



Position Statement by
The Ecological Society of Australia

The Use of Fire in Ecosystem Management

The Ecological Society of Australia and Position Statements

Occasionally there are broad issues of public interest in relation to which most ESA members have formed a similar view, based on their professional expertise. In these cases the Society may formulate and endorse a Position Statement which is intended to inform public debate and policy action. While there may be minor variation of members' opinion in relation to technical details encompassed within a Position Statement, there is widespread general agreement concerning both the importance of the issue and the major points raised within the Statement.

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Summary

The Ecological Society of Australia (ESA) recognises the need for land managers to use and exclude fire for management purposes. Fire, however, is a complex phenomenon and if employed (or excluded) without adequate knowledge, can threaten the biological productivity, biodiversity and sustainability of ecosystems. For example, biodiversity loss has been associated with both high fire frequency and fire exclusion. Conversely, certain fire regimes are essential for the survival of some native species.

During the past few decades the use of fire as a management tool has become controversial with conflicts arising between different land management objectives, especially the maintenance of biodiversity and 'protection' of assets. It is essential therefore that fire management be planned in a much more strategic and integrated way to achieve management objectives and thereby minimise the conflict between conservation and other goals. This can be achieved in part by:

- the use of integrated management plans with clear and clearly enunciated objectives;
- explicitly resolving conflicts between different objectives at locations where these occur;
- identifying fire regimes known or suspected to cause loss of biodiversity and, where possible, avoiding these fire regimes in management practice;
- monitoring of specified performance indicators, and
- incorporation of the results of monitoring into future management action.

Accordingly, the ESA strongly recommends a more scientifically based and precautionary approach to the development and implementation of fire policy based on:

- knowledge of the response of plants and animals (biota) to fire;
- knowledge of the physical environment and its response to fire;
- an understanding of pre- and post-fire weather conditions which will increase our understanding of both the nature of fires and the response of the biota.
- knowledge of factors affecting fire behaviour;
- the assessment of fire hazard, risk and threat;
- the development of contingency plans for the biota, humans and assets; and
- the adoption of explicit measures at the institutional level supporting experimentation, learning and adaptive management.

The ESA also encourages public agencies, educational institutions and members with relevant experience to promote a greater awareness of the role of fires in native ecosystems through research and education.

Introduction

Fire occurs in many terrestrial ecosystems in Australia and has had a significant influence on their biotic composition, structure, function and evolution. Since fire is a natural part of many ecosystems, its use as a management tool is often seen as straight-forward. However, this is rarely the case. Fire is a complex phenomenon and, if employed (or excluded) without adequate knowledge, can threaten the biological productivity, biodiversity and sustainability of ecosystems. For example, biodiversity loss has been associated with both high fire frequency and fire exclusion. Conversely, certain fire regimes are essential for the survival of some native species. Fire is complex because it is highly variable in space and time. This complexity and variability can be seen in a single fire where various parts of an ecosystem may be burnt (or not) to different degrees. This variability is also seen in successive fires in an area - the fire regime - where the type, frequency, season and intensity of fire vary markedly. Since a single fire influences the survival and response of species, and the pattern of recurrent fires strongly influences populations of species, adequate understanding of the context in which fire is used is essential to maximise its usefulness as a management tool.

Current knowledge

While much remains to be learnt about the effects of repeated fires on ecosystems, the following knowledge can be used to advantage immediately:

- fires are heterogeneous with variability in all elements of the fire regime;
- some factors that influence this heterogeneity, such as fuels, are under human control;
- conditions around the time of the fire (e.g. fire edge to area ratio, the weather before and after fire, invasion of introduced organisms, disease, health and age of individuals) may influence the survival and response of plants and animals (biota);
- the responses of biota to fire regimes may be strongly influenced by their life-history characteristics;
- knowledge of the response of most biota to fire regimes is poor, particularly for one of the most diverse groups, the invertebrates;
- fire can be a positive process with the survival of certain species being fostered by particular fire regimes.
- inappropriate fire regimes may be a threatening process - too frequent fire, fire exclusion, unseasonal fires or fires of inappropriate intensity may threaten species by interrupting life cycles and altering habitat.
- an adequate understanding of the effects of fire regimes on ecosystems requires consideration of the landscape context within which the fires occur, and the scale of the impact; and

- there is a need to develop a process-based understanding of the responses of biota to fires in order to improve prediction.

