be picked. These sanctuaries were scattered all over the landscape – wherever there was important Dreaming there was a sanctuary area.

Now, these are the main reasons why we can't go back entirely to Aboriginal traditional burning. But there's also another important factor. (I suppose you can call me a scientist, but having been brought up by Aborigines I'm probably more of a naturalist.) But there's one thing that scientists are on about! Aborigines are, well in my part of the world anyway, were the world's best natural historians, but the big difference between natural history and science, is that science in a lot of important cases is anti-common sense.

Now, I've got a gun, okay, a high powered rifle, I'm standing on a flat plain, I've got a bullet in one hand and a bullet in the gun and I shoot the gun and I drop the bullet at the same time. Which bullet is going to hit the ground first? They both hit at the same time! I mean, that is anti-common sense. You would think the bullet that is going ten kilometres would take longer to hit the ground. Now, evolution is like that. When you think about it, it doesn't really make a lot of sense. Animals evolve, become successful only if lots of them die. It's called survival of the fittest.

So, a lot of important scientific principles at first don't seem to make a lot of sense. That is the big difference between natural history and science. We were able to get onto the moon because science has made big breakthroughs by teasing out these anti-common sense laws. The only problem with this is that us scientists are so used to dealing with anti-common sense things that when you put most of us into the field we're often not very practical. What we have to do is combine together. Get the world's best naturalists and the worlds best scientists, put 'em together and you've got a winner. Thank you.







Plate 1. Spinifex (*Triodia pungens*) sandplain south of Alice Springs, recently burnt (Peter Latz/CCNT)



Plate 2. Same area, six months after the fire (Peter Latz/CCNT)



Plate 3. Same area, two years after the fire (Peter Latz/CCNT)



Plate 4. Same area, eight years after the fire (Peter Latz/CCNT)



Plate 5. Aboriginal burning (red-brown areas) giving mosaic of burnt/unburnt spinifex sandplain (Peter Latz/CCNT)



Plate 6. *Acacia ammobia*, rare shrub near Uluru (Peter Latz/CCNT)

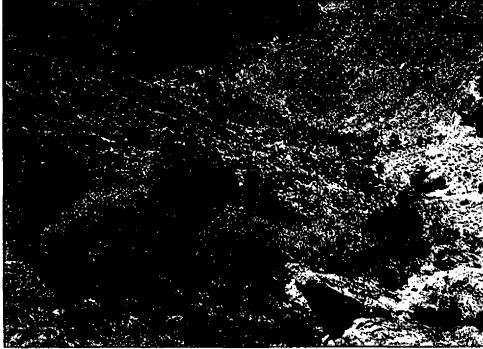


Plate 7. The rare shrub *Acacia undoolyana* (with darker foliage native pines) in foreground, regeneration after fire below (Peter Latz/CCNT)



Plate 8. Possum habitat near Alice Springs – note spinifex encroaching on top right (Peter Latz/CCNT)

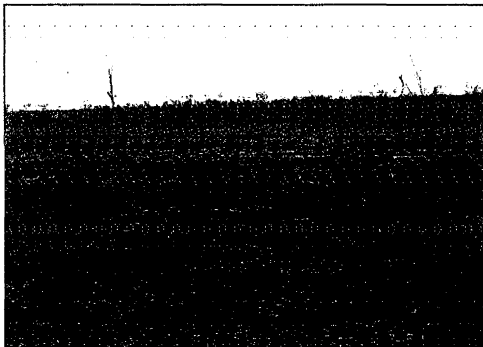


Plate 9. Rabbit warrens with dead mulga in background (near Tomkinson Range, northern SA) (Peter Latz/CCNT)



Plate 10. Dense shrub growth above Finke River, north-west of Hermannsburg (Peter Latz/CCNT)



Plate 11. Frillneck lizard descending to the ground in search of food after fire (photograph courtesy of David Curl)

We like our lizards frilled not grilled!

The short-term effects of fire on frillneck lizards in the Top End

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Fire is an important environmental factor for many lizard communities within Australia and elsewhere. Fire creates a mosaic of habitats within environments and this may be crucial in the maintenance of species diversity. This relationship varies from tropical to temperate environments in Australia. The majority of research on fire and lizards has been done on lizard communities in temperate and arid regions, where fire is generally of low frequency. And it is the number of years between fires that is important in determining the structure of the habitat, which in turn determines the composition of lizard species. Here, in Northern Australia, the higher frequency of fire does not allow this change in habitat structure to occur. Rather, it is the time of year and related intensity of fire that is important in determining composition and abundance in lizard communities in tropical environments (Braithwaite 1987, Trainor & Woinarski 1994).

In contrast, relatively few studies have investigated the short-term effect of fire on the ecology of a single species of lizard. Fire increases the accessibility of food for some birds in the Top End, by increasing the amount of open ground (Braithwaite & Estbergs 1985, Woinarski 1990). The primary aim of this presentation is to document the behaviour and short-term effect of tropical fires on a single species of lizard. This will allow firm conclusions to be made about the direct effect of fire on a particular species of lizard, and better our understanding of the role of fire in Australia's tropical savannas.

The species chosen for this investigation is the frillneck lizard, *Chlamydosaurus kingii*. It is arguably one of the most recognisable members

¹ Tony Griffiths was unable to attend the Country in Flames Symposium but submitted the paper he would have presented.



of Australia's rich lizard fauna. However, only one study of its natural history has been published (Shine & Lambeck 1989). This study revealed an arboreal, insectivorous lizard that is active during the wet season when it reproduces, but the study was unable to establish the behaviour of the lizard during the dry season as they become very hard to locate. Researchers have recently established that during the dry season frillneck lizards decrease their field metabolic rate, water turnover and body temperatures (Christian & Green 1994, Christian & Bedford 1995). A general reduction in activity and feeding, and the selection of large *Eucalyptus* trees occurs during the dry season (Griffiths 1994). This period of relative inactivity of frillneck lizards coincides with the majority of fires in this region. In addition to this, the distribution of frillneck lizards extends throughout the open forests and woodlands of Northern Australia (Cogger 1992), which are burnt on a very regular basis.

This study was carried out at the CSIRO's Division of Wildlife and Ecology Kapalga Research Station in Kakadu National Park. Frillneck lizards were monitored during a number of early dry season fires (low intensity) and late dry season fires (high intensity) that were lit by CSIRO as part of a landscape scale fire experiment. By attaching small radio transmitters to the base of the lizard's tail, individuals were able to be monitored before, during and after these two types of fires. Another sample of frillneck lizards were captured and stomach flushed one week before and one week after fires to determine changes in their diet.

Frillneck lizards are arboreal animals, spending over 95% of the time in medium to large trees. This is where they were located immediately prior to prescribed fires being lit. The majority of lizards remained in the same tree during the early dry season fires. The low flame height (usually less than 2 inches) did not pose any direct threat to the lizards as no mortality was recorded. One lizard (out of 17 monitored) lost a number of toes during a fire, and this reduced its chances of survival. The lizards that changed their positions moved to nearby trees and were clearly not affected by these fires. The response to the late dry season fires was considerably different in comparison. Approximately 30% of the monitored lizards died as a direct result of the late dry season fires. The lizards that survived these fires moved to larger trees or sheltered in disused termite mounds on the ground. The disused termite mounds offered excellent protection from the flames by being hollow and having well insulated walls. The lizards stayed in these shelters for up to 30 minutes, then climbed back into a nearby tree. Some lizards that remained perched in large trees during these fires received minor scorching to their frills, but this did not have an adverse effect.

A comparison of the diet of frillneck lizards before and after fire produced some surprising results. The volume and diversity of their stomach contents increased after fire. This increase was considerably greater after the late dry season fires compared to the early dry season fires. Interestingly, the number of items did not change, but the average size of the insects eaten increased after fires. This suggests that the lizards were able to see larger prey because of the removal of the ground vegetation by fire. The frillneck is almost exclusively a 'sit and wait' forager. That is, it remains perched on a vertical tree trunk approximately three metres from the ground, and using its excellent eyesight, waits for insects to pass by. Clearly, the removal of ground vegetation would assist this foraging behaviour.

A large patchwork of burnt and unburnt habitat is left after the early dry season fires. The frillneck lizards fitted with transmitters were monitored in the weeks following fire to determine if any preference was exhibited for either burnt or unburnt habitat, or conversely whether selection of habitat was not influenced by fire at all. The majority of lizards located in burnt areas remained in these areas. The lizards in the adjacent unburnt habitat moved into the burnt habitat over a three week period. This clearly indicated that these burnt areas were actually favoured by frillneck lizards. The greater accessibility of food after fire must be considered as an important factor in the selection of burnt habitat by frillneck lizards.

