



Department of the Environment and Heritage

Mr Gary Nairn MP  
Committee Chair  
House of Representatives Select Committee on the Recent Australian Bushfires  
Department of the House of Representatives  
Parliament House  
CANBERRA ACT 2600

Dear Mr Nairn

Environment Australia (the Commonwealth Department of the Environment and Heritage) is pleased to provide the attached submission to the House of Representatives Select Committee Inquiry into the recent Australian bushfires. An electronic copy has also been emailed to the Committee Secretary.

Environment Australia provides information in this submission regarding the impact of bushfire on matters of national and international environmental significance, and issues relevant to its responsibilities including those under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Terms of Reference (a) to (e) have been addressed in the submission in relation to Environment Australia's responsibilities including management of native vegetation, biodiversity, Commonwealth parks and reserves, heritage places, Ramsar wetlands and air quality.

Environment Australia thanks the Committee for the opportunity to provide a submission and trusts that the information will make a useful contribution to the Inquiry.

Yours sincerely

Roger Beale  
Secretary

20 May 2003





Department of the Environment and Heritage

## House of Representatives Select Committee Inquiry into the recent Australian bushfires

### Submission by Environment Australia

#### **Introduction**

Environment Australia (the Commonwealth Department of the Environment and Heritage) welcomes the opportunity to make a submission to the House of Representatives Select Committee Inquiry into the Recent Australian Bushfires.

Fire has always been a part of the Australian landscape. In addition to naturally occurring bushfires, indigenous people have used fire for a diverse range of purposes for thousands of years. The evolution of Australian plants and species, and their association in ecological communities has been significantly influenced by their natural history and induced fire patterns.

Changes in fire regimes can have a significant impact on the distribution of plants and animals across the landscape, and over the past two hundred years, fire regimes have been altered in many places. Very intense and extensive wildfires, like those experienced in January 2003, can also have a significant impact on ecosystems, human health, infrastructure and property. The recent fires were of historically large proportions.

Environment Australia provides information in this submission regarding the impact of bushfire on matters of national and international environmental significance and issues relevant to its responsibilities including those under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).<sup>1</sup> Fire management issues are discussed in relation to management of native vegetation, biodiversity, Commonwealth parks and reserves (none of which were affected by the January fires), heritage places, Ramsar wetlands and air quality. Under the EPBC Act, the Commonwealth Government has a responsibility to protect nationally listed threatened species and ecological communities, and to ensure the development of recovery plans for these species and communities.

The Bureau of Meteorology, which is part of the Environment and Heritage portfolio, will provide a separate submission on climate and forecasting issues relevant to the Inquiry.

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<sup>1</sup> <http://www.ea.gov.au/epbc/index.html>

## TERMS OF REFERENCE

Comments relevant to Environment Australia responsibilities are provided below against the Terms of Reference (a) – (e) for the House of Representatives Select Committee Inquiry into the Recent Australian Bushfires:

***(a) the extent and impact of the bushfires on the environment, private and public assets and local communities.***

### **Impacts on threatened species**

Bushfires such as those seen in January 2003 can significantly impact on nationally listed threatened species and communities.

Many plants and animals are killed as a direct result of the fire event, which can have a significant impact on threatened species populations that have limited remaining numbers and distribution.

The habitat for threatened species that do survive the fire may be depleted, resulting in a lack of shelter in the short to medium term. Lack of shelter also leads to an increased exposure to feral pests. For example, the endangered Mountain Pygmy Possum in Kosciuszko National Park has become more vulnerable to foxes since the January 2003 bushfires. Food sources are reduced for native and feral species, leading to further competition for the same food sources or prey switching. Lack of food and shelter can particularly threaten the survival of juvenile populations, which can significantly reduce the recruitment rates from a season's breeding.