The Use of Fire in Ecosystem Management

During the past few decades the use of fire as a management tool has become widespread and institutionalised in Australia. Increasingly often the use of fire is problematic and controversial. Conflicts have arisen between different land management objectives such as the need to protect human life and property versus watershed protection, habitat management and biodiversity conservation. For example, the widespread use of fire to reduce fuels would be aided by a thorough examination of the costs and benefits involved. At times, management objectives may be incompatible and trade-offs in fire policy will be necessary. Matters are further complicated since many of the effects of fire on ecosystems are poorly understood and the human and biophysical context in which management occurs is constantly changing. Considerable uncertainty is necessarily associated with the use of fire as an ecosystem management tool. Despite these uncertainties, fire can be an effective management tool in a number of ecosystems, and the Ecological Society of Australia recognises the need for land managers to use and exclude fire for management purposes. It also recognises that fire is one of the few effective and practicable management tools and may be the most appropriate management option available, especially for most land managers responsible for large areas and few personnel. However, the use of fire should be undertaken prudently and be consistent with clear management objectives. Furthermore, we believe it essential that fire management be planned in a more strategic and integrated way to achieve management objectives and thereby minimise the conflict between conservation and other goals. This can be achieved in part by the use of clear and clearly enunciated goals and written prescriptions for all applied fires.

Future Directions

Accordingly, a scientifically based and precautionary approach to the development and implementation of fire policy is required based on knowledge of:

1. the response of plants and animals (biota) to fires
2. the physical environment and its response to fires
3. factors affecting fire behaviour
4. the assessment of fire hazard, risk and threat
5. the development of contingency plans for the biota, humans and assets
6. the adoption of explicit measures at the institutional level supporting experimentation, learning and adaptive management.

Precautionary fire management does not, however, mean excluding fire until we have all the facts, but rather avoiding fire regimes known or suspected to result in loss of diversity. In

poorly-known ecosystems this may mean avoiding fire regimes known to be detrimental in better-known related systems.

In terms of point (6), current prediction of the potential impacts of fire policy is limited by lack of sufficient research, inventory and survey data. A technical assessment of all aspects of current fire management is impossible because of the scarcity of monitoring related to management aims. Therefore, a nationally coordinated and standardised, but locally applicable, approach to monitoring changes in ecosystems is desirable from both scientific and cost-efficiency perspectives. Systematic survey of plant and animal species in relocatable sites is required to help provide an improved basis for effective monitoring, and for further documentation of the effects of fires. Monitoring programs should be targeted to specified performance indicators that can be readily measured and evaluated. Maintenance of accurate fire history records is also essential and the use of GIS and Remote Sensing is strongly recommended as necessary tools associated with fire management programs and studies. Experimentation that furthers our understanding of the mechanisms underlying the response of the biota to fires should also be encouraged. The feedback loop in adaptive management must, however, recognise the variability of fire and the associated biological response and not overreact to the perceived initial changes following changes after fire. Consequently, timescales may need to be long and include several fire events before patterns and effects can be adequately identified above the background noise. The desire to adopt pre-European fire regimes, even if they were known, is often inappropriate for today's management needs, especially given the altered nature of many contemporary Australian landscapes (i.e. impacted by introduced species, fragmentation, climate change, soil loss). However, knowledge of pre-European fire regimes is important because it can provide better understanding of the environment in which biota evolved and to which they may be adapted, and the extent to which current management practices may threaten the persistence of ecosystems and biota. Consequently, there is a need to increase the level of knowledge of pre-European fire regimes, including traditional firing patterns employed by Aborigines. In this respect, lessons can be learnt from northern and central Australia where traditional burning practices are being used to guide management of the biota.

In conclusion, fire management issues need to be addressed through thorough, systematic and continuing programs of research, monitoring and experimental management. An essential element of this approach is a clearly articulated feedback mechanism for the incorporation of the program results into future management action. A greater awareness of the role of fires in native ecosystems is also needed and the ESA encourages public agencies, educational institutions and members with relevant experience to increase their level of promotion through research and education.