Fire does affect the ecology of frillneck lizards. What is important in this presentation is that the different types of fires have different effects. Frillneck lizards are able to survive the early dry season fires, and they use the burnt habitat to obtain more food. The mortality of frillneck lizards is much higher during the late dry season fires, and the sheltering behaviour is much more drastic. The lizards that survive are able to consume more food. The effects shown here are very much in the short term. Frillneck lizards are able to live for up to six years, and the mature adults in the population studied would have been exposed to six separate fires in their life-time, therefore fire is only a relatively minor event over a number of years. The prolific regrowth in the wet season erases most of the effects of the previous fires and acts to decrease any potential longer-term effects of fire. The potential danger for frillnecks is that a high frequency of late dry season fires may reduce the population to an unsustainable level. However, the migration of lizards from adjacent unburnt habitat is an important factor for analysis of population dynamics.

The management of the frillneck lizard in respect to fire is fairly simple in the light of current burning practices used in the Top End of the Northern Territory. A range of fire regimes creating a mosaic of habitats allows the



preferred open areas to be used and allows unburnt areas which act as a possible source of immigration if mortality is high. The avoidance of extensive late dry season fires is suggested in the light of these results.

Acknowledgments

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A healthy savanna, endangered mammals and Aboriginal burning

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Introduction

Tropical savanna is the first child of the wet-dry tropics. The extreme alternation of wet and dry seasons produces the savanna vegetation (eg Frost et al. 1986, Mott et al. 1985). Other vegetation types are largely the result of extra water accumulation at particular places in the landscape, either as surface water at low points in the landscape or as groundwater where the geology and geomorphology allow water to return to the surface. In the wet tropics where rainfall is relatively evenly distributed over the year, rainforest is the dominant vegetation type.

In many parts of the tropical world, rainforest has been cleared and/or been changed by frequent burning. This may result in a derived savanna vegetation, one which will gradually return to rainforest if kept free of fire. It is from such situations that data have been collected from Africa and South America (eg Gillon 1983, Medina & Huber 1992). In contrast in Australia, the area of wet tropics is very small in comparison with the vast area of wet-dry tropics. Consequently the vast Australian savanna area is not a rainforest waiting to develop if only people would stop burning (eg Bowman et al. 1988). For example, the present area of monsoon forest (the local rainforest/closed forest type) in Kakadu National Park is only 0.5% of the northern Stages I and II. Studies of Russell-Smith (1985) suggest that in the wetter times 5000 years ago it might have been four times as widespread as at present – still only 2% of the area.

A wet-dry tropical climate not only makes the survival of rainforest trees difficult but predisposes the vegetation to fire. An annual period of productivity during the wet season inevitably produces growth which dries out and becomes flammable during the dry season. The wet-dry tropics have abundant lightning – the highest annual rates of anywhere in Australia (Prentice 1978). Naturally it co-occurs with the wet season, but is most likely to cause fires early in the wet season when the vegetative fuel is still dry and rain generally light and localised.



As I have pointed out in an earlier study (Braithwaite & Estbergs 1985), the pre-Aboriginal fire regime would have been different in timing from the Aboriginal one which moved the main time of burning to the early dry season rather than the early wet season. Although lightning strikes still occurred after Aboriginal people took control of the landscape, much less fuel is available if considerable burning has occurred earlier in the year through human action. Although the biological impacts of burning at different times are quite different (see below), the point here is that fire has dominated this landscape for millions of years and is not a post-Aboriginal phenomenon of only tens of thousands of years. The fires have, as a result of the wet-dry tropical climate, been annual and must have had a huge impact on the evolution of the North Australian fauna and flora. In other words, fire has been an important evolutionary force for millions of years.

Furthermore, through the consistent high frequency, it has been a rather different evolutionary force from fire in arid or temperate Australia. All other components of fire regime, particularly severity, stratum type, area of fire, and patchiness within the fire area, relate in a general sense to the fire frequency (see Table 1). It is this different evolutionary force which over many millennia has moulded very different life histories and behaviour in relation to fire in tropical plants and animals. Thus the relationship between fire regime and biodiversity in the tropics, at least for the dominant savanna vegetation type, is likely to be fundamentally different from that of temperate and arid climatic regions.

Table 1. A comparison of components of fire regimes in the arid/temperate and tropical climates

Attribute	Temperate/arid	Tropical
Frequency	4–400 yrs	1–2 yrs
Time of year	more restricted	less restricted
Severity	to 100,000 kW/m	to 20,000 kW/m
Stratum	ground & canopy	ground
Area	larger	smaller
Patchiness	less	more

What is savanna?

This vegetation type is the dominant type for the seasonally dry or wet-dry tropics. It covers about 10% of the earth's land surface. It varies greatly in tree and grass cover. Its structural and functional characteristics are primarily determined by plant-available moisture and plant-available nutrients. Fire and herbivory are seen as secondary determinants or modifying factors (Frost et al. 1986).

In Northern Australia, herbivory by native species is low, and in excess of 99% of it is by invertebrates (Braithwaite, unpublished). Cattle raising is only possible in the low fertility native pastures of north-western Australia with nutrient supplementation either directly by feeding supplements or pasture modification (eg Winter 1990). Herbivory contributes substantially to generating heterogeneity in Africa where it is substantial (eg Belsky 1986). In north-western Australia, it is fire which is the main generator of heterogeneity. The principal exception is along the seasonal creeklines where differential moisture availability creates greater heterogeneity than further upslope.

Other vegetation types are primarily the result of accumulation of water in low-lying parts of the landscape (eg wetlands), access by roots to groundwater (monsoon forest), or substrate composition (eg rocky escarpment plant communities). They are small in area and generally fragmented. Percentages of country burned each year are highest in the savanna with a range of 48–71% being measured in Kakadu in different years. The equivalent figures for wetland and rockland (escarpment) are 38–48% and 8–68% respectively (AN Andersen, pers comm)

Savanna in Kakadu is about 65% of the area. In most other areas, there are less rocky and wetland communities and an even greater percentage of savanna. These other vegetation types are islands in a sea of savanna. In landscape ecology terms, savanna is the matrix. It follows from this that management of this landscape is fundamentally management of the savanna.

As a result of this prevailing frequent fire regime and other derived or direct aspects of the environmental context, a range of special features have evolved in the biota of the savanna. Specifically, these include:

1. Low flammability of canopy due to low volatility of essential oils;
2. Non-accumulation of fuel beyond 2–3 years due to termites and high decomposition rates (GD Cook, pers comm);
3. High vegetative regenerative capacity and little regeneration by seed germination after fire;



4. Substantial deciduousness of trees, particularly with trees of pan tropical genera of the middle layer;
5. Great variability between species in timing of flowering and fruiting (RJ Williams, pers comm);
6. Substantial availability of fleshy fruit as well as woody fruit;
7. High synchrony of seasonal leaf flushing between species within major strata;
8. A mixture of fauna of both arid and wet tropical origins with a great seasonal range of breeding times between species of birds, lizards and mammals.

Major gradients in the savanna

The savanna vegetation is far from uniform. There are three major gradients in the savanna. Major attributes of these gradients are listed in Table 2.

Table 2. Correlates of the major gradients in the savanna

Gradient	Scale (km)	Increasing	Decreasing
Coast-arid	10 ³	temperature seasonality inter-year rainfall variation reptile richness mammal species loss immense mammal richness latitude	total rainfall rainfall seasonal mean tree height projective foliage cover plant richness bird richness mammal richness frog richness termite richness
Lowland-rockland	10 ²	elevation endemicity	soil fertility productivity fire frequency
Seep-ridge	10 ¹	plant richness elevation	patchiness mammal richness mammal abundance productivity water availability

From the coast inland

This is the gradient from the wet end (c.1600 mm rainfall pa) to the dry end (450 mm pa) of the savanna landscape. In the Northern Territory, it occurs over a thousand kilometres distance and is the subject of special study under the name of North Australian Tropical Transect (NATT).

From the lowlands to the rocklands

This gradient extends from the wetlands associated with the river floodplains to the monsoon forests, paperbark and other 'margin' communities to the savanna and then to the sandstone escarpment or rockland communities. This gradient extends over about 10–50 km and is complicated and may be broken into wetland-margin, margin-savanna and savanna-rockland gradients, each with its own distinct set of correlates (Braithwaite 1990, Braithwaite et al. 1990). Major soil differences are seen between the fertile black cracking clays of the lowlands, the humic gleys¹ of the margin communities, the infertile lateritic soils of the savanna and the sandy skeletal soils of the rocklands.

Within the savanna, from seasonal creeklines to low savanna ridgetops

This is an altitudinal gradient of about 30–50 m over a distance of 0.5–1 km. The water of the seasonal stream is used by animals for drinking and enhances the period of productive growth during the dry season (Braithwaite 1990).

Finer-scale heterogeneity

Tributaries of the seasonal drainage lines of 5–10 km join in the usual dendritic fashion. These tributaries are <0.5 km and joined by other smaller tributaries and so on. Thus very minor topographic differences contribute to heterogeneity in the savanna.