In some instances the fire relationship is complex. For example, the Recovery Plan for the Leadbeater's Possum<sup>2</sup> identifies optimum habitat of Leadbeater's Possum as young regenerating or mixed-aged ash forest that contains both wattles and an ample supply of old hollow trees. The occurrence and quality of habitat is primarily determined by patterns of successional change and stand development resulting from disturbance, such as past wildfires and timber harvesting operations. Regrowth from the 1939 wildfires, combined with fire-killed remnants of mature forest, has provided abundant feeding and nesting habitat during the past 30 years. The Recovery Plan also states that the occurrence of intense fires is a key threat to the long-term viability of habitat in older-aged forest and mixed-aged forest. The Plan proposes measures to protect the Possums' habitat, such as ensuring the continued survival of nest-trees on logging coupes through the use of fire retardants and the creation of fire breaks around such trees.

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<sup>2</sup> <http://www.ea.gov.au/biodiversity/threatened/recovery/leadbeaters-possum/index.html>

Environment Australia is aware that the recent bushfire events burnt extensive areas including the habitats of some nationally threatened fauna species including, for example the:

- Spot-tailed Quoll (*Dasyurus maculatus maculatus* (s. lat));
- Mountain Pygmy-Possum (*Burramys parvus*);
- Long-footed Potoroo (*Potorous longipes*);
- Trout Cod (*Maccullochella macquariensis*);
- Macquarie Perch (*Macquaria australasica*);
- Australian Grayling (*Prototroctes maraena*); and
- Northern Corroboree Frog in Kosciuszko and Namadgi National Parks (*Pseudophryne pengilleyi*).

In addition, part or all of the known Victorian distribution of four nationally threatened bird species (Malleefowl, Black-eared Miner, Red-lored Whistler, Western Whipbird) occur within the region affected by the December 2002 Big Desert Fire.

The bushfire events also had an impact on many nationally threatened plant species. For example, the fires in north-eastern Victoria burnt areas where twenty eight nationally rare or threatened plant species occur. The recovery of threatened flora species may be affected by post-fire weed invasion or continued dry periods. While fire trails are needed for protection of physical and nature conservation assets, their use by vehicles can spread root-rot fungus (*Phytophthora cinnamomi*). Clearly, this is more likely the more frequently the fire trails are used and the fewer precautions taken to wash down vehicles before entry. *Phytophthora cinnamomi* is a key threatening process by causing dieback for many eucalypt species.<sup>3</sup>

State and Territory agencies are responsible for management of threatened species within their jurisdictions and may be able to provide more detailed information about specific threatened species affected by the recent fires. Long term research and post fire monitoring projects of threatened species and habitat, will be necessary to provide information regarding the recovery and status of significant species.

Such research will be required to adjust (where necessary) the priorities within Recovery Plans, in terms of actions and geographic locations. This applies to species with current Recovery Plans as well as to species for which Recovery Plans are being prepared or reviewed.

### **Impacts on World Heritage Areas**

The recent Australian bushfires affected two of Australia's fourteen listed World Heritage Properties: the Tasmanian Wilderness World Heritage Area which comprises almost 1.4 million hectares in central-western and southern Tasmania; and the Greater Blue Mountains Area which comprises 1 million hectares west of Sydney.

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<sup>3</sup> <http://www.ea.gov.au/biodiversity/threatened/tap/phytophthora/introduction.html#dispersal>

The known extent and impacts of the recent bushfires on these two World Heritage Properties are:

***Tasmanian Wilderness World Heritage Area:*** Six fires, which burnt out an area of just under 3,000 hectares, occurred within the Tasmanian Wilderness World Heritage Area. The majority of these fires were caused by lightning strikes and were suppressed by rain and fire control action by Tasmanian authorities. The largest fire, the Twelvetees Range fire east of Strathgordon, burnt out 2,782 hectares. The fire impacted primarily on button grass moorland and scrub margins - none of which are considered threatened.

***Greater Blue Mountains Area:*** Numerous bushfires, which collectively burnt over 100,000 hectares – or around 10 percent of the World Heritage Area - occurred in the Greater Blue Mountains Area World Heritage Property. The fires were caused by natural ignition (lightning) and arson. Bushfires burnt a larger proportion of the property the previous summer. A full assessment of the impact of these fires on the World Heritage values of the property has not yet been made.

