



Institute of Foresters of Australia
Western Australia Division
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20 August 2004

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Dear Mr Betts

Review of the Fire Policies and Management Practices of the Department of Conservation and Land Management

Please find enclosed a submission from the Western Australian Division of the Institute of Foresters of Australia (IFA) to the above review. I hope it is clear from this submission that the IFA has some very specific skills and expertise that will assist with this review.

Please do not hesitate to contact me on 9326 0155 if you wish to discuss this submission further, or require any further input from the IFA in the course of completing this review.

Yours sincerely,

John Tredinnick
Chairman, WA Division



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Review of the Fire Policies and Management Practices of the Department of Conservation and Land Management

A submission to the Environmental Protection Authority

By the Institute of Foresters of Australia

August 2004

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1 Introduction

The Institute of Foresters of Australia (IFA) is the organisation representing Australian professional foresters. The organisation was formed in 1930, has active branches in all of the Australian States and the ACT, and is governed by an elected Board. A requirement of membership is that members have University level qualifications in forestry or a closely related scientific discipline, or extensive relevant practical experience in forest management or forest science.

The IFA is an advocate for better forest management in Australia, for high professional standards in forest and woodland management and for the active management of our forests for all values.

Current membership is approximately 1200. Members are employed throughout Australia, and overseas, and in a variety of occupations, including native forest, plantation and national park management, research, bushfire management, land care, education, public service administration, private forestry and industry. The age and experience profile of our members ranges from new graduates to retired men and women with over 50 years of experience in forestry, park and land management in Australia.

1.1 The IFA and fire

The IFA is the only national organisation in Australia, which has developed comprehensive national policies on bushfire management and the role of fire in Australian forests and woodlands.

We have had a bushfire management policy for over 25 years. This is currently being reissued as two separate policies, one dealing with fire management and other with the ecological role of fire in Australian forests and woodlands. The restructured policies are still in draft form, but close to finality and are a sound representation of our thinking on, and approach to these issues. They are printed in full in Appendices A and B of this submission, and underpin this submission to the EPA.

Our concern and expertise in these issues stems from a number of factors:

1. Since the early years of the last century, and until recently, bushfire management in Western Australian forests was predominantly the responsibility of forestry agencies, which were staffed almost exclusively by professional foresters. Many IFA members have spent almost their entire careers as practical forest, park and plantation managers, where bushfire prevention, firefighting and fire-related research and development are a day-to-day preoccupation. We know the business, from the sharp end.
2. Professional foresters pioneered and became leaders in nearly every aspect of bushfire research in Western Australia since it began. This includes research into fire behaviour, fire prevention, prescribed burning, fire suppression, bushfire safety and health, fire training, fire ecology and fire weather forecasting.
3. Western Australian foresters remember the lessons of history of bushfire disasters in this state, including the Dwellingup and Karridale fires. Foresters took part in fighting them, in subsequent inquiries and royal commissions, and

in the application of fire management systems designed to minimise the risk of their re-occurrence.

4. IFA members have received university-level training in the science underlying bushfire behaviour, fire suppression and prevention, as well as in fire ecology, and land use planning which incorporates fire management and many have practical experience with prescribed burning, regeneration burning and firefighting. IFA members have also been involved with the integration of research findings and information systems into fire management practices.
5. We have a deep concern for Western Australia's parks and forests and for the values within them that are threatened by high intensity bushfires. At the same time we are members of the community, and wish to see land management practices that protect life and property from the ravages of wildfire, and the attendant human tragedies. We believe that there are no forest or community values that benefit from the impact of uncontrolled high intensity bushfires. IFA members spend, or have spent, a high proportion of their professional careers in the forest and woodland areas and have a deep concern for the range of biological values that underpin the world class biodiversity values that exist in the south west areas of Western Australia.

1.2 Our concerns about the state of bushfire management in Western Australia

The IFA is deeply concerned at the directions in which bushfire management in Western Australian public native forests has moved in recent years. We are appalled at the level of damage to ecosystems, rural assets, homes and life that occurred in other parts of Australia during the 2002/3 summer, and at the unprecedented size and destructiveness of these fires. We believe this to be a clear indicator of what could happen in Western Australia.

There are several critical factors.

Firstly, at the national level we see a lack of firm political leadership, absence of coordination and accountability at Ministerial and agency level, and a lack of commitment to effective bushfire management within some land management agencies. This situation fails to build on the excellent relationships that exist within bodies such as the Australasian Fire Authority Council (AFAC) and the Forest Fire Management Group convened by the Forestry and Forest Products Committee. In these forums bushfire specialists are able to come together and work cooperatively and amicably.

Secondly, we see the Western Australian community divided over fire management and the divide (especially between urban and rural communities) deepening. Familiar position-taking is occurring. On one side of the divide are some influential environmentalists and academics, supported by inner-city residents not threatened by bushfires, and not responsible for bushfire management. These people in general advocate a hands-off approach to land management, where "natural" events like bushfires are allowed to run free. On the other side are rural people, fire fighters, foresters and land managers who are responsible for values threatened by bushfires. The latter tend to advocate an interventionist approach, where steps are taken to minimise risks before fires start, as well as having in place a well-equipped rapid-response fire fighting force.

This divide is becoming institutionalised, and reflected in policy positions adopted by different agencies and political organisations. To add to the problem, responsibility for fire management is increasingly being taken out of the hands of land managers (who are trained to minimise threats and hazards) and placed in the hands of emergency services (people trained to respond to a disaster after it occurs). In the long run, this will ensure that wildfire disasters will continue, as the emphasis is on fire suppression, not prevention.

Thirdly, we see a divide developing between the scientists and professional foresters and the general community. This divide is being fuelled by the emotive responses of a minority group. The scientists and professional foresters have the ability and commitment to develop and maintain the integrated research, information and management systems which are critical to the longer term needs of balancing our understanding of the protection of biodiversity values, forest production and the well-being of local communities and property.

This divide should be a major concern to the government and the wider community, as without this major personal commitment by many professionals there is little hope of maintaining key personnel in these areas or encouraging the youth of Australia to become involved in the challenges at hand. In the longer term, if the professional researchers and foresters are provided with the appropriate resources and community support, the effort will then be directed into maintaining best practice in all these areas rather than the demoralising need to respond to short term crisis situations.

1.3 The IFA welcomes this Review

The IFA welcomes this review by the EPA. We see it as an opportunity to put our concerns and make recommendations for improved bushfire management to responsible people who have the wider interests of the Western Australian community and landscape at heart. We sincerely hope that the EPA is able to deliver a final report that is based on science and the experience of those that understand the fire situation in Western Australia.

2 Background: a brief review of the bushfire situation in Western Australia

2.1 Australia is naturally bushfire prone

Most of Western Australia is naturally bushfire prone. The south west experiences a “fire season” every year associated with the annual dry season. The severity of the fire season varies from one year to the next. It is largely dependent on the extent of the rainfall deficit during the dry season. About every 10 years the drought is so severe that all that is needed to create a conflagration is a period of extreme weather with high temperature, strong dry wind and an ignition source.

Despite the best intentions and efforts of fire prevention policies and personnel, ignition sources cannot be eliminated, and bushfires will occur. Dry lightning storms occur extensively in some seasons, accidents happen, and unfortunately there will always be deliberate malicious ignition by arsonists.

Thus, bushfires are an inevitable part of the Western Australian environment. Fires of low and moderate intensity occur every year, and serious high-intensity bushfires occur every few years, and have done so throughout our recorded history.