Savanna plants and animals

At first sight the savannas look as though they are composed of relatively few plant species. The savannas, however, are rich in grasses, particularly annuals. There are many ephemeral herbs, which appear above ground for a brief time, usually in the wet season or early dry season. Further, many of the grasses and woody plants look very similar to others in their group. On a half square km piece of savanna (including a section of creekline), we obtained 70 species of woody plants, 55 species of grasses and sedges, and over 150 species of herbs (Braithwaite, unpublished). Relative to other vegetation

1 A type of grey soil prone to waterlogging.



types in the area, the savannas are rich in mammals, lizards and insects (Braithwaite 1990, Braithwaite et al. 1990).

Fire and habitat selection

In many parts of the world, typically, infrequent but intense fires kill many plants thereby creating opportunities for new species to colonise from seed already present or blown or carried onto site (Table 3). Thus fire may remove a mature forest and replace it with a newly planted young forest. The process of replacement of dominant species is debated (Gill et al. 1981), but it is clear that both the structure and composition continue to change through time over decades and sometimes over hundreds of years. The resources available to animal species changes considerably over time. Thus the habitat changes over the years and the abundance of different animal species changes also. In many cases the animal composition may be totally different at one end of the successional series versus the other. Therefore fire has a clear influence on habitat diversity and the range of species which can be carried in an area of bush. This is the usual model of fire-driven habitat selection seen in arid, mediterranean and temperate climatic regions and incidentally is the subject of most of the literature on animals and fire. Examples include mammals, birds and lizards (eg Gill et al. 1981).

Such a model is just not possible with frequent fires of low intensity. The highest intensity fire we have recorded in Kakadu is $18\,000\text{ kWm}^{-1}$, less than a fifth of that of the fires of highest intensity in southern Australia. Most fires in Kakadu are between $2000\text{--}5000\text{ kWm}^{-1}$ (RJ Williams, pers comm).

Typically the changes in vegetation generated by fire in the tropical savannas are not dramatic and recovery is rapid. Within two weeks to a month, perennial grasses have usually resprouted, new leaves have appeared on the trees, new and prolific suckers have developed on shrubs and the underground lignotubers. This new vegetation is grown from reserves that exist in the plants and can be five times as rich in nutrients as the foliage it replaced. The removal of the old rank foliage also improves the accessibility of many resources to animals, including seeds and animal prey for predators and scavengers. Thus the fire itself and the short-term recovery phases following over the next two months are exploited by many animals (eg Gillon 1983, Braithwaite & Estbergs 1987). Many predators hunt around the fire itself, scavengers clean up any carcasses, granivores find seeds easily, herbivores feed on the new nutritious foliage, insectivores feed on herbivorous insects attracted to the new foliage and so on. Some species find the conditions created by the fires so favourable that they breed during the dry season (eg James & Shine 1985).

Recovery after fire in savannas is typically rapid, however, the nature of the impact and recovery varies with the co-related time of year and intensity of the fire. Thus for the rest of the year, the structure and resource availability of the habitat created by the fire and the short-term recovery of the vegetation remains until the next wet season, and this suits different species to differing degrees. For example, different lizard species survive and prosper to different degrees following fires at different times of year/intensities (Braithwaite 1987).

Similar results are being obtained with mammals in the Kapalga Fire and Water Experiment in Kakadu National Park (Andersen & Braithwaite 1992, Table 4). While there is preference for all experimental fire types (early dry season, late dry season, progressive fires through the dry season [simulation of Aboriginal burning] and no fires set [called natural]) by different species, the preference with some species changes from year to year. This is thought to relate to the strong effect different yearly rainfall patterns have on food resources. In effect, we are examining the interaction between years and fire type or regime.

The other important outcome is the large number of species and indeed total numbers of mammal individuals selecting the natural (no fire) treatment sites. Interestingly, there was no significant influence of any of the four fire regimes on mammal species richness after two years (Braithwaite, in press b).

In addition to the tropical models of fire and short-term changes, and the habitat changes due to time of year/fire intensity (Table 3), resource access opportunities may result from the removal of dominant species of animal. For example, the plunge in population numbers of *Rattus tunneyi* after a very severe fire in 1986 allowed a dramatic period of high survival for *Pseudomys delicatulus*, a species which appears to breed continuously as if waiting to quickly exploit such an opportunity (Braithwaite & Brady 1993). It is also important to recognise that this phenomenon has not emerged during the poorer times of the Kapalga Fire and Water Experiment, again highlighting the importance of the rainfall patterns of the years concerned.

In order to maintain the current intact biota of Northern Australia (eg Woinarski & Braithwaite 1990), it is necessary to maintain the heterogeneity of the savanna. The mammals are the group which appears to be most vulnerable to extinction.

The richness of mammals is positively related to habitat diversity at both canopy and ground levels (Braithwaite, in press a). It is clear that good habitat diversity is essential to their persistence and probably the persistence of most groups and thus biodiversity.



Table 3. Models of habitat partitioning involving fire

Animal selection of habitat created by:	Temporal scale (days)	Spatial scale (m)
Successional seres	10^3-10^4	10^3-10^4
Fire and short-term recovery	$10^{-2}-10^1$	10^3-10^5
Fire intensity and time of year of burn	10^2	10^1-10^2
Disturbance of animal populations	10^2	10^2

Table 4. Responses of mammals to four regimes in the Kapalga Fire Experiment

Fire treatment	Year 1	Year 2
Natural	<i>Dasyurus hallucatus</i> <i>Rattus tunneyi</i>	<i>Dasyurus hallucatus</i> <i>Isoodon macrourus</i> <i>Antechinus bellus</i> <i>Melomys burtoni</i> <i>Trichosurus vulpecula</i>
Early	<i>Trichosurus vulpecula</i>	<i>Rattus tunneyi</i>
Late	<i>Antechinus bellus</i>	
Progressive	<i>Melomys burtoni</i>	
No differentiation	<i>Isoodon macrourus</i> <i>Rattus colletti</i>	<i>Rattus colletti</i>

Aboriginal burning

Burning by traditional Aboriginal people was and is done for a wide variety of reasons (Braithwaite 1991b, see below). Almost all Aboriginal burning was incidental to other activities. If permeated all other activities, it was part of every day. It is integral to traditional life.

Purposes of Aboriginal burning

- Resource management. Burning in order to increase the abundance of desired species.
- Resource harvesting. Burning in order to improve the efficiency of hunting or harvesting of desired species.

- Communication. Setting fires to produce smoke to signal messages to others.
- Protection. Burning of flammable ground material to remove harbourage for snakes and/or cover for enemies.
- Warfare. Fires set to hide advance and confuse or dislodge hiding enemies.
- Diplomacy. Burn off cover to demonstrate goodwill by facilitating approach to others without possibility of hiding weapons.
- Ease of travel. Removal of dense ground vegetation allowing easier passage by walkers.
- Illumination. *Pandanus* was sometimes ignited to illuminate nocturnal ceremonies.
- Demonstration of status and bushmanship. Fire was so integral to almost all aspects of traditional Aboriginal existence, it offered many opportunities for demonstration of skill and therefore enhanced status.
- Education. Children were encouraged to play with fire in order to learn the fire knowledge so essential for traditional Aboriginal life.
- Spiritual cleansing. Smoke and fire are cleansing agents and were used with special sites in a variety of purifying rituals.
- Control of landscape. Ultimately burning gave people control of the landscape, whereby they would not be surprised by unplanned fire and could do particular burning activities as a matter of choice. They were in charge and burning probably came to symbolise being in control. The sight of long unburnt country was disturbing and the sight of well burned landscape was a source of satisfaction.

Future management

Contemporary managers have a wealth of issues to consider (see below) and satisfaction of some may conflict with the satisfaction of others. In other words, compromises will be necessary. The exact emphasis given to the various issues will change with region and types of economic activity conducted there, and it is right that it does so. For example, the rural sector near a city will rate protection of people and property and smoke abatement as a more pressing issue than would a national park where nature conservation issues will be given greater prominence.



Nonetheless, in both cases a strategic approach is needed. The aim should never be to burn all of a region. This would be unnecessary waste. Control of fire in the landscape should always be the aim. With Aboriginal management, control was the outcome, whether it was thought about in those terms or not. Further, that some areas remain unburnt is an important conservation goal (see above). Maximising habitat diversity is a reasonable overall goal for fire management for conservation. It is also in effect the outcome of traditional Aboriginal management. It is in fact to be expected that a long-standing management regime is likely to be what the fauna and flora is adapted to.

Fire management issues

- Protection of life and property
- Greenhouse gases abatement
- Human health
- Nutrient loss and soil erosion
- Conservation of flora and fauna
- Animal ethics
- Preservation of Aboriginal culture
- Aesthetics
- Avoidance of litigation

Conclusion

Heterogeneity is a defining characteristic of savanna and whether viewed from the perspective of fire control or maintenance of biodiversity, its maintenance must remain the keystone of fire management in any landscape dominated by savanna.