Environment Australia is working with State management agencies regarding the extent of impacts on World Heritage values and possible management implications. As a consequence, it is possible that management priorities and strategies may need to be reassessed.

#### **Impacts on areas on the Register of the National Estate**

In December 2002, bushfires occurred in the Sydney region and in January 2003, lightning strikes ignited parts of Kosciuszko National Park and Brindabella National Park (NSW), and Namadgi National Park (ACT). Fanned by extremely strong winds, the fires reached a high intensity on 18 January 2003, severely damaging the above national parks, Canberra suburbs, Tidbinbilla Nature Reserve, Mount Stromlo Observatory Precinct, surrounding rural areas and pine plantations. Simultaneously fires commenced in the Victorian high country, affecting towns, national parks, forests and rural land.

Numerous heritage places on the Register of the National Estate have been damaged or destroyed. As well, places that support the management and interpretation of heritage such as works depots, services, visitor management infrastructure, interpretation signs and government housing were destroyed.

Affected heritage places in urban/rural contexts include: houses, farms, rural homesteads, farm buildings, gardens, fences, landscape settings, bridges, research complexes (Mount Stromlo Precinct) and defence complexes (Holsworthy).

The severity of the damage to the National Estate depends on the intensity of the fires (variable across the burnt regions), and the potential of the values to recover. The full effect of fires on heritage is yet to be ascertained but there will be a need for reassessment of values of many national estate places, particularly historic places.

Those national estate areas and places that are known to be damaged include:

- Approximately 65% of the Kosciuszko National Park and Brindabella National Park in NSW;
- Approximately 483,800 hectares of parks in Victoria, predominantly the Alpine National Park (VIC) and also including Mt Buffalo National Park and part of the Snowy River National Park;
- Approximately 95% of Namadgi National Park, 99% of Tidbinbilla Nature Reserve, a large proportion of the Murrumbidgee River Corridor and several areas within Canberra Nature Park;
- Mount Stromlo Observatory Precinct including the 1920's Administration Building, at least 6 of the 7 telescopes and their dome structures (the condition of the Farnham Telescope not yet been reported), the works complex, the Director's House, trees and gardens, and several of the staff cottages; and
- The Sergeant's Mess Building, Holsworthy and possibly others places at Ingleburn.

The full extent of the damage to the historic sites in the alpine parks and nature reserves is still being fully ascertained but confirmed losses or damage includes:

- Around 30 huts in the Victorian high country, 3 historic mine sites, much of Glen Wills Historic Reserve, and Maisie's Plot in Victoria;
- 21 huts in Kosciuszko National Park;
- Within the Namadgi National Park, the Mount Franklin Chalet, all but one of the arboreta, several brumby trapyards, buildings from the Bendora Dam construction camp, ACT-NSW Border survey marks, 'Tennant' Homestead;
- In the Murrumbidgee River Corridor, seven of the Cotter Precinct cottages; and
- The Tidbinbilla 'Rock Valley' and 'Nil Desperandum' homesteads.

Further implications of the damage on national estate values are:

- Indirect effects on heritage values such as removal of remnant trees in national estate areas and possible sedimentation and contamination of the streams and reservoirs of water catchments; and
- The large loss of the historic heritage estate of the alpine parks will mean increased significance of the features that remain.

Commonwealth agencies responsible for heritage places affected during the January 2003 fires, such as the Department of Defence and the Australian National University (ANU), have been provided with general advice, and advice under section 30 of the *Australian Heritage Commission Act 1975*, recommending securing of sites, reassessment of heritage values, professional recording of damaged places, salvage of historic fabric, and subsequently conservation Management Plans of extant features.

As soon as information becomes available, affected Register of the National Estate places will have their records upgraded, or they will be recommended to the Australian Heritage Commission for removal from the Register of the National Estate. This process has begun.

