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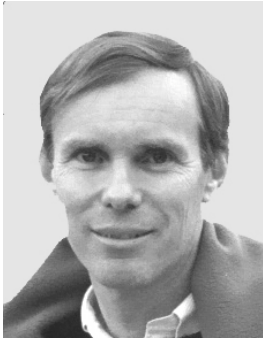
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**Fire Management:
Imbalanced and Misunderstood?**

Peter Moore

Paper prepared for presentation at the “Forests, Wood and Livelihoods: Finding a Future for All” conference conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, Australia, August 16, 2005

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SESSION: MEETING THE DEMAND FOR
FORESTS AND FOREST PRODUCTS TO 2020:
ISSUES FOR DEVELOPMENT AND AUSTRALIA

Fire Management: Imbalanced and Misunderstood?¹

PETER MOORE

Email: metis@metis-associates.com

Rural fires occur from the edge of highly developed and urbanised land through to remote and inaccessible wilderness. Ignition sources are numerous and varied, and nearly always from people. Fire impacts range from catastrophic to beneficial. Fire is an integral and important component of most natural ecosystems, and efforts to eliminate it may be neither practicable nor desirable. Equally, unplanned fire is neither desirable nor welcome in areas such as agricultural lands. In order to have any success in 'managing' fire there must be a good understanding and knowledge of fire in the landscape being managed. To establish what is required for fire management it is necessary to consider and frame the factors systematically. I present the key identified areas of fire management — analysis, prevention, preparedness, response and recovery — to highlight some questions and concepts that should be applied. Aspects of fires that are important for the focus for fire management have been set out in the Strategic Bushfire Management Plan of the

DR PETER F. MOORE has 25 years of fire management and forestry experience. He completed a Masters Degree at the University of Montana with the US Forest Service on a Rotary Scholarship, and a PhD on the implementation of prescribed burning policy. He coordinated management of fires during the 1994 NSW bushfire emergency before directing Strategic Planning for State Forests. As Principal Policy Officer and then Director of Policy Development he worked on natural resource policy issues and established the Forestry Policy Office of the Ministry for Forests. Since 1998 Peter has been the Coordinator of Project Fire-Fight South East Asia and a Fire Management and Policy Specialist working for WWF, IUCN, TNC, GTZ, South African Department of Water and Forests, DFID, ASEAN and CARE International. He is Programme Coordinator for IUCN Vietnam in Ha Noi.

Australian Capital Territory and in the Canadian Wildfire Strategy. Fires *ignite* THEN *spread* through fuels THEN *impact* on assets (human built or environmental). We can prevent/reduce ignitions; prevent/reduce the chance for fires to spread; prevent/reduce the negative impacts on assets. The mix of these options and the balance between them will vary with circumstance. Systematically framing fire management factors in combination with what fires do when they start, burn and impact more clearly identifies where the 'fire problem' might be found.

Introduction

Rural fires (including bushfires, forest fires, brush fires, veldt fires, grass fires *et al.*) not only can, but do, occur from the very edge of highly developed and urbanised land through to more remote and inaccessible wilderness areas. They start in, burn across and impact on and in the 'landscape'. Causes and ignition sources are numerous and varied, and nearly always (90% of ignitions) due to people (FAO 2001). Fire impacts can range along a continuum from catastrophic to beneficial, catastrophic outcomes often being associated with substantial asset or infrastructure loss but also with significant environmental damage (Rowell and Moore 2000).

Fire is an integral and important component of most natural ecosystems, and efforts to eliminate it may neither be practicable nor desirable (The Nature Conservancy 2004). Equally, unplanned fire is neither desirable nor welcome in less natu-

¹This paper draws on a paper prepared for a publication in press by the Instituto Superior de Agronomia Departamento de Engenharia Florestal, Portugal co-authored by Ross Smith – Fire Management Specialist – Global Fire Management gabbar@idx.net.au

ral ecosystems such as agricultural areas, although its use and impact may be beneficial or necessary in many cases (Ganz *et al.* 2003).

In order to have any success in ‘managing’ fire there must be a good understanding and knowledge of fire in the landscape being managed (Moore 2001). It is useful to consider and frame the factors systematically. One approach to do this has been developed over time and documented most recently by Moore *et al.* (2003). The key areas of fire management identified are discussed below under separate headings — analysis, prevention, preparedness, response and recovery — to highlight some questions and concepts that should be applied.

The Strategic Bushfire Management Plan of the Australian Capital Territory and subsequently the Canadian Wildfire Strategy identified aspects of fires that are important for focussing fire management efforts. Fires *ignite* THEN *spread* through fuels THEN *impact* on assets (human built or environmental). A total of three aspects in all, and for each we can prevent/reduce ignitions; prevent/reduce the chance for fires to spread; prevent/reduce the negative impacts on assets. The mix and the balance of these options will vary with circumstance. Systematically framing fire management factors in combination with what fires do when they start, burn and impact more clearly identifies where the ‘fire problem’ might be found.