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Why the skillful use of fire is critical for the management of biodiversity in Northern Australia

David Bowman
Conservation Commission of the NT, Darwin

Introduction

This paper is divided into two parts. The first section presents the argument in support of my contention that skillful fire management is critical for the management of biodiversity in Northern Australia. The second part considers problems standing in the way of skillful fire management, and philosophical issues associated with the destruction of biodiversity due to a failure to adequately manage landscapes.

The argument

Biodiversity is often defined as the diversity of living things on Earth. But just as it would be senseless to attempt to regulate the global economy by making a collection of all the different coins in the world, so it is senseless to attempt to understand how to *manage* biodiversity by ignoring ecological process and fixating on biological inventories. Both ecosystems and economies are driven by *processes*. In order to *manage* biodiversity one must influence the nature of ecological processes. Understanding processes necessarily involves the consideration of time, particularly rates of change.

A superb example of ecological processes are the consequences that follow the combustion of vegetation by fire. These consequences occur across a wide range of time scales: from events that occur during the passage of flames through to much longer-term effects such as the evolution of species with features that enable them to survive particular frequencies and intensities of wildfire. Given this huge cross-section through time, it is obvious that a comprehensive and perfect knowledge of the effects of fire on ecosystems is impossible given our short lifespans, our inability to travel through time, and, in the case of the European colonists of Northern Australia, their brief acquaintance with this region's environment.



Nonetheless, these difficulties have not deterred many non-Aboriginal people with an interest in land management from holding strong views about the effect of fire on Northern Australian landscapes. For example, the following ideas have wide currency: that North Australia was originally covered by a huge rainforest, and that the North would return to this original pristine condition if it were not for fire. One version of this idea is that the reason for the minuscule size and fragmentary distribution of rainforests in Northern Australia is that Aboriginal people destroyed the original rainforests through their use of fire (Kershaw 1985). Although these are interesting academic hypotheses, they are supported by a weak chain of inference: rainforests were once widespread – rainforests currently have a fragmentary geography – rainforests are destroyed by fire – Aborigines use fire to burn landscapes – therefore Aborigines destroyed the rainforests.

Recent research has cast grave doubt on the above model of Aborigines as destroyers of the great rainforest. It is now doubtful that rainforests were ever widespread in Northern Australia. Indeed there is some biogeographic evidence to suggest that in fact fire-adapted savanna may be very ancient (Bowman, Woinarski & Menkhorst 1993). Be that as it may, what is clear is that the absence of fire in *Eucalyptus* savannas does not result in their conversion to rainforest (Bowman & Panton 1993c). Further, the fragmentary distribution of rainforests may actually reflect the constituent species' superb ability to disperse and colonise vacant, albeit fire protected, niches in the landscape (Russell-Smith & Dunlop 1987). Perhaps the most damning of the above model is evidence that the current destruction of fire sensitive vegetation types is almost certainly the result of the cessation of skillful Aboriginal burning (Bowman & Panton 1993a, Price & Bowman in press, Bowman 1994).

Both field research and mathematical modelling have shown that on sites without topographic fire protection, healthy populations (that is forests with a balance of seedlings, saplings and trees) of northern cypress pines (*Callitris intratropica*) can develop only under a very specific fire regime of frequent mild fires (Fig. 1). Infrequent fires result in cypress pine forests that are densely stocked with juveniles. This situation has occurred in an area in western Arnhem Land where a forestry program stopped all fires in an area dominated by *Callitris intratropica* (Bowman, Wilson & Davis 1988), and in southern Australia where grazing has resulted in a cessation of wildfires.

Conversely very frequent burning ultimately eliminates all size classes and results in the local extinction of *Callitris* (Fig. 1). The very specific fire regimes required to support healthy populations of cypress pines would not

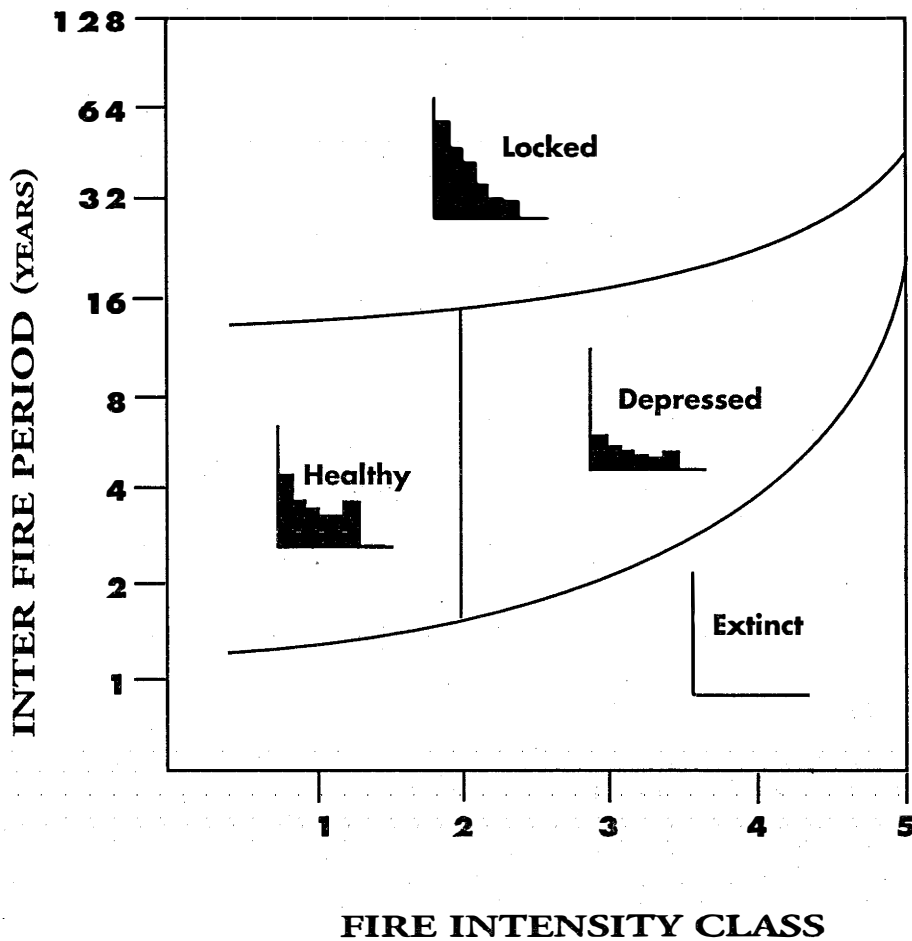


Figure 1. The results of a computer simulation study that shows the response of a stand of *Callitris intratropica* to various fire frequencies and intensities over a 300 year period. The histograms are symbolic portrayals of different size-class distributions that are produced by the various fire regimes. For more details see Price & Bowman (in press).

occur under natural conditions. Lightning strikes at the end of the dry season are a common cause of intense bushfires which are highly destructive of cypress pine forests (Bowman 1988).

The local extinction of *Callitris* is currently occurring in vast areas throughout the Top End. The decline of the cypress pines is occurring on all land tenures: Aboriginal land, pastoral land and national parks (Bowman & Panton 1993a). This tree species is most probably like the miners' canary, signalling that fundamental ecological changes are occurring in response to the breakdown of traditional Aboriginal land management and a shift to



intense fires, many of which are deliberately lit. If this conclusion is correct then the conservation of biodiversity in Northern Australia will hinge on land managers returning to fire regimes that approximate those used by Aboriginal people.

The return to land management that approximates that of traditional Aborigines is not an easy matter given the ecological changes that have occurred over the last 150 years of European colonisation. Large areas of land have not been burnt by traditional methods due to the galaxy of impacts associated with Europeans (eg decline of Aboriginal populations due to disease, prohibition of traditional burning by pastoralists, and the adoption of more sedentary lifestyles by many Aboriginal people). Further, since European colonisation, ecological processes have changed and remain dynamic, owing to the introduction of feral and domestic megafauna like cows, horses, donkeys, etc, and the spread of weeds. For example, there is evidence that some species (such as native annual *Sorghum* species or spear grass) have become more abundant (Bowman & Panton 1993b). These species, and the exotic *Pennisetum polystachion* or mission grass, are highly flammable and their increased biomass results in more frequent, severe and destructive fires (Bowman & Wilson 1988, Panton 1993).

Technological approaches to land management may not be able to mimic traditional Aboriginal burning practices. Setting fires from aircraft cannot simulate the effect of traditional Aboriginal people burning their country during the course of their annual round. The cost of paying people to burn landscapes on foot may be prohibitively expensive, although this method is practical for specific localities (eg burning around camping grounds, rainforests, rock art sites and along bushwalking tracks).

There is no doubt that the arrival of Aboriginal people some 60 000 years ago also caused substantial changes to the ecology of Australia: the early Aboriginal settlers probably made mistakes, and caused some extinctions. However, I believe the diversity of life that existed in Australia 200 years ago was the direct product of skillful traditional Aboriginal land management. Because the ecology of Northern Australia has changed, and because the way people use Northern Australian landscapes has changed since European colonisation, I argue that Aborigines and non-Aborigines alike must now learn (or re-learn) to manage the North Australian landscapes of today. We can do this by informing ourselves of traditional Aboriginal ecological knowledge, applying the scientific method and learning from our mistakes: a process of 'adaptive management'.