### **Impacts on Commonwealth managed reserves**

None of the Commonwealth reserves managed by Environment Australia were affected by the January 2003 bushfires. Only two of these reserves, Booderee National Park and the Australian National Botanic Gardens are in south-eastern Australia.

Over several decades there has been negligible asset loss and no loss of life due to wildfires in Commonwealth reserves managed by Environment Australia or its predecessors.

### **Impacts on Air quality**

Bushfires, in addition to their potential immediate threat to life and property, can generate substantial air pollutant emissions, such as particles, carbon monoxide, air toxics and volatile organic carbons (VOCs), and strongly raise (ground level) ozone levels.<sup>4</sup> These emissions can disperse to impact on surrounding urban air sheds and wider regional areas, with potential for exposure of communities and increased risk of adverse health impacts.

For example, during Sydney's Christmas 2001 bushfires, PM<sub>10</sub> (particles 10 microns and less in diameter) levels above 150 µg/m<sup>3</sup> were sustained for 10 days. In Sydney's 1994 bushfires, the peak PM<sub>10</sub> was 210 µg/m<sup>3</sup>, compared with background levels of about 30 µg/m<sup>3</sup>.<sup>5</sup> Canberra's 18 January 2003 bushfire resulted in a maximum PM<sub>10</sub> 24 hour average level of 192 µg/m<sup>3</sup>. For comparison, the *National Environment Protection (Ambient Air Quality) Measure* ('Air NEPM') sets a PM<sub>10</sub> 24 hour average standard of 50 µg/m<sup>3</sup>.

However, while PM<sub>10</sub> levels recorded far exceeded the Air NEPM standard, the health impacts are unclear. While international epidemiological data support a relationship between elevated particle levels in the atmosphere and pulmonary health, Australian studies of the links between specific *bushfire* events and asthma have only found a statistically significant relationship in one event. That study<sup>6</sup> found that there was a significant increase in asthma presentations with each 10 µg/m<sup>3</sup> increase in PM<sub>10</sub> concentration, concluding that particles from bushfires should be considered as injurious to human health. Out of four studies that examined the health impacts in Sydney from hazard reduction burning in May 1991 and the 1994 bushfires, one provided weak support for a link between particle air pollution and an increase in daily asthma attendances, but the other three found no such link.<sup>7</sup>

### **Impacts on Ramsar wetlands**

In March 1996, Ginini Flats Wetland Complex Ramsar site, in Namadgi National Park, was listed as a wetland of international importance under the Ramsar Convention on

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<sup>4</sup> <http://www.ea.gov.au/atmosphere/airquality/urban-air/>

<sup>5</sup> Lewis PR and Corbett SJ, "Bushfires, air pollution and asthma", *Medical Journal of Australia*, 3 June 2002, 176(11): 517.

<sup>6</sup> Johnston FH, Kavanagh AM, Bowman DMJS and Scott RK, "Exposure to bushfire smoke and asthma: an ecological study", *The Medical Journal of Australia*, 3 June 2002; 176(11): 535-538

<sup>7</sup> *Ibid* Lewis PR and Corbett SJ (2002).

Wetlands. The site consists of a complex of subalpine *Sphagnum* bogs and associated wet heath and wet grassland, including some of the largest, deepest and best preserved bogs found in mainland south-eastern Australia.

The Ginini Flats wetlands occur in low-lying, open areas with impeded drainage, which has resulted in the formation of a bog complex on deep peaty soils. The area is relatively undisturbed and includes particularly good examples of a *Sphagnum* bog at its northernmost limit in the Australian Alps.

The site is also important habitat for vulnerable and rare species, including the Broad-toothed Rat (*Mastacomys fuscus*) and the Northern Cooroboree Frog (*Pseudophryne corroboree*). The population of Cooroboree Frogs at Ginini Flats is one of the largest known populations for this species.

The January 2003 fires in the ACT and NSW swept through the Namadgi National Park, including the area of the Ginini Flats Wetland Complex. Only the top 2cm of the deep bog complex was burnt when the fires swept through the area. Despite the drought, the bog complex had managed to maintain a lot of moisture, protecting the wetland and small animals from the fires.