High intensity fires are a consequence of one or two factors, or both operating together: (i) predisposing drought and hot dry weather; and (ii) heavy fuels. The decision to deliberately exclude fire from naturally fire-prone ecosystems (which leads to heavy fuels) represents one extreme of the possible range of fire regimes, and in practical terms this inevitably translates to a regime of periodic large-scale, high intensity fires. These burn right across the landscape and tend to result in homogenous stands of largely even-aged vegetation. It is these fires that most often cause loss of life and extensive damage to private property and community assets.

2.2 The consequences of European settlement

Aborigines lived in harmony with the bushfire-proneness of Australia for perhaps more than sixty thousand years. Although denied by some academics and environmentalists, it is nevertheless clear that in pre-European times, fire was extensive and frequent. This is supported by ethnohistorical research, the records of early explorers and settlers, the reconstruction of the fire record from grass trees, knowledge about frequency of lightning and a simple understanding of fire dynamics. Instead of dismissing these records or interpretations, the scientists within our community should be supported to test these interpretations through research. Aboriginal people had little capacity for suppression of any but the mildest of fires and surely would have understood the potential for conflagration fires to burn thousands of hectares where fuels were heavy and continuous. The inevitable consequence to the Aboriginal people of very large intense bushfires was immediate loss of food supplies.

The IFA has reviewed the evidence on Aboriginal burning. We are satisfied that all the evidence points to the fact that they carried out frequent, regular and widescale burning throughout the year to create a mosaic of burnt and unburned patches that limited the extent and intensity of fire spread under severe weather conditions.

However, European settlement resulted in the insertion of fire-vulnerable communities and assets into this fire-prone environment. At the same time,

Aboriginal people declined in numbers and were stopped from practicing their traditional burning practices. Fuels began to accumulate, relieved only by occasional wildfire. For the first time, fire became a threat and bushfire damage a problem for Australian society. Europeans failed to appreciate or even acknowledge Aboriginal fire management, and developed the widely held view that all fires are “bad”.

Even today, most Western Australians do not understand the relationship between fire and natural ecosystems, and do not appreciate that fire is a natural part of our environment. Nor do they understand that bushfires can vary in intensity from a mild, trickling fire with flames less than a metre in height, to a raging inferno with flames over 100 metres in height. A large sector of the Western Australian community still believe that all fires cause permanent damage to “the environment”, and this view influences land management practices across the country.

2.3 Dealing with bushfires

Dealing with the bushfire problem boils down to a simple equation. On the one hand it is necessary to minimise the risks of fires starting and of causing damage to valued assets; on the other you must have a capability to suppress fires before threatened assets are burnt. This equation has been well understood by practical land managers and fire scientists for generations. Effective bushfire management systems for forests and woodlands, which minimise the risks to all values, have been designed, and in some cases implemented successfully.

Implementation, however, is not simple, and there is no general agreement on the approach to be taken. Bushfire management is complex and frustrating, and little real progress ever seems to be made, or is made and rapidly counteracted by some other development or policy decision. Some of the key problems faced by modern bushfire managers are:

- i) Bushfire disasters do not occur every year. There is often a run of mild fire seasons, where fire intensities are low, fires are readily contained and little damage is done. The community becomes lulled into a sense of security. Funds for bushfire prevention and preparedness are channelled elsewhere. Foresters with long experience of bushfire seasons have an old saying: “10% of the fires cause 90% of the damage” – it is the irregularly occurring bad fire season for which the community must be prepared, not just the more frequent mild season.
- ii) In the Australian bushland, especially eucalypt forests, ground fuels do not quickly rot away into humus as they do in the cool temperate coniferous and deciduous hardwood forests of Europe. Instead, the forest floor litter of dry leaves, twigs and branches, and the thick fibrous tree bark accumulates year after year until a “steady state” is reached with massive quantities of fire fuel available for burning. Dry eucalypt forest, for example, accumulates flammable fuels at a rate of over two tonnes on each hectare every year and will continue to do so for decades. Bushfires burning in heavy fuel are difficult to control under moderate fire weather but under severe weather conditions, which overlay a prolonged drought, a “firestorm” can develop that no firefighting force on earth has the power to control.
- iii) On bad days, bushfires always come in numbers. One fire leads to another as burning embers are carried aloft on high winds; lightning storms can generate dozens of strikes one after the other over a very wide area; and sorriest of all,

whenever there are bushfires around, the criminal work of arsonists is activated. When fires come in numbers under severe weather conditions, even the biggest and best fire suppression force is quickly overwhelmed. This is probably the most important reason why hazard reduction must be undertaken beforehand – having a reduced quantity of fuel in the forest is the only factor that will assist when multiple fires occur simultaneously on a bad day.

- iv) A final and critical factor which has emerged in recent years, is the designation of so-called “wilderness zones” in the Australian bush by our State governments. In these areas large bushfires must be considered to be inevitable. Furthermore once the fire is large it is inevitable that it will burn out of the wilderness zone under extreme weather and will threaten life and damage property.

2.4 Fire and the community

The IFA believes that these factors are not well understood by the Australian community. On the contrary they are denied by many people, even some who hold responsible positions in land management agencies.

Our view is that this denial or misunderstanding mitigates against an effective bushfire management system being implemented in rural and semi-urban Australia. Indeed, the events of 2002/3 in eastern Australia highlight the fact that when it comes to bushfire management, Australia has not advanced significantly from where it was on Black Friday in 1939. We note:

- Although the lessons of the past are well known, they are being forgotten or denied;
- Although we have invested millions of dollars in research, its messages are ignored, or supplanted by ideology;
- Although every Australian is faced with an increased burden of insurance, we continue to fail to undertake the most basic “preventative medicine”; and
- Although a basic aspect of Australian culture is to look after your mates and try to be a good neighbour, some government agencies are moving away from their duty of care responsibilities to the community.

This issue is made worse by demographic changes to society, especially our increasing urbanisation, which in turn is leading to people losing touch with the reality of the bush. At the same time, growing numbers of city-people are drawn romantically to the bush, and are seeking a lifestyle at the urban fringe, surrounded by tall trees and dense bushland. Every Australian city has new residential developments of this sort, where inexperienced people are being placed in situations of great vulnerability to fire. Not only do these people not understand the threats around them, many have been indoctrinated with the old European view that “all fire is bad”, and actively oppose the work of fire managers trying to reduce fuels by prescribed burning so as to minimise the risk of the inevitable disaster a few years hence.

A great many urban people have been led to believe that ecosystems are threatened by the periodic low-moderate intensity fire which is used in hazard reduction work. This view is not supported by credible research. The Western Australian bush is very resilient to periodic fire, and prescribed burning operations can incorporate input from ecologists to ensure fire-vulnerable species or vegetation types are protected from

frequent fires. Fire regimes in targeted areas can be managed to maximize the protection of the values. On the contrary, by far the greatest damage arising from high intensity fires is to the soil, with post-fire erosion silting up waterways and reservoirs, and to wildlife where untold millions of animals are incinerated, or lose their habitat. Although there has been decades of research into the impacts on the environment of low-moderate intensity prescribed burning, almost nothing is known about the long-term changes to biodiversity following very large high intensity fires.

Governments need to educate the community and politicians about the role of fire in Australian ecosystems. There is a need to strongly put the case that the consequences of making a deliberate decision not to introduce fire to an area of bushland are at least as profound as deciding to apply planned fire at some time under particular conditions of fuel, weather and ignition pattern. This is a message that needs to start to be delivered to pre-primary children and emphasised throughout the education system.

In testing the fire management options there is a need to maintain strong relationships between foresters, database managers, researchers, academics and community groups in an open and transparent way rather than support those who are keen to maintain the “them” and “us” attitude.