The rich natural bounty of living things unique to Northern Australian is both a monument to one of the greatest ecologically sustainable cultures, and a challenge to our technological civilisation. Without skillful management we may look forward to landscapes populated by weeds, vermin and feral animals.

Issues arising from the argument

Fundamentally land management is about making choices. Land managers need to be clear about objectives and must operate within tight budgetary constraints. The achievement of some objectives is easy while others are impossible. For example earlier this century it was decided to eradicate the Tasmanian tiger because it was perceived to be an agricultural pest: since 1936 there have been no definite records of this creature and it is presumed to be extinct. The objective of ridding Tasmania of a pest was apparently achieved, although in hindsight many grieve for this remarkable creature. Pigs are a serious agricultural and ecological pest on the Australian mainland, and feral pigs may become reservoirs of diseases that could damage the nation's livestock industry. There is a clear need to exterminate feral pigs. To date, however, our civilisation has been unable to control this feral animal. Thus although land managers can identify their goals, they may be unable to achieve them. Similarly, ideal land management for the whole of Northern Australia might be a return to traditional Aboriginal fire regimes, but because of ecological changes associated with European colonisation such an objective would be impossible to achieve for the entire region. Finally, a paradoxical feature of land management is that not making a decision is a decision in itself. For example if we do not attempt to control fire, then those species that require fire management will be disadvantaged.

Where do we go from here? In a sense, science has met a boundary, as further refinement of the above argument will do little to improve things in the North Australian landscapes. Of course applied research is required to determine what are the most effective fire-management strategies to achieve particular ends, but this is technological rather than scientific research. It is now the time for society to demand better fire management, be that through education, increased funding for land management agencies, or changes in administrative relationships between government bureaucracies, pastoralists and Aboriginal Land Councils. Fundamentally the problem of how to manage fire to conserve biodiversity is not a scientific matter. The difficult choices regarding what will be managed and what will not, need to be made by society through 'the political process' (eg agitation of community groups, political leadership, or administrative reform). This leaves scientists in a



perplexed state, for in a sense the scientists have dealt themselves out of the pack. Championing the need for land-management, or indeed becoming a land manager, are noble activities but these tasks result in the cessation of the one activity which motivates a scientist – the practice of science.

But what is science? For me it is a rational dialogue with mystery: our lives are so cluttered by technology that we forget how little we know of our origin and our destiny. Similarly ecological science can be thought of as a way of 'talking to country'. Over the last ten years I have been privileged to interact with North Australian landscapes. I first learnt to overcome my initial fear (a blend of alienation and cultural revulsion?) of the strange vegetation and discordant bird calls – perhaps it was the light that seems to burn away all colour to leave a midday delirium. But then you learn of a light that calms before darkness falls, a light so soft that it reveals subtle folds of land, and makes small details (a rock, a shrub, a pool) resonate perfection. Country 'speaks' in many ways to those who are prepared to pay attention.

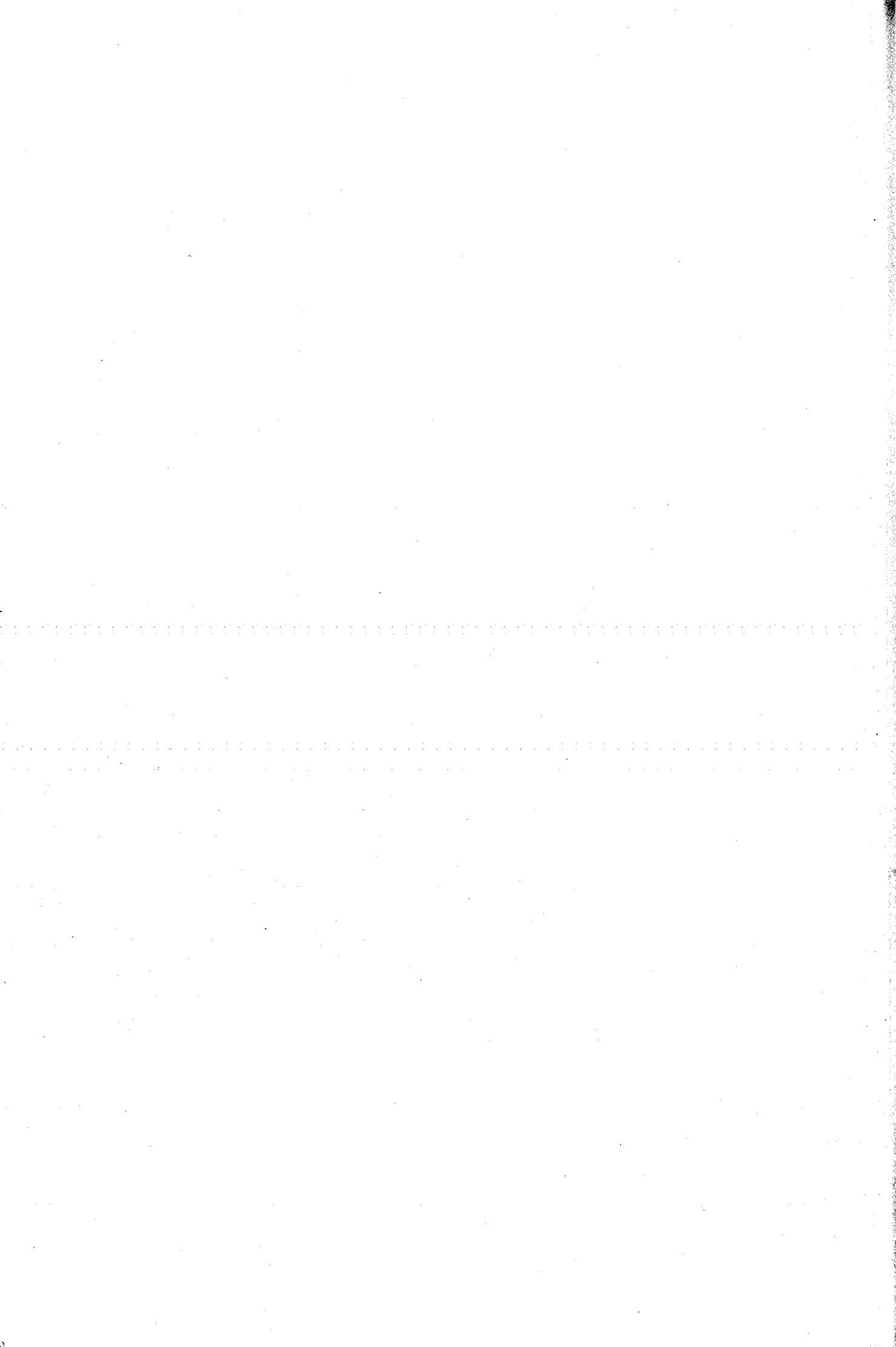
Through science I have learnt some of the landscape's story. I have heard a landscape crying out for management. Therefore I feel obliged to communicate that message. The observed has influenced the observer: like the quantum physicists, ecologists fundamentally lose absolute objectivity, and like the original atomic physicists some ecologists may comprehend sin. The decisions we make today not only affect the continued existence of long lineages of life forms, but in a sense those decisions directly affect us. Why else does extinction bother us so much?

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Discussion 3

Andrew Craig

I've got a question for Dick on his talk. I am intrigued by your comment about the plants and animals being adapted to fire. Do the plants and animals we see in a given area reflect changes over the time that Aboriginal people have been in the area? In other words, to restate that, has there been sufficient time for animals to evolve quite significantly during the period of Aboriginal occupation – as opposed to the much longer period during which they have been subjected to natural fire?

Dick Braithwaite

With most of the ecological issues, locally, you have that seasonal drought that Tony alluded to, many of the adaptations are, of course, adaptations to that seasonality as well. So it's very difficult, and perhaps not all that useful, to try to tease those two apart. It's the climate that's the overall determinant over the long term, and fire just very easily and comfortably fits in that context. If you change the fire regime you change the abundance of species but, indeed, the work here on the abundance of animals and plants is made especially difficult by the very great variation we get from year to year irrespective of fire. Most recent work in the savanna is showing very extreme fluctuations in abundance of a sort that we really didn't expect.

Deborah Rose

I want to direct a question or two to you, Peter. You said at the beginning of your talk that you'd seen some really profound differences between North Queensland and the Northern Territory. I wonder if you could just elaborate a bit more on the kinds of differences you've seen, and some of the causes that you believe might be responsible.