*(b) the causes of and risk factors contributing to the impact and severity of the bushfires, including land management practices and policies in national parks, state forests, other Crown land and private property.*

#### **Fire in natural systems**

Fire is a complex phenomenon and many factors influence its behaviour. For example, factors influencing fire intensity include available fuel, moisture, temperature, fuel composition, wind and topography. The rate of fuel consumption can make a fire more or less intense. Oils and resins, common to myrtaceous species such as eucalypts, increase heat yield and fire intensity while the presence of some minerals can have the opposite effect.

Wind increases oxygen supply, influences convection and can produce 'spot fires' from burning fragments blown from the fire. Topography also influences intensity. A fire ignited at the top of a slope will burn slowly downhill whereas a fire ignited at the bottom of a slope will gain momentum, as it burns uphill because warm air rises and preheats uphill fuels. Many factors affecting intensity also affect the rate of spread. For example, fires ignited in dry, windy conditions with abundant fuel spread rapidly, although in extreme fire danger conditions high rates of spread will occur over sites with very low fuel loads. Fuel continuity plays a role in spread as can topography through features such as streams and lakes and other natural barriers.

Fire regimes are the patterns of fires and take into account factors such as type, intensity, frequency, season and extent. Fire regimes vary by ecosystem because different ecosystems have a different composition and structure, which has been determined by climatic conditions, soil types, vegetation types, topography and evolutionary history. Fire 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, partially burnt and unburnt. This heterogeneity is referred to as the burn mosaic. This variability can also be seen in successive fires in the same area, where the type, intensity, frequency, season and extent of fire can vary markedly.

In the short term, a single fire event influences the immediate survival and response of species. In the long term, a fire regime influences species abundance and community composition. As a result, an understanding of the context in which fire is used as a management tool is essential to maximise its effectiveness.

### **Commonwealth support for improved fire management**

The Commonwealth has invested substantial resources into research and improved practices to mitigate the impact and severity of bushfires. There has been considerable research over decades by CSIRO, universities and land management agencies into the effect of fire on biodiversity. A national summary of research into the impact of fire on Australia's plants, birds and invertebrates was published by Environment Australia in 1999.<sup>8</sup>

The Natural Heritage Trust (NHT)<sup>9</sup> has supported many projects developing and communicating improved fire management practices, tailored to the needs of different regional communities. 46 projects, with Commonwealth investment of nearly \$7 million, have been funded through the NHT that incorporate fire management issues including:

- Studies on the impact of fire on biodiversity;
- Development of fire education materials and fire management aids;
- Development of endangered species Recovery Plans;
- Native vegetation management projects; and
- Management of Indigenous lands in central and western Arnhem Land.

### **Commonwealth managed parks and reserves**

Bushfires are a significant management issue for Booderee National Park, Kakadu National Park and Uluru – Kata Tjuta National Park. Fire is also a major ecological management tool in these parks.

The broad fire management prescriptions for these parks are outlined in the approved Management Plans for the respective parks. In the case of Booderee and Kakadu National Parks, more detailed, park-specific “fire management plans” or programs supplement these plans. These plans/programs are based on the best available knowledge of the impact of fires on human life and property, the ecology of the plant and animal communities of the area, and other heritage values of the reserves. Kakadu National Park and Uluru – Kata Tjuta National Park are World Heritage Listed for their ecological values and cultural values.

Over many centuries the traditional owners of Kakadu National Park and Uluru – Kata Tjuta National Park have refined prescription burning to suit local ecosystems. These

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<sup>8</sup> <http://www.ea.gov.au/biodiversity/publications/technical/fire/>

<sup>9</sup> <http://www.nht.gov.au/projects/index.html>

traditional burning practices remain intact and are incorporated into the annual management of these parks.