The key elements of fire management have been characterised as:

- analysis
- prevention
- preparedness
- response, and
- recovery.

These elements are parts of a package and must be used together. They are closely inter-related, and so a focus on just one element will fail. To provide optimum chances for improved fire management, a careful and systematic approach, dealing with all elements of fire management, is necessary.

Analysis

Analysis of fire occurrence and impact is the cornerstone upon which other key principles and subsequent management actions are founded. To understand whether or not fire is a problem, and then to assess the type and size of any problem, requires collation and analysis of fire-related statistics and other information. Understanding fire cause is an integral part of developing effective fire management. The core question is ‘*if you don’t know who and what causes fires and where they are located, how can you know who and what to target to prevent them or reduce the impacts they have?*’

Not all bad fires are big fires, and not all big fires are bad fires. From time to time great loss, and environmental and community impact, can occur from small fires that last a short time, especially at the forest and urban interface. Consequently the collection of simple statistics of burnt area may not on its own be useful. The information that is currently available in most countries and agencies provides a possible indicator of the nature of the fire situation and whether it is a problem or not. The data that are useful in analysis are simple and relatively straightforward to collect (PFFSEA 2001):

- when did the fire start?
- where did the fire start?
- when did the fire finish?
- how large is the area burnt?
- what assets were affected?
- what ignited the fire?

In many countries, fire management is divided amongst an array of agencies. Fires are misunderstood, being viewed as an unpredictable emergency, and the need for consistently-collected data is not appreciated. Appropriate information will allow better management of fire by facilitating timely concentration of resources for prevention, suppression and recovery where and when fires are most problematic (Moore 2001). The sort of information identified above is not collected consistently in Australian states and is unavailable for the nation as a whole (Ellis *et al.* 2005).

Whether fires are a problem or not depends on the answer to the following questions:

- is community health negatively affected?
- is biodiversity threatened, protected or even stimulated?
- all costs included, do fires save or cost money?
- who benefits and who loses?

Prevention

It is widely accepted that ‘prevention is better than cure’. Prevention reduces the likelihood and impact of fires, through reducing unwanted ignition sources and decreasing the intensity of fires, while increasing the ability of organisations and communities to deal with negative fire impacts.

Depending on the circumstances, prevention might include:

- education and awareness-raising
 - alerting community members to the impact on them of unwanted/undesirable fire,
- fuel management
 - reduction, removal or other manipulation of the fuel in which fires burn
- enforcement
 - appropriate laws and regulations, sanctions and supervision.

The need for increased awareness often links directly back to fire analyses, including deliberate legal use of fire, for example to dispose of unwanted crop residues. Until agencies have a clear picture of fire incidence and impact, who causes fires and why, it is often very difficult to appropriately target and direct effective education and awareness-raising programs.

There are many areas around the globe where most unwanted fires are from inappropriate use of fire for agricultural purposes, or use of fire by near-urban and urban-edge residents. In these instances, legislative restrictions and harsh penalties are rarely the answer — a box of matches remains the least expensive tool anywhere in the world, and traditional fire users or those from poorer communities are unlikely to change their habits unless they can be convinced of a benefit to them.

Similarly, recognition of legitimate fire use and permitting its use under carefully identified conditions during fire-dangerous periods is likely to reap more rewards than an absolute ban on fire

use. Where land users and managers are legally able to use fire, under a permit or licence, they are far more likely to be careful in its application and control than if there is an outright ban on using fire.

Securing or maintaining funding for prevention work can be difficult, as prevention activities at the local level are ongoing and long-term, and the benefits and outputs are sometimes difficult to measure and to communicate. This is compounded by prevention activities being most effective, and best carried out, when no unwanted fires are burning, which is often when the least attention is paid to fires.

Despite these possible constraints, prevention is one of the most important elements and must be effectively and consistently funded. There is growing recognition in global fire circles that focussing solely on response capability is a long-term recipe for failure, and must be matched in the other key areas of fire management, especially prevention (Moore 2002).

Politicians often respond to severe fire episodes in the most politically attractive mode. Securing and providing more suppression resources is an action that is easy for politicians to demonstrate as something positive. Analysis often reveals that other cornerstones of successful fire management, prevention and recovery, are lacking, and it is not additional resources that are needed but more efficient ways of utilising resources already available and balancing their distribution between the elements of fire management.

Preparedness

Preparedness levels need to be based on both prevention and response. Despite sound prevention measures and adequate response mechanisms, very adverse fire conditions will develop occasionally. Adequate levels of preparedness can help to ensure that such fires do not take fire agencies by surprise and that public alert mechanisms, fire detection and initial attack capability are operating effectively.