Peter Stanton

Some profound differences were brought home to me a few days ago when I watched some burning at Munmarlary. It was being carried out in 24% humidity and 34 degree temperature. Now, I don't think I had experienced, until that day, 24% humidity in the last two years. On Cape York at the moment, even in the driest parts, I doubt if the 3 pm humidity would be below 50%, and on much of Cape York and eastern Queensland since April we've had a continual south-easterly air stream with showers and rain, and even where it hasn't been raining there's been cloud. So, the one thing that was very apparent was that the sort of burning conditions we're getting over there in the last few days in August are probably not even achievable in many years in eastern Queensland as late as October or November.

Now, that's the first thing. The south-easterly stream brings different conditions. I don't have an explanation for a lot of other things I saw but the cypress pine one was interesting, and David has referred to that. In



Queensland, more often, we have an explosion of cypress pine and it's a pest, even in a very low rainfall belt – in the Salvator Rosa National Park, for instance. Major Mitchell dragged horses and carts through there about 1840 and he spoke of the hills in the distance. He called them the Salvator Rosa hills as they reminded him of the works of some particular painter by that name. In that same area today you can't see 30 metres, let alone see the hills several miles away. And when you look from above, look at aerial photos, in particular, you can see what the difference is. The eucalypts that Mitchell saw are probably still there, though all the spaces in between are filled up with cypress pine. Obviously, there's been an immense decrease in fire frequency in that time. Somehow or other the cypress pines got away. I don't know what the full story is, and the only thing that's going to knock them out of the system is some major fire catastrophe.

In north-eastern Queensland the same thing is happening. The cypress is overtopping, in some cases, quite tall, well developed rainforest. But there's a more obvious explanation there that is certainly related to a change in fire regime. The cypress is obviously thriving now, where it didn't 30 or 40 years ago. But there's a whole host of differences in the landscape there as compared to Arnhem Land.

On north-eastern Cape York, you've got another 500 millimetres of rainfall. It's better distributed throughout the year. We can talk about monsoon forest but much of eastern Cape York at the moment is getting drenched with rain, so we don't in reality, have a true monsoon climate. And the landscape is also very much more dissected by drainage lines. You can hardly walk for half an hour, or an hour, without running into a swamp that's pouring water, or another system, such as a rainforest, that would actually stop a fire. You have this matrix of open forest and heath with rainforest and it's all so much broken up that the chances of fire igniting from a distance and carrying all through that system are very limited. That system could only have been maintained by Aboriginal burning where individual landscape units have been lit up over a long period of time. The incredible thing is that when that individual attention has disappeared for as little as twenty or thirty years, on aerial photographic evidence, things like cypress and rainforest have just erupted across the landscape. So, it is a very different landscape. But if we move to western Cape York which is a little bit closer to a uniform lateritic plain with fewer drainage lines, probably a drier climate, I guess you get a little bit closer to the Arnhem Land situation. But even there, there's more evidence for rainforest patches expanding, and for cypress, in some cases, expanding.

Cypress doesn't appear to be under threat even in those situations and, once again, the major difference with Arnhem Land is that, in August, you're not going to get 24% humidity. Maybe 60%. Whichever way the breeze or the prevailing wind comes from on Cape York, it's a maritime wind, the north-wester and the south-easter, and so there are certainly very interesting climatic differences. There are some very interesting topographic differences, and also social history, human history differences in that until much more recent time, in Arnhem Land you had continual Aboriginal occupation. In most of eastern Cape York, Aboriginal occupation probably disappeared totally 30, 40, 50 years ago. So, the regions are superficially similar over large areas but when you look at them closely, they are very, very different.

Tony Law

Central Land Council

My question is addressed to Peter Latz. What David is saying about hard decisions and all the rest really does drive a point. In the arid lands context, you were saying, at the end of your talk, Peter, that the best of science and the best of Aboriginal wisdom have to come together. Are you advocating some project or program of action and, if so, what?

Peter Latz

I would very much like to see the Central Land Council and the Conservation Commission work much more closely together. Is that fair enough?

Tony Law

We both know that position. We're talking about 324 000 square kilometres of Aboriginal country, not counting pastoral leases and all the rest. There is lot of spinifex and a lot of grass. You've got major access difficulties and all the rest. We're trying to do it in an extremely ad hoc fashion. If we were waiting for politics to sort things out, federation would be past and we'd be into the next century.

Peter Latz

I'm not as pessimistic as you and what you have done in the Tanami desert in the last six months is the best you could do under the circumstances. As I said, the thing about arid Australia is that you have these periods which are not predictable. What makes arid Australia unique, and this is true for the bulk of Australia, is its complete and utter unpredictability. But the beautiful thing about the arid zone is that the plants have lived there for millions of years and they have adapted to this unpredictability.

Freya Dawson

Faculty of Law, Northern

Territory University

I've got a question for David. I was very interested in what you were saying about biodiversity not being a list, and that we have to take aesthetic value or other values into account. When you apply that to the Australian situation, you say, we've got to re-engage in the landscape, we've got to make judgements, we've got to make choices.



You talked about the savanna being very rich in biodiversity compared to the rainforest and you were saying: 'Obviously, well, you can write a bigger list for the savanna than you can for the rainforest.' My question is: if we're going to re-engage, and it's not on the basis of just a list of biodiversity variables, (ie there are more species here than there), what other values are we going to take into account and how do we actually decide which values to privilege? I got a very strong impression that you had your own sense of value about what was important and what aspects of biodiversity we needed to preserve, but how do we take account of everybody else's ideas on the same thing?

You want the bad news, I guess – that biodiversity is going to be shown to be the emperor's new clothes in the sense that when everybody gets down to biodiversity and really starts thinking about it they realise: 'Hey, we've just got a synonym for nature conservation and all the old problems which were connected to nature conservation come back to haunt us.'

David Bowman

The reason why biodiversity got up politically and got onto the agenda of Rio and all the rest of it is because it made these horrendously intractable problems associated with the evolutionary event our species has triggered suddenly seem amenable to rational discourse and very tractable. All you have to do is go and map and plot and count up and average and, you know, arrange networks and it's all going to work nicely for you, we thought. But then actually when you look at the conservation biology literature, people are just beginning to shake their heads and say: 'Well, what about processes? What about changes? What about viable population? What is a whale?' Dumb question! What is a whale? You say 'Oh, a whale is a big thing which lives in the ocean', but whales need at least a mate and then they probably need genetic variability and then they need a habitat and then they need food and then they need population regulation and then they need not to be overhunted and then you sort of wind up realising 'My God! Maybe the ocean is a whale.'

That was my point about biodiversity, and connecting it to fire: biodiversity sounds simple, and fire sounds like an add-on. We'll worry about fire but let's draw up our lists first. And then you realise that really your lists are going to mean nothing unless you have an appreciation of change.

I sound like one of the four riders. I'm bringing really bad news. We are talking about the termination of lineages which have been on the planet for millions of years, probably tens of millions of years and we're terminating them. So, we're talking about some serious decision making.

Freya Dawson

Can I add one point? With the pines that you've been talking about, that sort of change is obviously occurring if they're expanding in some parts of the country and they're becoming largely extinct in other parts of the country, but you're suggesting a process and a re-engagement to bring it back to the way it was? To what extent do we accept that change? And to what extent do we try to actively counteract it, if we accept that the process is going to be continually engaging with us?

Frank van der Sommen
Consultant

Another question for Dave Bowman. It is accepted that the *Callitris* species on the Australian continent is a permanent relic and there are other examples. So we are looking at remnants of ancient flora. What status do you think they should have today if we are looking at species which are hanging on in an environment which really isn't all that suited to their long-term survival? We are spending a lot of energy in keeping them going. Should we actually institute processes which keep those species going when, in fact, they shouldn't be going at all?

David Bowman

You're in a fantastic restaurant and you've only got a limited amount of money. You've got to make choices about what you're going to eat. The choice with the landscape conservation biodiversity issue is that we've got a limited amount of money, we've got to make some real choices and they're very difficult. There is not a big machine we can feed the data in and it will come out with the answer. Obviously very ancient species are so interesting, they tell us so much about our past and also they're veterans. They've been in the game for a long time. They deserve some respect. You would be heartless to go and root out a fern which is an enormous living fossil, like the ones in Carnarvon Gorge, just because you can do it. Why not respect them? We are going to have to make choices.

My take home message is this: Aborigines created a landscape for which we have been given a very large menu. The menu is shrinking by the day. And so, we've got to decide whether we just let natural processes roll on. We know that life on Earth's going to remain. It's just going to change a lot.

Peter Stanton

Could I present a manager's perspective? I've had it said to me too: 'You're interventionist, just let nature take its course.' To me it seems to be colossal hide and arrogance. We've devastated this continent. We are down to the last 10 or 20% of natural vegetation. It is an island. It is full of feral weeds and animals. And then we sit back smugly and say: 'Let nature take its course. Don't worry about it.'

The context in which we might have said that a couple of hundred years ago is gone. To me as a manager, it's irrelevant what might have happened in the last 8000 years.