3 Prescribed burning

To understand the ecology and history of south west ecosystems, is to know that ‘all fires are not bad’. The biodiversity apparent in the region is due to evolution of the systems under the influence of such natural environmental factors such as fire along with climate, landforms and soils. Some people may say “let nature take it’s course’. However that same ideology is likely to say:

- no lives lost;
- no loss of net values;
- limited loss of assets; and
- definitely no increased personal costs (with the rise of insurance costs).

Public education is essential to better understand the implications of no prescribed burns, and the slight inconvenience of smoke or temporary loss of aesthetic values. It should also ensure the public realise there is not a possibility for NO burns as some may suggest. As indicated in the discussion paper, during the 2002/03 fire season 42% of fires were caused by lightning, and 26% were attributed to arson. Unfortunately neither of these ignition sources can be removed. Interestingly, fuel reduction burns that escaped caused only 1% of all bushfires.

The case for prescribed burning is made in the discussion paper, but it is thought necessary to review it again here as it is NOT considered an option that can be foregone. In other words, prescribed burning MUST be continued if life and the full spectrum of forest values, including biodiversity (are to be protected from damage by unplanned fires.

3.1 Prescribed burning does not prevent fire

The first point to reiterate is that prescribed burning will not prevent fire in an area. What it will do is reduce the fuel load, enabling the fire to be more successfully controlled and reduce the risk of uncontrollable large intense wildfire.

Every 10 years or so, a dry season will dry out normally moist vegetation, accumulated fuel will become flammable, natural barriers such as swamps and rivers will disappear and overstorey vegetation will become stressed and shed more foliage to increase fuel loads further. A severe bushfire will occur if this is combined with extreme weather conditions of hot temperatures and dry winds, and an ignition source occurs (lightning, accident, arson).

A prescribed burn will reduce the amount of fuel and the amount of bark on tree boles. The rate of spread of fire is determined by surface and near surface fine fuels (these will build up in 2-4 years). The flame height of the fire front is determined by elevated fine fuels (these build up in ~10years). The amount and distance of spotting ahead is determined by the quality of the bark fuel (this builds up in ~15 years).

As adequately described in the discussion paper, if a fire occurs in an areas where it has been up to 5 years since it was previously burnt (either by prescriptive burn or by wildfire) then the fire will be easy to control and a ‘head attack’ will likely be successful. If it has been 6 to 10 years since fire, then it will be difficult to control

and a head attack may fail. A 'flank attack' is likely to be successful. If it has been more than 10 years since an area has been burnt, a fire in that zone will be very difficult to control and a direct attack will usually fail. It is important to note that the more difficult a fire, the more expensive it is to fight. Interestingly, the paper reports that during the 2002/03 fire season 87% of fires on CALM managed land were contained to less than 100ha in size. This was attributed to both rapid responses and low fuel levels.

The impact of a fire is directly related to the intensity. The intensity is influenced by the heat of combustion (constant), the speed of the fire (in turn dependent on weather and fuel) and the fuel consumed (dependant on total available and intensity). Therefore the load of fuel is the only variable that can be influenced to reduce the intensity and thus the impact of a fire.

3.2 Resources

To try and prevent destructive intense wildfires, rapid response is essential and this requires both resources and access. Mr Hodgson quotes that "for every \$1 spent on funding allocated to fire management, there is a \$22 cost saving". In this context it is noted that there has been a reduction in the amount of heavy equipment available to fight fires as a result of a decline in level of native forest harvesting over the last 5 years. The number of permanent and experienced fire fighting personnel in government agencies has decreased, and there is increasing reliance on volunteers, which increases response times and puts unfair responsibility on bush fire brigades trained and equipped primarily to fight grass fires. There is also the issue of liability and risk of litigation of individuals in fire command positions.

3.3 Local government planning / liability

There needs to be adequate buffers around vulnerable communities and assets. Land within a 1 km interface with bush and urban development needs to be considered. Once local government planning approval is provided and a house is constructed, then the only way to reduce the risk to the home is by reduction of fuel. It is spotting (caused by travelling embers) that causes the destruction of houses in most cases.

Victoria is the only state that permits a landowner to choose to stay and try and protect his/her house. All other states have the right to evacuate people from any area under the threat of fire. It is also interesting to note that it is local councils that approve the building of houses close to natural bush areas. However, due to common law, CALM are liable for damages from any fire that originated on their land (ie land managed by them). These anomalies need to be addresses in tightened legislation. Local government town planners must also be educated in the requirements of access roads to enable a rapid response to fight fires.

3.4 Increase in occurrence of wildfires

The area of CALM managed land subject to prescribed burning has decreased in recent times due to increasingly complex land management issues, drier fire seasons, decreased physical and people resources and changed community expectations. Since 2002, there has been an increase in the size and intensity of fires due to the increased fuel levels resulting from the reduced prescribed burning being carried out by CALM. This has resulted in an increase in the resultant level of damage to ecosystems, rural assets, homes and life.

If fuel reduction activities continue to decline, then there are likely to be more high intensity fires in milder conditions.

If there is a reduction in fire management, there will likely be:

- increased damage/loss of private property and public infrastructure;
- destruction of old growth forests and loss of wildlife including endangered species;
- degradation of forest soil with increased erosion rates and increased pollution of water reserves leading to increased costs of water treatment;
- increased burden on state and federal budgets for firefighting, disaster relief and restoration of infrastructure (interestingly there is no financial reward for successful fire management);
- rural communities dependant on value adding industry will be social and economically effected due to long crop replacement times;
- increased fire insurance premiums; and
- increase in the loss of life.

3.5 Biodiversity values

CALM acknowledges and does not advocate otherwise, that too frequent or intense fires will influence the ecological recovery of an area. It also does not advocate burning in regenerating forest until such time as the young trees have developed sufficiently to be tolerant of low-intensity fires. This is primarily a function of tree height and bark thickness. A mosaic burn will leave 5-35% of an area unburnt. Some areas are excluded from burns. These will usually be ecosystems that have:

- obligate seeders with a long juvenile period;
- fauna habitat species;
- fauna which have low fecundity and dispersal capacity;
- fauna that prefer late or mid successional vegetation;
- communities that take a long time to recover; and
- inflammable zones (eg. river beds).

The reasons that some people provide for not burning are all strongly argued against in the detailed 2004 draft fire management policy prepared by CALM. A continued audit of the fulfilment of management plans and process would provide comfort to the public that these issues are being addressed (by mosaic burns, weather condition triggers etc). It would also identify how the processes can be improved.

4 The Discussion Paper

The IFA believes that the process leading to formation of the discussion paper was flawed. The Minister requested that the review be as open and consultative as possible and the public exchange days with general community and interest groups were intended to achieve this. Unfortunately, it appears that this consultation was given far greater weight than discussions within key operational and research groups that deal with the issues on a daily basis. As a consequence, often those without a full or complete briefing in the issues were asked to form opinions that have been incorporated into the discussion document, and this perpetuates some of the skewed ideology. While the review was intended to be independent of CALM, the knowledge base within the department must be utilised to the fullest extent to ensure that there are no omissions and that there is no bias in the outcome and therefore the advice to the Minister.

The IFA is aware that several key professional people in this state were given little time to comment or respond on draft documents. Further that when professional people submitted key information for consideration during the preparation time, some of this key information was not acknowledged or integrated into the discussion paper.

The EPA stated that it was 'keen to present a fair and unbiased document based on the facts' - then asked people to choose 'personally acceptable trade-offs'. While the public have a right to voice individual opinions, they cannot be given undue influence over the total knowledge present on the issue. Everyone's memories are young, and the annoyance value of smoke will preside over the memory of a township destroyed and lives lost.