An important aspect of preparedness is training and development of fire management and suppression personnel. It also includes the installation and maintenance of infrastructure such as access roads and tracks, firebreaks and fire towers, and preparing assets and homes. Ongoing monitoring of weather conditions, fuels and ignition sources to provide timely advice and warnings of possible fires ensures that resources can

be most effectively used and can assist in reducing ignitions in or just prior to severe fire weather.

Response

Response is the ‘fire fighting’ or ‘suppression’ phase. Fires are rarely completely extinguished but are more likely to be ‘secured’ or ‘contained’. Possibly up to 95% of all rural fires can be adequately managed by local resources without any external assistance. The remaining 5% are the critical fires that cause about 95% of all damage and loss.

Pre-incident planning is essential to bring together all of the key players in the ‘landscape’ and to identify and work out in advance how fire suppression will operate. It is almost inevitable that without a formal planning process and inter-agency desk-top exercises and joint training, preparedness and ability to operate together and work to common goals will be inadequate when serious fires emerge. This is particularly so when more than one agency carries some responsibility for fire management and public safety.

Recovery

Recovery, or restoration, in its widest sense encompasses the repair, replacement or rebuilding of assets damaged by fire. The assets include not only agricultural crops, plantations, houses and infrastructure, but also ecosystems. Ecosystem function, structure, productivity and natural fire regimes have to be re-established: all are part of ecologically sustainable development and management. Similarly, communities and individuals, including emergency service personnel, need support to recover from the impacts of fire. Not all impacts are physical — some are emotional and require careful and professional treatment.

Restoration can be very important to prevent future fires. Burnt areas may be more prone to fire in the years following a fire due to the presence of more fuel and debris from burnt, dead vegetation or invasive species. After some forest types burn, more light and space is available for grasses and other vegetation to grow on the forest floor. This vegetation may quickly biologically cure and burn easily. Such a process can create a cycle rendering the forest ever more inflammable if it is not properly managed and restored after a fire outbreak.

What fires do: start, spread and impact

The Strategic Bushfire Management Plan of the Australian Capital Territory and subsequently the Canadian Wildfire Strategy identified aspects of fires that are important in prevention efforts. Fires *ignite*, THEN *spread* through fuels, THEN *impact* on assets (human built or environmental). This suggests that we have opportunities to:

1. prevent/reduce ignitions
2. prevent/reduce the chance for fires to spread
3. prevent/reduce the negative impacts on assets.

The mix of these options, and the balance between them, will vary with circumstance.

The ignition is often called the ‘cause’. Cause is more complex than simply ‘ignition’ and needs to be un-bundled. The concept of ‘fire cause’ is not generally well understood, nor has it been clearly documented. Three elements make up ‘fire cause’ — that is, why fires start:

1. the ignition (e.g. accidental ignition or intentional fire lighting)
2. the underlying cause — the events that lead to the ignition, (e.g. failure to maintain equipment properly, or the need for fire for farm production when no other option is available, often due to poverty)
3. motivation (e.g. accidental, misguided, deliberate).

Summary of fires

Fires have to be analysed so that the balance of *prevention*, *preparedness*, *response* and *recovery* can be assessed and any conclusions implemented. Identifying the means of ignition, the fuels through which the fires spread and the impacts they have provides a sharper focus on specific aspects of the fires and their management requiring attention. By considering the elements influential in ignition, spread and impact, priorities for planning and action across the full spectrum from analysis to recovery can be identified.

Applying the four elements and the three parts

I will illustrate the use of analysis, and the four elements and the three parts of fires, to provide a general analysis of fire problems. Indonesia, Portugal and Australia exemplify similar and also different requirements for effectively dealing with fires and their management.

An overall assessment of the standard of analysis and the four elements of fire management in the three countries is given in Table 1. The results are presented as a rating on a 1–5 scale: 1 = low/poor, 3 = adequate, 5 = high/effective. Low scores reflect correspondingly great potential for progress or improvement. The assessment is not intended to be comprehensive or complete, though it is indicative of the balance of fire management elements in each country.

For individual states of Australia, or provinces of Indonesia, this assessment might be different, but Table 1 suggests that nationally only Australia is in a position better than adequate for only two of the elements of fire management — preparing to fight fires and fighting them. Portugal is in an adequate position for the same elements and Australia is adequate for prevention. In all other elements all three countries need to consider carefully and improve. Improve what?