The following are comments specific to fire management in each Commonwealth reserve:

***Booderee National Park:*** Available fire history records commenced in 1957/58. The fire history is reasonably accurate for larger fires but some smaller fires may not have been recorded, particularly in earlier years. Not all records (particularly older records) indicate fire intensity or unburned internal areas within the fire perimeter.

The wildfire historical data show that 25% of Booderee has experienced no wildfires in the past 44 years, while just over 8% has had 3 or 4 fires.

Wildfires have occurred in 37 out of the 44 years in Booderee since 1957/58. The 1972/73-fire season saw just over 3,000 ha of what is now Booderee burned. In the 1962/63 fire season approximately 1,500 ha was burnt. With the exception of these two seasons, all other fire seasons have resulted in less than 500 ha. burnt by wildfire annually. Smaller sized fires have occurred since the early 1970s, which is probably a result of improvements in detection, response and suppression of fire.

The Fire Management Plan for Booderee National Park (2000 – 2004) comprises 188 (A4) pages and is summarised in the 2002 Booderee National Park Management Plan (pages 52-56).<sup>10</sup> The Fire Management Plan details fire management strategies and approaches, fire trail requirements, cooperative fire management arrangements and resource and neighbouring land protection considerations. The Wreck Bay Aboriginal Community has a complementary fire management plan for their land.

The fire management prescriptions cover asset protection, visitor protection, biodiversity protection, cooperation with neighbouring NSW fire authorities, operational work schedules and research priorities. Fire is managed in the Park in accordance with the following principles:

- Protection of human life and property within Booderee, Jervis Bay Territory and adjacent lands;
- Protection of Koori (Indigenous) sites and historic places;
- Protection of threatened species, plant communities of special significance and fire sensitive species; and
- Maintenance of a natural diversity of habitats for native fauna and flora (for example, small patch or mosaic burning).

The Fire Management Plan divides the Park into seven “asset protection zones”, two “wildfire control zones” and 27 “area management zones” – each with a specific analysis, fire management objectives, strategies, actions and performance indicators. Strategies for life and property protection are based upon an effective fire protection zone adjoining buildings within and outside Booderee.

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<sup>10</sup> <http://www.ea.gov.au/parks/publications/booderee-pom.html>

A fire break is maintained around the Park's perimeter fence and fire hydrants have been installed in some vulnerable areas, particularly the heath community. Some prescriptive burning to encourage community diversity has been undertaken, with good results. A larger program of fuel reduction in the Botanic Gardens, including burning or other methods, is also undertaken.

Prescribed burning may be carried out in areas of identified high fire risk to protect adjacent properties, cultural resources, recreation facilities, camping areas, fire sensitive vegetation and species diversity. Annual prescribed burning programs for hazard reduction and ecological purposes are prepared detailing all proposed burns and trail maintenance requirements. These programs are submitted to the Wreck Bay Aboriginal Community Council, the Sussex Inlet North lessees, the Department of Defence and the Shoalhaven District Bush Fire Management Committee for their comment, before adoption. Fire management programs are reviewed every five years.

***Kakadu National Park:*** The landscape, the ecosystems, the balance of species and their management by traditional owners inside the northern Parks, has been continuous for 40-50,000 years. The only major modification of traditional fire management practices by traditional owners is for the protection of built assets.

During the 2002 calendar year 70% of the park burnt; significantly more than would have burnt in an "average" year, mainly due to the long hot dry season. The impact of fires in Kakadu in 2002 are not atypical, neither were the fuel loads. Extra dry years like 2002 occur in cycles, often after a series of wet years. Neither traditional burning nor hazard reduction burning can be effectively undertaken during the wet years, leaving a high fuel load for the dry years and little opportunity to reduce it without precipitating a wildfire from control burns.