The paper is a conglomeration of data, with twenty diverse questions that in many cases, most people will only be able to offer uneducated responses. For example question 10 asks "is there a minimum proportion of an area subjected to prescribed burning that should not be burned?" From the data provided, and in further research, an individual may determine that the greater diversity in the mosaic burn will lead to biodiversity due to variation in response to fire. However, to ask what proportion should be left unburnt is naïve. This has not been fully researched and so there is no one that could respond to this other than those currently working in the area. The question should have been more general so as to gauge the support for mosaic burning.

The process adopted by the EPA in conducting the review has resulted in a discussion paper without clarity of the key issues that need to be addressed or recommendations, making it difficult to provide an informed response to the major issues. Our submission is intended as broad outline of the IFA's position on some of the issues raised.

4.1 The consultant's reports

There were three consultative reports offered in conjunction with the discussion paper. The URS field audit aimed to review if the planned objectives of fuel reduction burning were achieved in the field. The audit indicated that the majority of objectives were effectively achieved, but highlighted the need for written records to verify process and the ongoing education of field officers in procedure and policy.

The report by Mr Athol Hodgson aimed to investigate fire management policies and practises in the context of national and world-wide 'best practice', and to make recommendations for improvement. Overall it was a very positive report indicating that CALM did manage fire with techniques that are 'best practice' in Australia and world-wide. Some excellent recommendations were made to further improve these by fine tuning the legislation to further clarify responsibilities and to promote research to improve the knowledge base and to enhance the scope for 'best practice'.

The literature review to determine effects of fire on biodiversity was disappointing. It was pedantic and self righteous. The limited understanding of the topic of managing fire to promote biodiversity is already known and acknowledged by fire managers and fire ecologists, and is something that should be addressed by encouragement through funding and research. However, the authors chose to be negative through highlighting the unknown, rather than accumulating the knowledge that is already known.

It is acknowledged that the scope for the review was limited to refereed papers. Even so, much of the standard literature on the topic (eg, Fire and Biodiversity – The effects and Effectiveness of Fire management¹) was not reviewed. In fact, the EPA discussion paper itself visited a broader source of information. In some instances the authors demonstrated a fundamental lack of knowledge on current practises. For example, it is suggested that a prescribed burn should prevent 'natural' burning which is not the case. The quality of the review was further diminished because the authors choose to cite references inappropriately to support their opinions, even when authoritative references were readily available in the literature. This is exemplified by reference to the study of Grove and Malajczuk (1985) to argue the proposition that litter accumulation in Karri forest is the same 4 years after fire as it is 36 years after fire. Not only does this misrepresent the work of Grove and Malajczuk (1985) it also neglects the highly relevant studies of litter accumulation undertaken by O'Connell (1987, 1989). This issue is discussed further in Appendix C.

Rather than a timely summation of that which is known on the effect of fire on biodiversity, we were provided with the negative view that not enough is known and the authors question the scientific integrity of practically all of the science that has gone before.

¹ 1994 Biodiversity Series Paper No 8, Dept of Environment Sport & Territories

5 Response to Questions

The EPA seeks comment on a series of 20 propositions, some of which represent substantial issues and others of which are verging on the illogical or self-evident. It is not clear how the EPA have established these propositions and how they relate to the input provided at the community forums held in 2003. Some of the propositions are written in a way that makes them quite biased and treat fire as if it is not a natural part of the south-west environment.

i) Should protection of human life be the top priority in all circumstances?

There is no question that CALM would be found negligent if the protection of human life was not afforded the highest priority during fire management and suppression operations. As a land management agency CALM has a clear common law responsibility to take reasonable steps to prevent fires burning on lands under its control from causing harm to neighbours. Occupational health and safety legislation also places an obligation on CALM to provide a safe place of work for its employees, contractors and volunteers and to minimise avoidable risks resulting from work practices and the environment itself. Recent coronial inquests into the death of fire-fighters in eastern Australia have raised the possibility of fire management agencies being charged with industrial manslaughter offences.

There is a need for clear legislation and operational guidelines to deal with the circumstances of evacuation during bushfires and other emergencies. Compulsory evacuations that are hastily planned and executed at the last moment pose a great risk of loss of life and are also likely to lead to extensive property losses. Evidence from a number of case-studies shows that well-informed residents who have made adequate preparations can remain and successfully protect their homes during very severe bushfires. However, the safety of people choosing to remain with their properties during a bushfire cannot be guaranteed. In the unfortunate event of loss of life, fire management authorities should not be blamed for failing to forcibly evacuate people.

ii) Should private property assets be protected before public property assets (National Parks etc)?

Historically this may have been the case because assets such as buildings and crops were readily valued in monetary terms, whereas the multiple values of native vegetation have only begun to be properly understood in the past decade or two, except in the case of commercial timber resources. However, the IFA recognises that considerable advances have been made through CALM's Wildfire Threat Analysis system to provide an objective comparative weighting for a broad range of commercial, social and environmental values.

This issue is too complex for a simple yes or no answer. In practice, private land holders and public land managers have a shared responsibility to manage fire and both need to take action to manage fuels, minimise unplanned ignitions and provide adequate suppression resources. It is unreasonable to expect that either party should shoulder the entire burden of responsibility for fire management. To ensure a proper balance, planning guidelines and fire regulations need to be strongly enforced on private property, and government agencies must have appropriate fire management policies and the resources to implement them in the field.

The internal review of CALM fire management operations undertaken by Muller (2001) considered the issue of fire protection on developments adjoining CALM-managed land and made three recommendations (2.3, 2.4, 2.5). The IFA considers that implementation of the Muller recommendations would substantially address this issue.

iii) *Should biodiversity (i.e. native plants and animals) and the habitats that support them be protected before property?*

The response to this question hinges on the definition of protection. In the case of property assets, such as buildings and crops, fire protection generally equates to fire exclusion. However in the case of ecosystems that have evolved with fire, as those in south-western Australia clearly have, fire exclusion is unlikely to provide an effective strategy for protecting biodiversity values in the longer term. In fact there is growing evidence that management strategies that allow the development of large tracts of long unburnt vegetation can ultimately lead to undesirable outcomes for biodiversity and other environmental values such as water quality. This is because when long-unburnt areas do eventually ignite through lightning or by accident, heavy fuel accumulations lead to high intensity fires that cause extensive physical damage to soils and standing vegetation. Such fires also burn throughout the landscape, removing much of the heterogeneity that exists as a result of edaphic conditions and past low intensity fires (Jurskis *et al.* 2003). Recent examples of fires that have reduced landscape heterogeneity include the Nuyts Wilderness fire of March 2001 and the Mt Cooke fire of January 2003.

iv) *Should bushfires be left to burn within CALM managed land and put out only when they threaten private property or areas of significant biodiversity?*

The question suggests that we can sit and watch fires and only decide to attack them when they pose a threat to property or “significant biodiversity” (a term notably missing from the glossary). This is not the case and the EPA needs only to look as far back as the summer of 2002/3 for an answer to this question. In the ACT, fires that could have been suppressed when first detected went on to destroy homes and cost human lives. The example highlights that decisions on whether to attack and suppress a fire should not be delayed.