I'm told 'Don't worry about rainforest invasion of sclerophyll. It's been going on for the last 8000 years.' I can look and see that in the last 20 or 30 years, in some particular area that I'm responsible for, 80% of the sclerophyll forest has disappeared. The only responsible thing that I can do, as a manager, is to take action to preserve what options remain so that somebody else who's more theoretically inclined, more research inclined, more philosophically inclined, can make better decisions in the future. At least, they will still have options to make decisions on. But unless I take action now in the face of obvious and rapid change, then we won't be arguing about these sort of things in 20 or 30 years time.

Final discussion

Kathy Deveraux

I'd like to thank all the speakers this afternoon, particularly April Bright, Patrick Green and Joe Yunupingu for their contribution on the Aboriginal perspective of the fire symposium. The main area that I'd like to bring to your attention is a strategy to employ and involve Aboriginal participation in fire management and land use. In summarising the discussion I'd like to talk about four issues here.

- One is to use a collaborative team approach to facilitate joint management on land issues.
- Two is employment, education and training for sharing of knowledge on all levels.
- Three is coming to terms with legal and political implications. Fire is a political and controversial issue, and should be a priority in addressing community awareness and cross-culturalism.
- Four is post-Mabo legal ramifications that affect every community.

Throughout the fire symposium we have heard many views that have been represented by government and non-government groups. It is my opinion we have been put on notice. We are politically positioned to take action in addressing all these issues that are now on our agenda.

And, finally, Aboriginal people have to continue using fire in accordance with their tradition. Thank you.

Jeremy
Russell-Smith
ANCA, Jabiru

Thank you Kathy. I'd just like to make a couple of comments. Perhaps they don't relate much to the proceedings, or maybe they cut across them.

The first is that I am impressed by the differences, geographical and cultural, in burning practices across Northern Australia. I think that is something we always need to bear in mind. Central Australia, a land of unpredictability. In the north, a land of great predictability but obviously very marked differences in the effects of fire regimes raging on eastern Cape York compared with the Top End and the Kimberley.

Second, this diversity of practices requires a high level of communication between people. Obviously, with different objectives in mind. I would illustrate that by a Kakadu situation where we are required, if we are going to deliver an effective fire management program, to communicate with park staff, many of whom are Aboriginal people, and also other Aboriginal people who live in the area, Aboriginal neighbours, pastoral neighbours.



And probably with one exception – a person who employs a ‘no burn’ policy – we are all effectively in agreement. We don’t like raging late dry season fires. That person who employs a ‘no burn’ policy gets burnt out every year and blames us.

Extending on from this I’d just like to pick up from a comment made by Bill Panton that this ‘no burn’ policy that rages in the urban area or the urban-rural interface is obviously ridiculous, given the fires that are currently going around the place at the present time. There are huge fuel loads that build up there every year. They’ve got to be managed in some way. Wet season burning or annual burning is one way obviously to do that. There are other ways but it needs to be addressed. To walk away from that type of problem is negligence, environmentally.

Another theme I should also point out, that applies not just to Darwin, is a very important emerging theme: getting community involvement.

I come to the third point. We need to cooperate a great deal more. And that requires better levels of communication but, more realistically and practically, fire as a land management issue has to be introduced into school curricula. I don’t think there’s any escaping that fact. The Bushfires Council in the Northern Territory is making a start, and it is essential. You cannot attempt to run fire management programs across the country, whatever the objectives, if the people are not informed.

In the Jabiru area, as an example, we have a school which probably has about two hundred pupils, a third of whom are Aboriginal kids from the region. There are no Aboriginal teachers in that school. How can anyone, realistically, who is going through that school process, develop any broad-based environmental perspective on land management issues, burning issues. I see this as pretty much a central issue which requires attention into the future. Thank you.

As mentioned in a lot of the publicity for this event, this symposium is being funded primarily by the Department of the Environment, Sport and Territories who have a Biodiversity Unit. When I was speaking with Neal Hardy of that Unit earlier this year, he told me that what they were aiming for is a national strategy on biodiversity and I put it to him that in Australia a national strategy will only have any hope of being effective if it’s built up out of understanding the regions of Australia. I resisted the idea of trying to run a symposium devoted to national issues here in Darwin. We don’t even really understand the issues across North Australia as well as we could. Neal and his colleagues accepted that argument.

Deborah Rose

And one thing I've gotten out of the speakers today is the realisation that across North Australia, from the Kimberley through the NT and over into north Queensland, we really have a lot of significantly different regions and there probably isn't any single strategy that would even be suitable for North Australia. What this means then is that, as Jeremy said, there's an impressive need for communication throughout the region. There's also an impressive need for local knowledge and here I would really want to urge the scientists back to the Aboriginal people. I would remind everybody yet again of Peter Latz's discussion of the local experts and the scientists who have quite different kinds of expertise and the intense need to put these people together.

In short, we can think of geographical regions and then we might also think of regions of knowledge, and those regions of knowledge are located amongst different segments of the people of North Australia. Just as geographical regions need to be in communication to know what's happening, different regions of knowledge need to be able to talk to each other. I'm very grateful, therefore, especially to all of the Aboriginal people who came today and to everybody who sat and listened and who will go away with a very grounded understanding of what it means to have intense detailed local knowledge.

I would like to thank a couple of speakers especially for their comments: David Bowman urged us in the most eloquent way to grapple with what he termed the 'philosophical issues' here. And of course we all want to shirk away from it because we're none of us philosophers. But really every one of us is a philosopher, and I was very impressed with Peter Stanton's non-philosophical statement which I actually took to be a very philosophical one. He said that as a manager, it's his obligation to keep open as many options as possible and I would like to reinforce that view. To me that is something like 'zen and the art of land management' only perhaps it goes a little bit further. Because what's inherent in that, I think, is the view that this is a world that's full of a hell of a lot of living things and each of them, all of them, have a logic of their own and they're all interacting in ways that are far more complex than we are ever really going to be able to control or grapple with. Therefore, if we keep the options open we keep open the possibilities for life and that is really what it is all about.

On another point, one of the things that is open to this symposium, and I include all of you who've sat here all day as well as the people who've spoken, is to send some messages back to the Department of the Environment, Sport and Territories who very kindly enabled this to happen. It seems to me that one of the regional issues that has come up, that struck me very forcibly, is that there has been, across North Australia, quite an unequal distribution of financial resources, of scientific resources, of scientific research.



Peter Stanton's words out of north Queensland carried a special urgency and it may be that one of the recommendations that we could send back is this: in addition to thinking regionally, it may be important also to consider those regions where these issues are particularly urgent and to think of ways in which facilities and resources can be distributed more evenly or in which the expertise that's built up in one area could be made available across regions in appropriate fashion. I will just open the discussion for comment there if anybody wants to take up those issues or if anybody has any other issues that they'd like to send back to Canberra.

You're talking about species diversity and it seems to me from this forum here, we have a number of different approaches towards land use. We've already been talking about tribal variations and different people, different lands having different approaches to fire. We've talked about pastoral lands also being managed in different ways in relation to fire and they, in themselves, create a form of diversity in landscapes, in terms of different fire regimes which, in fact, ought to also be considered when we're looking at the whole question of, if you like, global diversity or landscape diversity. You mustn't just look at what we're doing with the species and individuals.

I wonder if it's appropriate that, coming out of this meeting today, we make some more formal statement to the NT Fire Service or, perhaps, just the Darwin community more broadly, that we are concerned that issues of biological diversity, as they affect the local Darwin area, might be severely impinged by the current fire management practices that are going on, and that the various groups that are involved should work closer together to get a fire management strategy that's more appropriate.

A really positive thing which should be sent back to Canberra concerns the conservation of biodiversity and the complex land tenure issues, particularly Aboriginal land and Aboriginal management. Wouldn't it be a wonderful idea and maybe it has already been thought of, if the Canberra bureaucracy in ANCA set up a unit which started thinking about how they're going to facilitate rational land management, particularly in Aboriginal land, across different land tenures. There's definitely a need for a clearing house to start thinking through some of the issues involved here. Another thing which I think would be a really important idea which should be sent back to Canberra is: wouldn't it be great if Aboriginal people could actually be paid for their knowledge. I would like to see a lot more Aboriginal people being paid to burn their country on a seasonal basis, to burn other people's country, it would be tremendous! Because, with all due respect, flying around in machines throwing fire out of helicopters and aeroplanes does not

Andrew Craig

Bill Panton

David Bowman

simulate to any degree the fineness of detail which is required for firestick farming.

Firestick farming is going to require a lot more care and thinking about boundaries and, as we've heard from some of the Aboriginal speakers, just thinking about when the wind's about to change or has changed or how deep the water is, or should we wait three hours, or could we do it then or could we do it later. If you're in a helicopter, as Peter Stanton said, you've booked it, you're moving, you know you're part of the capitalist machine. I would like to see bushwalkers too have a permit to walk around when bushwalking, burning country. I think there should be encouragement for the view that part of the experience of interacting with country should be burning it.

Seriously, the message should go back to Canberra that we have some really great opportunities here for collaboration but there is going to be a need for (a) a bureaucratic clearing house and (b) probably some funds to oil the wheels, maybe not indefinitely but to kick it off.