Kakadu National Park is so large (the size of Switzerland) that one Fire Management Plan would not cover all circumstances, so a series of five District Fire Plans are implemented. Approaches to fire management are summarised in the Kakadu National Park Plan of Management (refer part 2 section 13 'Fire').<sup>11</sup>

Traditional owners implement much of the annual burning, and as traditional knowledge is transmitted orally, little is written down and the formal prescriptions are not detailed. Prescribed burning is undertaken particularly in the early dry season to:

- Reduce grass fuels;
- Stop fires from spreading later in the dry season by providing barriers with less fuel between large blocks of unburnt country; and
- Protect fixed assets and sensitive habitats such as small rainforest patches.

Fires are lit from both the ground and the air in the prescribed burning program. More attention is given to managing remote areas and managing habitats. Bininj/Mungguy residents still burn country, particularly around outstation areas and areas used for

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<sup>11</sup> <http://www.ca.gov.au/parks/publications/kakadu-html/index.html>

hunting and gathering purposes, especially floodplains.

**Uluru – Kata Tjuta National Park:** During 2001-2002 approximately 80% of the Park burnt, most of it from a wildfire started outside the Park. This unusually high proportion of Uluru – Kata Tjuta National Park burnt due to three previous years being unusually wet (accumulating high litter loads and preventing control burns) and the last year being very dry. No significant built assets were affected. In Uluru, this cycle of wet years followed by a very dry year is regular at 25-26 years (to the extent that there are records).

A Fire Management Plan is currently being compiled for Uluru – Kata Tjuta National Park. As with Kakadu National Park much of the annual burning is implemented by traditional owners and is undertaken using a ‘patch burn’ (mosaic) strategy. It does not have a documented burning schedule. Fire management is outlined in the 2000 Uluru – Kata Tjuta National Park Plan of Management (pages 75-79).<sup>12</sup>

Objectives for fire management at Uluru – Kata Tjuta National Park are to:

- Maintain traditional Anangu burning practices and promote their integration with scientific knowledge;
- Maintain the Parks’ biodiversity;
- Protect life, property and culturally significant sites and mitigate the effects of wildfire;
- Maintain community education and interpretation programs dealing with the role of fire in the Park;
- Develop a regional and integrated fire management plan; and
- Ensure the Parks’ World Heritage values in relation to fire management are protected.

Environment Australia encourages managers of the Yulara resort next to Uluru – Kata Tjuta National Park to maintain a fire management strategy for the commercial and residential Yulara area, which helps sustain populations of the vulnerable Mulgara and Great Desert Skink, as well as maintenance of life, property and landscape aesthetics.

**Australian National Botanic Gardens:** The Australian National Botanic Gardens (ANBG) is a small area on the slopes of Black Mountain, surrounded by Canberra Nature Park, managed by Environment ACT. The Management Plan for the ANBG 2002-2008<sup>13</sup> specifies “The southern and western boundaries of the Gardens will continue to be managed as a fire buffer zone between the higher forested slopes of Black Mountain and the developed landscape zones of the Gardens” (refer section 8.5 ‘Risk Management Strategies’). A sprinkler system is installed in this buffer zone to protect the assets of the Garden should a fire approach through the Canberra Nature Park. The sprinkler system was installed in 1987 and successfully protected the Gardens from the February 1991 fire that approached the northern boundary. Hazard reduction programs focus on removal of available fuel and on prescription burning of strategic areas. The most recent hazard reduction burn was carried out in March 2001.

<sup>12</sup> [http://www.ea.gov.au/parks/publications/pubs/uluru\\_plan\\_2000.pdf](http://www.ea.gov.au/parks/publications/pubs/uluru_plan_2000.pdf)

<sup>13</sup> <http://www.anbg.gov.au/anbg/manplan/2002/12-chap8.html>

The fire buffer would not necessarily be able to prevent a fire of the intensity of the January 2003 entering the Gardens. The ANBG will be reviewing its fire management strategy in light of this experience.

### **National Reserve System and management requirements**

Australia is a signatory to the *Convention on Biological Diversity*, which requests countries to:

- establish a system of protected areas to conserve biodiversity;
- develop guidelines for the selection, establishment and management of protected areas; and
- promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species.