The EPA provides its own response to this question on page 13 of the discussion paper “*..the key is firstly, fire prevention and secondly a capacity for rapid response to overcome newly started fires whilst they are relatively cool and to prevent from spreading*”. The IFA supports this position.

v) *Should CALM managed land be prescribed burnt at intervals to achieve a relatively uniform period since the last burn/fire?*

vi) *Should the frequency of prescribed burning be determined primarily on biological grounds or on a regular timetable or should there be a compromise between the two?*

Issues v) and vi) are closely related and need to be considered simultaneously. The forests of southwest Western Australia are fire prone, and have experienced fire regimes determined by both lightning and human-caused ignition for many millennia. Landscapes encountered by early European settlers in the South West were unquestionably cultural landscapes fashioned by the hand of man, rather than primeval wilderness. For present day land managers, the issue is not whether we choose to apply fire to the landscape, but how we do so to achieve multiple resource

objectives. If land managers choose not to apply some regime of planned burning then they surrender to the uncertain consequences of fires started by lightning, accident, and arson.

Unlike some land management practices, prescribed burning need not be limited to a single objective. Thus a fire lit under carefully chosen conditions may achieve multiple objectives such as fuel reduction, habitat regeneration and temporary increase in streamflow or groundwater recharge. Prescribed burning is also planned and implemented at a landscape scale, and with appropriate management processes need not be reduced to a series of simple trade-offs between protection and biodiversity conservation as is implied in the Discussion Paper.

It is important to recognize that large gaps still exist in our current understanding of the biological values in the southwest systems. CALM has been addressing this issue through the various research projects at different levels of investigation (landscape, ecosystem and species). Further the complexity of the systems requires a flexible approach that is underpinned by targeted research programs. In the absence of this approach the debate will continue on emotive and unscientific grounds.

The way forward lies in adopting a landscape-scale approach to fire management planning. Some progress has made in this area with the definition of landscape units that can provide a context for examining the current distribution of vegetation age against some idealised or desired condition (Muller 2001).

The IFA recommends that the EPA use the opportunity provided by the current public review to report on progress with implementation of a landscape-scale approach to fire management planning by CALM.

vii) Should we apply the precautionary principle when dealing with issues where there is a lack of knowledge of the impacts of a regular and ongoing prescribed burning programme on the full suite of plants and animals?

Fire is a natural environmental variable in the Australian landscape – to attempt to exclude it because we do not fully understand its impact is naïve. While we may not have complete knowledge of the consequences of low intensity fire, we equally do not know the impacts of the high intensity fire that will inevitably occur if we do not undertake prescribed burning. The correct application of the precautionary principle should be to continue burning practices that have occurred in the past rather than attempt to do the opposite.

viii) Should prescribed burns primarily occur during the autumn season, and should spring season burns be avoided as much as possible?

This suggestion displays a bias towards autumn burning that is not substantiated by scientific evidence elsewhere in the Discussion Paper or the Consultant's reports. The evidence is that past burning prior to the arrival of European man occurred whenever the conditions were suitable, which would range from spring through summer and autumn until the opening winter rains. There is no sound ecological reason for favouring autumn over spring burns. Autumn burns are considerably more difficult to carry out and can easily result in much higher fire intensities. Wetlands, bogs, logs and trees are burned. In spring burns the surface of the fuel layer is dry whilst deeper layers are moist and usually do not burn. In autumn the deeper layers often remain dry and although initially ignition can be difficult an intense fire can develop once the

deeper layers catch alight. In spring burns more unburnt pockets are left, thus achieving a mosaic effect.

Restricting prescribed burns to the autumn season would unnecessarily limit the opportunities for completing the annual burning program, as well as limiting the range of resource management objectives that could be achieved. For example, it would preclude the use of early spring fires to remove logging tops generated by thinning operations in forest stands, and would prevent the judicious use of fire to burn buffer zones around peat swamps and organic soils. Once again a flexible approach is required in this context so that the complexity of issues and values can be accommodated.

ix) Should CALM set a target for the proportion (and hence area) of CALM managed land to be prescribe-burned each year and strive to achieve that target each year?

CALM should set annual targets for prescribed burning in order to guide planning and budgeting. However, it must also be recognised that these targets need to be flexible enough for managers to adapt to the prevailing weather conditions and to prioritise their efforts. It may sometimes be necessary for managers to concentrate resources on tackling complex and difficult burns that require commitment of resources over an extended period. For example, undertaking prescribed burning in 70 year-old regrowth karri forest around Pemberton is a very high priority in terms of protecting the community, tourism industry assets, and commercial forest values. However such burning requires a high level of resourcing and may commit crews for up to several weeks. In contrast, burning open Jarrah forest in the eastern zone of the main forest belt is relatively straightforward and burns of 5000 to 8000 ha can be completed in one or two days. For these two examples, comparing the area burnt provides little information about the effectiveness of the outcome, or the efficiency with which limited resources of funds, staff and suitable burning weather have been utilised.

Some measure of the reduction in wildfire threat would be a more useful performance indicator than a simple measure of area burnt. The Wildfire Threat Analysis (WTA) system developed by CALM may have an important role to play in monitoring performance against targets. To date it has been employed as a tool for planning and prioritising burns, but there may be scope for it to be also used as a tool for reporting on the outcomes of the prescribed burning program. .

The IFA supports the development of performance indicators that directly reflect the reduction in wildfire threat achieved as a result of fuel reduction burning and other hazard management techniques. The EPA should use the opportunity provided by this review to endorse the development of performance indicators for prescribed burning, and for these to be made available to the public on an annual basis.

x) Is there a minimum proportion of an area subject to prescribed burning that should not be burned?

In general terms, opportunities to retain unburnt areas within the boundaries of a prescribed burn are directly proportional to the size of the burn. In a small burn, the need to secure a burnt edge around the entire perimeter of the area and to minimise the occurrence of unburnt pockets close to the edge means that a very high proportion of the area may have to be burnt. In contrast, larger blocks of several thousands of hectares provide scope to safely retain larger unburnt pockets provided they are more than 0.5 km from the nearest part of the burn perimeter. A broad scale burn carried out during mild weather conditions where fuel levels are not homogenous will lead to

a mosaic of burnt and unburnt patches. Over successive burns, some areas burn all the time, other never burn and others burn sometimes. This helps create not only a mosaic of fuel levels but also a diverse range of habitats that can maintain the range of biological values in the area and the ecological functioning processes in the area. A target of 10% - 30% remaining unburnt, provided this is well distributed, is considered a reasonable aim.

Southern forest areas commonly contain a mosaic of heathland, open forest and tall Karri forest. It has been quite common for discrete patches of Karri forest to remain unburnt during prescribed burning either because of chance events of fire spread, or a deliberate operational decision to not impose a uniform ignition pattern across the burn area.

Land managers need to have some flexibility, as the ecosystems within a particular area cannot be tackled through one uniform approach. CALM are currently establishing an information/database to test many of the risks of fires in different landscapes and systems. The community should support such an approach rather than criticise CALM's efforts. Really it comes down to "horses for courses". In other words, the minimum proportion for a threatened ecological community on the southern ironstones may need to be treated differently from wandoo woodlands in the drier eastern fringes of the forest and the tall forests of Karri (which establish from seed in post fire situations).

x) If a target of unburned land within a prescribed burn is set, should that target be actively pursued through fire planning and the burn?

A mosaic approach will address this in part, but at the end of the day flexibility is needed in this area as the value of unburned land has to be balanced with the complexity and range of issues that have to be balanced in the planning process.

As discussed in issue x) above, managers have some flexibility in determining the proportion of area burnt through the sequencing of ignition operations. However, the IFA would discourage the enforcement of strict targets that might necessitate the construction of additional tracks within a burn, unless there is clearly a justifiable reason for doing so. Examples of this situation are discussed in the following section.

xii) How far should fire planning and management be driven by the need to protect harvestable trees or future harvestable trees within CALM managed land?