Table 1. Indicative assessment of the standard of elements of fire management for three countries on a scale of 1 (low/poor) to 5 (high/effective)

Fire management elements	Australia	Indonesia	Portugal
Analysis	1	2	1
Prevention	3	1	2
Preparedness	4	2	3
Response	4	2	3
Recovery	2	1	2

Table 2. Indicative assessment of the three parts of fires for three countries on a scale of 1 (low/poor) to 5 (high/effective)

Fire parts	Australia	Indonesia	Portugal
Ignition	4	1	3
Spread	2	1	1
Impact	3	1	2

Analysis

Analysis, both initial and repeated cyclically, is required to effectively generate and maintain a sound basis for fire management — the policy settings, and framing and forming the balance of the elements. The analysis of fires is poor in all nations, though the potential for clearer evaluation of fire circumstances and situations is good for many. Australia, Brazil, Canada, Chile, United States, France, The Gambia, Mongolia, Namibia, South Africa, Thailand and Vietnam are examples. The information available is generally arithmetical: numbers of fires, areas burnt and dates. This provides a starting point for asking questions about fires and their management, but the answers cannot be drawn from these data alone. More information may be needed, but certainly more insightful analysis is essential.

Table 2 looks at the parts of a fire to inform the focus of the fire management elements.

Ignition

Australia and Portugal have clear regulatory frameworks for fire ignitions that are effective and generally well enforced. The government of Indonesia struggles to manage ignitions, though there is a legal basis for doing so. Weak enforcement, not confined to fires alone, reflects the capacity of responsible government institutions and adequacy of resources.

Spread

None of the three countries does particularly well in dealing with the factors that contribute to fires spreading. In Australia there has been a decline in the management of fuels in landscapes over recent decades. This is a product of an increasingly complex set of factors surrounding the management of land, particularly natural or protected areas. The influences noted by the COAG Inquiry into the 2003 Bushfires in Australia (Ellis *et al.* 2005) include:

- inadequate funding, skills, staffing and equipment
- increased fragmentation of land ownership in some areas — including absentee landowners — which has placed added pressure on the fire agencies to respond to fires and led to greater expectations of support from volunteer rural fire brigades

- concern on the part of managers to avoid risks of injury and of fire escape, and the blame associated with the use of fire for fuel reduction
- greater constraints on the number of days each year that are considered suitable for fuel-reduction burning
- public pressure to minimise fuel-reduction burning in order to protect air quality in regions where few winds, low temperatures and inversion layers occur at times that are most suitable for fuel-reduction burning
- other detrimental consequences to environmental assets and values that might result from fuel-reduction activities.

These same factors are not part of the fire-spread factors in Indonesia and Portugal. For Indonesia, the driving underlying influence is land use change, particularly the large-scale conversion of forests to commercial or export crops such as oil palm. In Portugal, demographics have changed: the agricultural landscape is no longer as intensively managed as it once was as employment is generated in towns and cities along the coast. One key influence is the Common Agricultural Policy of the European Union, which has reduced the intensity, amount and types of agriculture being practised in Portugal.

Impact

Most countries deal poorly with the impacts of fires. The dominant response is to repair or replace infrastructure such as houses and buildings; little or no effort is put into ecosystem repair or restoration. In Australia, much is known about how buildings catch fire and are impacted upon by fires. This knowledge is readily available in various forms and is applied by both individuals and through the planning system at local and state levels. In Portugal, the reaction is similar. In Indonesia, the bulk of the impacts are not physical but on human circumstances, and particularly on the health of local people. The effects of fires are also being experienced, through ‘haze’, in Brunei, Malaysia and Singapore.

Summary

Fire management is not well understood, though it is possible to consider it in clear terms. Analysis identifies that fires are having negative impacts, and can be considered a ‘problem’. The combination of analysing fire management by considering each of its elements, and then considering the three parts of fires, allows a sharper focus on where the problems of fires actually lie. It is then feasible to identify what is necessary to deal with fires, if that is appropriate. Investment, planning and resources can then be allocated to prevention, preparedness, response and recovery — the fire management elements — on the basis of this evaluation.

In the generalised example used to illustrate this it can be concluded that:

- Australia
 - is working well on ignition and impacts but effectiveness can be improved
 - is not performing as well on how fires spread
- Indonesia
 - must improve in all parts of fires
- Portugal
 - is working adequately on ignitions
 - is not doing well on fire spread or impacts.

So improving fire management in these three countries involves the same process (analysis) and dealing with some of the same elements (fire spread). The approaches will differ, due to the circumstances in each country. For Australia, the resolution of land management with respect to fires, including consideration of fire-adapted ecosystems, is a key step in managing the impacts of fires. In Indonesia, fires spread because the landscape is changing. The change is driven by policy, economics and failures in regulation and laws. Fixing fires means a major emphasis on non-fire aspects of investment, enforcement and governance, but all are internal. In Portugal, fire spread is being enabled by an external policy — the Common Agricultural Policy — though the adjustments by the country in response will have to be internal. Dealing with fire management, ignitions, fuels and impacts in any context is a complex problem that, more often than not, requires solutions that have very little to do directly with fire management!

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