Pauline Woodie

Another issue that I've just raised with Greening Australia, because we are based in Darwin, and there's only me and Joe and Mike Carmody who work throughout the Territory, based from Katherine up – would there be any possibility if we had someone based in the community? Because as we said earlier on: 'we all speak different languages even though we are all Aboriginal'. But I'm not the same as her, I don't eat the same bush tucker like her, I don't speak the same language as her.

Could we have someone assisting us in remote communities and actually working with old people, because we have been flown over from the islands into school or college and that, and we lost most of what our ancestors used to do? That happens all the time because we had to learn your scientific way of mathematics and English, and is there any possibilities then if we can have somebody based in the communities, working for us, in producing information and sending it to us here in Greening Australia. Or anywhere, any other areas?

Deborah Rose

That kind of networking seems like probably one of the most effective things that can be done because the systems already are in place. They're just not being utilised. You know, the old people are there, the knowledge is there, the desire to learn is there. It's all there and the question is – how can what's there lock into a Greening Australia structure, or any of these others.



Or anywhere else. Before we lose our old people, because they are going away, now, there's only a few left in the communities, as far as I know from my side, on the Tiwi Islands, and I guess it's everywhere else too.

Pauline Woolie

I'd be happy to incorporate your comments and include an emphasis on the fact that when we're talking about different systems of knowledge, we're also talking about different ways of organising knowledge. The bright young scientist, fresh out of university, with the degree in his or her hand is central in one region of knowledge, and in another system of knowledge, the old people who have it all in their heads are the ones who really are the experts.

Deborah Ros

And they all go, just leaving us slowly because we are in 1994 now.

Pauline Woolie

Contributors

Russell Anderson

Russell Anderson has a diverse background evolving from forestry, farming, human resource management and technical services spanning over 30 years. His community involvement during this period included seven years as Deputy Shire President of Litchfield and 12 years as Committee Chairman of the Bushfires Council.

Russell enjoys the challenge of his position as Executive Officer of the Bushfires Council and Chief Fire Control Officer for the Northern Territory. He is a strong advocate in the development and growth of the Territory.

David Bowman

David Bowman (PhD) trained as a forest ecologist in Tasmania, and has carried out ecological research throughout Northern Australia since 1984 for the Conservation Commission of the Northern Territory. In 1994 he won a Charles Bullard Fellowship to study forest ecology at Harvard University.

John Bradley

John Bradley has undertaken extensive linguistic and anthropological fieldwork in the Borroloola area between 1984 and 1994. He has assisted the Yanyuwa people in the presentation of their 1992 land claim, and is the author of the Yanyuwa dictionary as well as other publications with and for Yanyuwa people. He is currently a PhD candidate in anthropology at the Northern Territory University.

RW Braithwaite

Dick Braithwaite (PhD) is Senior Principal Research Scientist with the CSIRO Division of Wildlife and Ecology. He has worked on a wide range of ecological issues in Northern Australia over his past 15 years based in Darwin. He is currently Officer-in-Charge of the CSIRO Tropical Ecosystems Research Centre, Darwin, and is National Coordinator of the CSIRO Multi-Divisional Program for Tourism. Dick is a member of numerous committees including the Kakadu Board of Management and the NT Bushfires Council.



April Bright

For most of her fifty years, April Bright has been deeply involved in her traditional country and with her people. Together, her mother, aunties, uncles and the old people taught her about her country, steeped in their culture. She learned to hunt and forage for food, but just as she learned the Dreamtime stories, if not more importantly, April was told about the birthplaces, the burial sites, the spiritual affiliation with her country and how to 'look after country'.

Kathleen Deveraux

Kathleen Deveraux is from the Rak Mak Mak Marranunggu local descent group. She was born in 1954 at Panypiyaduk, a stock camp on the Finnis River that is normally referred to as Possum Yard. This site has a Dreaming story about a possum that belongs to her clan group. She grew up along the stock routes and cattle camps from Fog Bay, Finnis River and Wagait to Meneling Station.

In 1991 and 1992 the Mak Mak clan were handed back some land as a result of the Finnis River Land Claim. This land from Sweets Lookout to Mount Finnis is now registered as the Gurudju Land Trust. The White Eagle Aboriginal Corporation is the incorporated body that takes care of the progress and development of this land.

Wali Fejo

Wali Fejo is one of the Larrakia people, and the Principal of Nungalinya College in Darwin. He reports: 'I was grateful for the opportunity to be involved and glad to see the variety of people who came together in my country. I look forward to seeing the ideas from the symposium taken back to people's home communities.'

Patrick Green

Patrick Green is Chair of the Junjuwa Association in Fitzroy Crossing and Chair of the Yarangi Cattle Company (WA). He has been active for many years with Aboriginal organisations and issues in Western Australia. He is a Bunaba man and, except for the time he was in school, has spent his life in and around his own home country.

Tony Griffiths

Tony Griffiths has recently completed a Master of Science degree at the Northern Territory University. His research topic focussed on the effects of both the seasonal climate and widespread fires of the Top End on the frillneck lizard. Tony has spent the majority of his 'research' life in the Top End, investigating the population ecology of small mammals, participating in fauna surveys and generally marvelling at the beauty and diversity of the Northern Territory.

Camilla Hughes

Camilla Hughes (BA, LLB) came to Darwin in 1990 to practise law after graduating in Arts and Law from the University of New South Wales. Currently she lectures in constitutional law, administrative law and torts in the Law Faculty, Northern Territory University.

Rhys Jones

Rhys Jones is Professor in the Division of Archaeology and Natural History, Research School of Pacific and Asian Studies, The Australian National University. In addition to having triggered the firestick farming debate and carried out research on the use of fire as a land management tool in Arnhem Land, his research interests include the origins of humanity, human colonisation of the western Pacific and Australia, Aboriginal ecological adaptations, and historical European views about hunters and the evolution of human society. He has carried out extensive fieldwork in Tasmania, Arnhem Land, and the Daly-Fitzmaurice region of the Northern Territory.

Peter Latz

Peter Latz is a botanist/ecologist with the Conservation Commission of the Northern Territory. He was born in Alice Springs, grew up at Hermannsburg, and then took on various jobs in the Territory before obtaining a degree in biology at Adelaide University. Since then he has completed a Masters degree at the University of New England, Armidale. His research interests are broad and include 'bushtucker' (from before it became fashionable), fire research (including fire-stick farming), rare plants and the effects of climate and grazing on plant communities.



Tony Press

Tony Press is the Executive Director, Biocultural Landscapes North, of the Australian Nature Conservation Agency. Based in Darwin, he is responsible for the management of the World Heritage National Parks of Uluru and Kakadu as well as nationally significant conservation areas in the Indian Ocean and Timor Sea. Tony has lived in the Territory for 10 years, the first 5 in Kakadu. He has a strong personal commitment to involving Aboriginal people in nature conservation and to the recognition by public administrators of the legitimate rights and aspirations of indigenous peoples.

Deborah Bird Rose

Deborah Bird Rose (PhD) is a Research Fellow of the North Australia Research Unit of The Australian National University. Over the past 14 years she has worked with Aboriginal people in various parts of Australia in documenting cultural, social and ecological issues of significance. She has worked with Aboriginal claimants on land claims and in land disputes, and has worked with the Aboriginal Land Commissioner as his consulting anthropologist. She is author of *Dingo Makes Us Human* (Cambridge University Press, winner of the 1995 Stanner Prize), and *Hidden Histories* (Aboriginal Studies Press, winner of the 1991 Jessie Litchfield Award for Literature). At this time her research interests are focussed on indigenous and settler concepts of 'nature' and 'productivity'.

Jeremy Russell-Smith

Jeremy Russell-Smith (PhD) is Project Officer in Kakadu National Park where he is involved in fire management and related natural resource management issues. He has carried out extensive research into fire ecology and related issues in the Top End.

Peter Stanton

Peter Stanton graduated from the Australian Forestry School in Canberra in 1962 and worked for the Queensland Forestry Department until 1974. He was involved in all aspects of forestry operations, but from 1967 onwards specialised in national parks matters, carrying out extensive exploratory surveys across the State to determine potential national park areas. In 1977 he joined the Australian Parks and Wildlife Service and has since adopted a range of responsibilities. He was the Service's first Regional Director and served in that role for eight years. He has now returned to field duties in far northern Queensland as Senior Principal Conservation Officer of the

Queensland Department of Environment and Heritage. Throughout much of his career he has been deeply involved in managing fire and in documenting changes in the land.

Joe Yunupingu

Joe Yunupingu Djalalingba is Senior Ranger and Cultural Adviser with the Dhimurru Land Management Association in Nhulunbuy, NT. He and his brother Galarrwuy Yunupingu are the senior people of their group, and are committed to teaching younger people the responsibilities of Yolngu land management. Mr Yunupingu's clan country is in the area of Cape Arnhem.