The native forests in the South West are relatively resistant to fire damage except for high intensity fires that adversely affect all values. In the juvenile stages the leaders of young trees are easily damaged by fire and recently regenerated stands need to be kept free of fire for set periods, depending on the species. Young stands require a period of protection by fire exclusion for some time after they have been regenerated, whether this occurs following silvicultural treatment or as a result of natural regeneration following wildfire.

Timber is an important State asset, and timber values should be protected from large, intense wildfires. Plantations are especially valuable, and represent a significant State investment. It would be irresponsible to let them burn needlessly.

Changes in land tenure during the past decade have resulted in many thousands of hectares of even-aged regrowth forest regenerated following timber harvesting now being included in the conservation estate. While these stands arguably no longer have a commercial timber value it is important that they be protected and managed to

ensure that the full suite of other forest values is maintained. The IFA considers that current guidelines applied to assess the adequacy of regeneration stocking following disturbance, and to assess the effectiveness of prescribed burning in young stands, need to be re-examined in the light of changed management objectives for some stands. There should be a clear distinction between the standards that apply to stands that may be harvested for timber in the future, and those that apply to stands where nature conservation will be the primary objective. In either case, standards should be consistent with the principles of ecologically sustainable forest management.

In this context the issue of protecting other production components of the south west forest (eg water production) have not been included in the series of questions presented in the Discussion Paper. The question of maintaining water production areas is a critical component to the survival of the human populations in the south west and also to the well-being of all Western Australians.

xiii) How far should fire planning and management be driven by other uses, such as tourism, recreation, apiary, wildflower picking and access generally?

The 5-7 year cycle in jarrah forest usually provides a range of areas that are suitable for these activities. Some practical things can be used such as not burning both sides of a main tourist road in the one year to ensure wildflower displays are always available. The danger in acceding to too many requests for burn deferral is that attainment of the overall target of 250,000 ha per year will be easily compromised and the very values that the community value may be placed under threat through the lack of fires. The community has to accept that a short-term impact on a scenic tour drive from a prescribed burn is a better alternative than a high intensity wildfire that kills the trees outright. In the karri forest it is well known that the best wildflower displays occur in areas recently burnt.

xiv) Should areas around townsites and other important economic assets be subject to frequent burns to establish and maintain a low fuel load with aim of providing increased protection from wildfire?

In general the answer is Yes. Human life must be given a higher priority than possible impacts on biodiversity. Many of the objections to burning are short term. For example, the scorch from most Spring burning is only apparent for a few months. The Canberra experience in 2003 is a reminder of the enormous damage caused by high intensity wildfire not only to people but also to environmental values.

There is still a need to recognize that in some extreme situations, prescribed burning will not necessarily provide protection to those who place their property in high risk areas. This is a critical area from a legal perspective if a fire escapes from public land into private property.

xv) Should the CALM Act be amended to give clear responsibility for fire management and operations on CALM managed land to CALM?

Yes. Clear responsibility is essential for fire management on all lands. CALM should have the responsibility and the will to take action on all fire management issues related to CALM land. The IFA supports the concept of a clearer statutory responsibility structure for all fire management to clarify the roles and responsibilities of all parties.

xvi) *Should there be a more explicit statutory structure for all fire management both for CALM managed lands and for privately owned areas?*

Yes. Without question fire management in Western Australia needs a major review and clear lines of responsibility laid down and accountability made very explicit. The IFA supports the concept of a clearer statutory structure for all fire management to clarify the roles and responsibilities of all parties.

xvii) *What responsibility should planning authorities, developers, communities and individual property owner's carry for the protection from fires?*

All these groups need to accept responsibility and this question needs to be examined in depth during a recommended complete review of fire management in WA. The current situation is completely unacceptable. In this context, the IFA recommends a review of the roles and responsibilities of fire management in this State, including clarification of the responsibility of all sectors (including those that advocate no burning as an option).

xviii) *How important is it to keep smoke from prescribed burns away from communities?*

The question the community has to ask is whether it is preferable to be subjected to short term smoke events from prescribed burns or enormous amounts of smoke from a wildfire, which also has the potential to kill people. It can be argued that people who are susceptible to smoke can take personal action to avoid impacts by staying indoors during the brief period smoke is about. The attempts to avoid putting smoke over the metropolitan area has been a prime reason why fuel levels in forests close to Perth are so high. This question also needs to address the longer-term implications of risking severe and extensive wildfires as well as no prescribed burning.

Experience in the South West over the last 30 years has demonstrated time and time again the benefit of past prescribed burning in halting the run of high intensity wildfires. Similarly, the attempts to apply a "no burn" policy have not succeeded and virtually all of these areas have been burnt, often under very severe conditions.

xix) *What measures should CALM implement to ensure that communities are informed about intended prescribed burns and have the opportunity to participate in burn planning?*

The IFA considers that CALM has more than adequate procedures in place to advise and consult with adjoining landowners and the community. Consultation at a strategic level (eg, at the policy development level or through 5 year planning proposals) is reasonable. Any attempt to consult too extensively beyond that may mean that achievement of the annual prescribed burning target will be severely compromised. The situation is similar to the Police Force being asked to consult with the community whenever a high-speed vehicle pursuit is to be made.

The day-to-day responsibility of fire management has to be allocated to the professionals within the community.

xx) *What areas of research should CALM and others undertake to best inform fire management policy and practices?*

- a. A study to measure the relative contribution and impact on human health of smoke from prescribed burns over an extended period compared to other sources, eg vehicle emissions.

- b. As above for emissions from a major wildfire. The aim would be to give an indication if the smoke emissions from even one wildfire would exceed that from several prescribed burns.
- c. A study to investigate methods of educating the public in fire management through science teacher forums, media education programs to local community groups.
- d. How do fire regimes affect streamflow, groundwater recharge and water quality in forested landscapes? In particular, what are the differences in response to low and high intensity fires?

6 Recommendations

There is currently little support either professionally or publicly for fire management professionals in Western Australia. Similarly, the community attitude to the scientists and professionals working on database development and integration have little support either professionally or publicly for their commitment to the maintenance of information and data systems for the fire and resource managers.

There is a great risk of loss of experienced and talented fire managers and support scientists unless the situation changes. This would prove a loss to society in general, especially when the management of a serious bushfire is required.

Similarly, if fire fighters are unable to control high intensity fires (that would result from a reduction in the amount of prescribed burning practises) and are unable to apply any risk reducing policy, why would these people (often volunteers training after hours) continue to put their life on the line?

Implementation of the following recommendations will hopefully improve the current 'us and them' mentality of public vs fire managers. The IFA believes that the following areas require urgent support and resources so that current management practices can be maintained and improved.

1. Adequate resources

There is a need to review the allocation and adequacy of resources for fire management. These resources are required to implement current policies, including ongoing audits, maintenance of research and database management teams and adequate physical and personnel resources for rapid response times.

2. Recognising the priority that must be given to human life

The EPA should advise the State Government of the need for an explicit public statement recognising that protecting the lives of the community and fire fighters is a paramount consideration in all fire management operations.

3. Laws to reinforce and clarify the implementation of policy

There is a need to review and update the legal aspects associated with fire management. This review should include the accountability of all sectors from senior ministerial staff to the community groups and individuals within our society. The chain of command needs clarification so that during major fires there is a clear delineation of roles and responsibilities (including FESA, CALM, general public). This could also be achieved through an upgrading of the currently established Memorandum of Understanding.

4. Public education

Public education is an essential component of fire management. In this context there is a need to lift and raise the current standard of debate on the issues. The education needs to be pro-active, and cannot allow the media to dictate the agenda. This education needs national co-ordination. All areas (local, federal) need to be providing the same messages.

5. Research funding

It is obvious that there is a great need for further research in both the ecological area (to further determine the effects of prescribed burning and wildfires on biodiversity and other critical values such as water supply) and on fire technology. Research and information systems are critical support mechanisms to fire management in Western Australia. The establishment of the federal Bushfire Co-operative Research Centre based in Melbourne promises great advances in all fire management areas including education. Project Vesta in Western Australia has also seen the improvement of understanding and hence technology of fire management. Areas for further research to improve the knowledge of fire and biodiversity include; the effectiveness of mosaic burns to retain habitat, further fauna studies (such as movement or death of fauna during prescribed burns and intensive burns), the effect of fire and intensity on biodiversity (such as knowledge on the flora with the longest juvenile stages) and the influence of different fire regimes on the production of water in the south west forest region. Improved knowledge on the health implications of prescribed burn smoke (and wildfire smoke) is also needed.

6. Information management and database integration

There is an on-going need to capture appropriate quality data, integrate this data and maintain the data in a secure environment to support both operational and research groups involved with fire management in Western Australia. This requirement extends well beyond the immediate CALM operations to the wider scientific community so that the management options applied can be tested in an open and transparent manner. This data should be available to the scientific and operational staff in a format so that it can be tested and lead to improvements in fire management practices.

7. Support of operational and research staff

Support should be increased for operational and research staff involved with developing our understanding of the different fire management options. This sector of society is often forgotten in the emotive aspects of fire management until there is a crisis and then their skills are paramount to the well-being of the wider community. The depth of experience and knowledge in the IFA can contribute in this forum towards supporting professional standards within the industry.

8. Flexibility in Fire Management Plans

Fire management plans need to be flexible to enable the incorporation of any new knowledge. The complexity of the systems within the southwest forest regions requires flexibility in management. For example, a strategy in a disturbed and isolated stand of forest surrounded by urban or agricultural holdings requires a very different fire management approach to restricted and biogeographically distinct ecosystems surrounded by production forests. Recognition of this complexity in tenure, land management and biological values raises a whole range of questions relating to the need of balancing values and priorities. These decisions are often left to local fire managers. Support and training for these people at the end of the day will make or break the protection of the very values that the wider community wants to protect in the southwest forest areas.

9. Implementation of the recommendations from the Muller (2001) review

Most of the issues discussed in the IFA's submission have previously been examined in the internal review of CALM's fire management practices undertaken by Muller (2001). Some issues have also received further attention by the Nairn and COAG inquiries into the bushfires of the 2002/03 season. The Muller report made 44 recommendations that were subsequently responded to by the CALM Corporate Executive. The EPA could perform a valuable function by reviewing progress with implementation of the Muller recommendations, and bringing to the attention of the State government the more complex issues that have not yet been addressed. These issues are likely to involve multiple agencies, different levels of government and changes to legislation.

10. Accountability of the Conservation Commission.

The Conservation Commission prepares fire management plans for implementation by CALM. At present CALM is accountable for outcomes. Outcomes should be a joint responsibility.

11. Independent monitoring and public reporting of outcomes

There must be independent monitoring and public reporting of outcomes against performance measures and standards.

12. Future staff needs

Future staff needs must be proactively addressed through succession planning for fire commanders and managers.

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Appendix A: ***Managing Fire – the Policy of the Institute of Foresters of Australia***

The Issue

In most Australian forests and woodlands weather conditions occur every year during which, given sufficient fuel, bushfires can be virtually impossible to contain. Uncontrolled fires can pose a serious threat to human life, property, community assets and forest values and these impacts need to be minimised by effective management. Fire also plays an important role in the maintenance of biodiversity and ecological processes and is an essential tool for silviculture and forest management. Forest managers are required to integrate a broad range of fire-related issues and to implement management programs that address objectives related to ecosystem management, sustainability and community protection.

Background

Management of fire in forests and woodlands is principally based in legislation passed by State and Territory governments. This may include general legislation relating to fires in rural areas, as well as specific provisions in the legislation that governs the management of publicly-owned native forests and plantations. The Commonwealth Environmental Protection and Biodiversity Conservation Act imposes requirements in relation to fire management activities. Common law provisions may also impose a duty of care on forest owners and managers with regard to fire.

Planning for fire management requires systematic assessment and analysis of the threat of bushfires to forest and community values. Hazards and risks associated with bushfires are addressed through the development of strategies for prevention, preparedness and suppression of fire. Fire prevention activities include public education and awareness programs, minimising the risk of fire outbreaks from forest operations and recreation activities, enforcement of fire regulations, and thorough investigation of the cause of fire outbreaks.

Preparedness involves the management of fuels, detection of fires, provision of communications systems and development of response plans to be activated in the event of unplanned fires. Collaboration between forest managers and other agencies responsible for fire management in rural areas is important in ensuring that resources are used efficiently and that the response to fire emergencies is effective and well coordinated.

The provision of a well-equipped and trained workforce is also an essential component of fire preparedness. Agencies responsible for the management of forests have a requirement to maintain an effective workforce available for fire management tasks, and to allocate sufficient resources to this task in order to meet their duty of care to the community, volunteer fire-fighters, and their own employees. Safety of personnel must be a paramount consideration in all operations associated with fire suppression or the planned use of fire.

Prescribed burning is the planned application of fire under specified environmental conditions to meet particular management objectives. Prescribed burning is an important tool for forest management and is used for a range of purposes including forest regeneration, site preparation, fuel reduction and habitat management. Scientific studies have demonstrated that the speed and intensity at which a forest fire burns is related to the amount and arrangement of fuel comprised of leaves, twigs, bark and understorey shrubs. In most forests, the amount of fuel increases with the

time since last fire, and may continue to accumulate for several decades. Prescribed fire can be used to reduce the amount of accumulated fuel, thereby reducing the intensity and difficulty of suppression of unplanned fires, and minimising likelihood of severe damage to forest values. Prescribed burning can also have an important role in providing heterogeneity of fire regimes at a landscape scale.

Fire management programs should be based on the best available information about fire behaviour, the role of fire regimes in the environment, and the influence of fire on communities and society. This requires a commitment to ongoing research in a range of disciplines, and a commitment to technology transfer to ensure that new information is made available to decision makers and practitioners. Scientifically-based decision support systems are an important tool for integrating a wide range of information and can assist managers to make consistent and transparent decisions about complex issues. Decision support systems are currently being used for smoke management and to plan the use of prescribed fire for biodiversity conservation.

There is a need for forest managers to engage the community during the development and implementation of fire management programs, particularly where publicly-owned forests and woodlands are involved. Fire-related issues likely to be of interest to the community include environmental protection, risk management, and the relationship between bushfire smoke and human health. Effective communication and consultation with the community leads to greater support for fire management programs, and ensures that knowledge available within the community is made available to forest managers.

Policy

The Institute of Foresters of Australia advocates:

That management plans for forest and woodland landscapes should recognise the important ecological role of fire and provide strategies to ensure that fire regimes are compatible with broad land management objectives;

- That forest managers have a responsibility to minimise adverse impacts on society that may result from uncontrolled forest fires, and should allocate adequate resources to manage fire risk in an effective and safe manner;
- That there is a need to manage the accumulation of flammable litter and understorey fuels in strategic areas of forest in order to limit the intensity and difficulty of suppression of fires;
- The use of prescribed fire as an effective tool for managing fuel accumulation, maintaining ecosystem processes and achieving silvicultural outcomes in forests and woodlands;
- Recognition of the importance of effective communication and consultation between forest managers and other stakeholders in relation to planning and implementing fire management activities;
- Development of inter-agency agreements to address issues of common interest related to forest fire management including resource sharing, standardisation of training and equipment, and mutual aid during fire emergency situations;

- The use of scientifically-based decision support systems to inform forest managers in the context of strategic planning, resource allocation and operational issues related to fire;
- The application of performance indicators that provide meaningful information about the effectiveness of fire management in terms of environmental, social and economic outcomes.

Appendix B: ***The Role of Fire in Australian Forests – the Policy of the Institute of Foresters of Australia***

The Issue

Bushfires are a characteristic feature of forests and woodlands throughout Australia. At one extreme, extensive areas of grassy forest and woodland in northern Australia burn annually or every few years. In contrast, tall moist forests in southern Australia may experience high intensity fires at irregular intervals of decades or even centuries. Between these extremes there are a wide variety of fire regimes characterised by combinations of frequency, intensity, season, scale and patchiness of burning.

Fire plays an important role in the maintenance of biodiversity and ecological processes and contributes to the distinctive nature of Australian forests and woodlands. At the same time, uncontrolled fires can pose a serious threat to human life, property, community assets and commercial forest values. Inappropriate fire regimes may also threaten ecological values. In most Australian forests, complete fire exclusion is neither feasible nor ecologically desirable. Forest managers must therefore seek to understand the role of fire and to manage it in ways that complement broad objectives for land management.

Background

Fire is one of the most important factors in the ecology of Australian forests and woodlands. Charcoal deposits in lake sediments and pollen evidence indicates that forest fires have occurred periodically since Tertiary times, more than 16 million years before present. Aboriginal people have inhabited much of the continent for more than 40 000 years and over this period have used fire as a management tool for cooking, hunting, maintaining access and for spiritual reasons. The landscapes that European colonists and their descendents have come to recognise as being distinctively Australian have been fashioned by fire over many generations. Lightning causes a substantial number of bushfires, and is likely to have been an important source of ignition in pre-historic times.

Fire regimes are influenced by environmental factors including climate and weather, topography, soils, and the characteristics of the vegetation itself. In many forest landscapes, fire regimes have changed dramatically in the last two centuries as a result of agriculture and urban development, changes in land management practices, legislative restriction of the lighting of fires, and organised fire control.

Occasional extreme events such as prolonged droughts and severe fire weather conditions can greatly increase the scale and intensity of fires beyond what is experienced in an average season. The effects of extreme bushfire events on human society and the environment can be profound.

Fire plays an important role in a number of ecological processes within forests and woodlands. Heat, smoke and ash provide triggers for germination of many plant species, and a number of eucalypts regenerate best on ash seedbeds produced by burning. Fire regimes affect nutrient cycling processes in forests, and fire is instrumental in mobilising some elements into inorganic forms that are available for uptake by plants. Stand development processes including recruitment, mortality, senescence, hollow formation and litter accumulation can be substantially influenced by fire, with resulting effects on structure, density and composition of understorey and

overstorey layers. For this reason there is a direct relationship fire regimes, habitat condition and population densities of many fauna species. In some environments, fire regimes play an important role in determining the boundary between different vegetation types including rainforest, eucalypt forest, shrubland and grassland.

Altered fire regimes may be linked to a decline in ecosystem health and vitality, inadequate regeneration, weed invasion and more frequent outbreaks of pests and diseases. Excluding fire from naturally fire-prone forests can lead to conditions quite different from those with which existing ecosystems have developed. Fire exclusion is also likely to result in an increasing risk of large-scale high intensity bushfires.

Fires in forests and woodlands can produce very large quantities of smoke and release significant amounts of greenhouse gases. Heavy concentrations of bushfire smoke can inconvenience the community and cause significant economic loss if the use of airports and major roads is restricted. At a national scale, fire regimes have considerable scope to influence greenhouse gas emissions and carbon balances and need to be managed accordingly. It is likely that these global issues will increase in prominence in the years to come.

Policy

The Institute of Foresters of Australia:

- Recognises that fire has an important and on-going role in maintaining biodiversity and ecological processes in forests and woodlands;
- Recognises that the ecological effects of fire vary according to the season, frequency, intensity, scale and patchiness of burning in a landscape;
- Believes that the decision to deliberately exclude fire from naturally fire-prone forests and woodlands represents one extreme of the possible range of fire regimes, and that this can have consequences for the condition of ecosystems in the longer term;
- Supports education and information programs to better inform land managers and the community about the role of fire in Australian ecosystems;
- Recognises that forest fires can have effects that are significant at local, regional and global scales and that communities, agencies and governments should foster cooperative arrangements in relation to understanding and managing forest fires;
- Advocates the need for ongoing and well-coordinated research into the behaviour, environmental effects and social impacts of bushfires;
- Supports the collection, analysis and distribution of comprehensive information about fire regimes in forests and woodlands throughout Australia.

Appendix C:

An example of misleading use of scientific literature in the consultancy report on Fire regimes and Biodiversity prepared for the EPA by Wells, Hopper and Dixon (2004).

On page 6 of the consultancy report the authors make the following statement: ” *These results are supported by studies of fuel loads (McCaw and Hanstrum 2003, Grove and Malajczuk 1985) in areas that are prescribed burnt. Such studies suggest that in some ecosystems fine fuel loads may carry a wildfire unless burnt at intervals of 2-4 years. Grove and Malajczuk (1985) observed litter accumulation in 4 year post-fire Eucalyptus diversicolor (karri) forest to be equivalent to a stand which had remained unburnt for 36 years.*”

This example highlights serious shortcomings in the interpretation and use of relevant scientific literature in this review.

Firstly, the study described by Grove and Malajczuk (1985) investigated above-ground biomass of trees and understorey species and biomass of fine roots and understorey roots in an age series of stands. The understorey in the 36 year-old stand was in fact 8.8 years old since fire. Grove and Malajczuk (1985) did not present any original data regarding the accumulation of leaf litter on the forest floor. The authors of the consultancy report have failed to make the important distinction between live biomass and the surface leaf litter layer, despite the fact that this is of fundamental importance to fire behaviour and is well recognised in the literature relating to fuel classification and description.

Secondly, the consultants claim that the data presented by Grove and Malajczuk (1985) show that litter (sic) in a 4 year old stand was equivalent to that in a stand that had remained unburnt for 36 years. This statement is not supported by data presented in Table 2 of the paper. An extract from Table 2 of Grove and Malajczuk (1985) is presented below showing biomass loading in tonnes per ha of dry weight:

Component of biomass	Understorey age (years)				
	4	8	11	9	14
Bossiaea leaves	0.13	1.30	1.66	0.93	2.40
Bossiaea twigs<4 mm	0.36	2.51	2.89	1.66	3.99
Trymalium leaves	0.11	0.80	0.64	0.76	0.13
Trymalium twigs <4 mm	0.19	0.96	0.57	0.88	0.12
Total	0.79	5.57	5.76	4.23	6.64

For live understorey shrubs the components normally regarded as being available for combustion are the leaves and twigs <4 mm diameter. Larger twigs and

branches may char, but rarely contribute to flaming combustion. The data presented above illustrate a clear increase in the quantity of potential understorey fuel from 4 years to 8 years after fire, and also some evidence of a slight continuing increase up to an age of 14 years post fire.

Thirdly, the authors of the consultancy report have elected not to cite the highly relevant work of O'Connell (1987, 1989) who investigated litter accumulation in Karri stands by means of both empirical and process-based studies. Both of O'Connell's studies demonstrated that the surface litter layer continued to accumulate for several decades.