Protected areas are those systems of national parks and other types of conservation areas dedicated to the protection and maintenance of biological diversity and formally managed and protected for this purpose. The protected area system is a key tool for assisting with the conservation of Australia's biodiversity.

In Australia, the development of the National Reserve System (NRS)<sup>14</sup> is a collaborative effort between the Commonwealth, and the States and Territories, non-government organisations and Indigenous landholders, to achieve an Australian system of protected areas as a major contribution to achieving conservation of our native biodiversity. The goal of the NRS is to establish a comprehensive, adequate and representative system of protected areas to contribute to the conservation of Australia's native biodiversity.

In achieving this goal, the NRS:

- Aims to contain samples of all ecosystems identified at an appropriate regional scale;
- Considers the ecological requirements of rare or threatened species and rare or threatened ecological communities and ecosystems, in particular those listed in the *Environment Protection and Biodiversity Conservation Act 1999*, and other State, Territory and other local government legislation policy instruments; and
- Takes account of the needs of special groups of organisms e.g. species with specialised habitat requirements or wide-ranging or migratory species, or species vulnerable to threatening processes that may depend on reservation for their conservation.

If lands included in the NRS are not sufficiently secured with respect to purpose and management standard, including fire management, their values are at risk of being lost or degraded. In accordance with the World Conservation Union (IUCN) standards for protected areas, a key requirement for the maintenance of the values of lands included in the national reserve system is an effective management regime.

The Commonwealth, the States and Territories have been discussing means for progressing the NRS including the identification of management standards. The aim is to have Management Plans, or where this is not possible, statements of management intent,

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<sup>14</sup> <http://www.ea.gov.au/parks/nrs/index.html>

in place for all existing NRS reserves and for any new reserve within 3 years of establishment.

***(c) the adequacy and economic and environmental impact of hazard reduction and other strategies for bushfire prevention, suppression and control.***

#### **Impact of altered fire regimes on biodiversity**

Recent national assessments of biodiversity identify the significance of altered fire regimes as a threat to biodiversity. The National Land and Water Resources Audit *Australian Terrestrial Biodiversity Assessment 2002*<sup>15</sup> notes that changed fire regimes threaten ecosystems across Australia and are one of the principal threats to biodiversity in northern Australia species. The *State of the Environment Report 2001*<sup>16</sup> also highlights the deleterious impacts inappropriate fire regimes can have on native species.

Although some elements of Australia's biodiversity have evolved to survive in fire prone environments, and in some instances particular species require fire, a change from natural fire regimes can cause a decline in species abundance and composition or result in local extinctions. For example, altered fire regimes have been implicated in local extinctions of several vascular plant species across Australia and three species and subspecies of birds. The *2000 Action Plan for Australian Birds*<sup>17</sup> estimated that altered fire regimes affect 45% of mainland bird species.

Fire management is a critical environmental issue across the northern savannas. The Cooperative Research Centre for Tropical Savannas<sup>18</sup> has reported that increasing woody plant density has been associated with reduced prescribed burning in pastoral areas, particularly on the more productive soils and under lower rainfall conditions. In some areas woody plants, both natives (like *Acacia*, *Eucalyptus*) and weeds of national significance such as Prickly Acacia and *Parkinsonia*, have increased markedly in recent decades. This has resulted in loss of productive pasture and extensive areas of native habitat and associated species (especially seed eating birds such as the endangered Gouldian Finch and Golden-shouldered Parrot).

The impact of fire on the natural environment is related to the frequency, intensity and timing of the fire (fire regimes). Fire can have major effects on species diversity. Inappropriate fire regimes can cause the local extinction of plant species. There is a gap in knowledge about fire regimes and in defining ecologically appropriate fire regimes for different ecosystems in different ecological, economic and geographical contexts.

For example, altered fire regimes since European settlement are thought to have caused, or contributed to, the extinction of the Kangaroo Island Emu and the Paradise Parrot. In the coastal heaths of south eastern Australia, frequent burning since European settlement has led to the decline and/or local extinction of several heathland dependent birds, most

<sup>15</sup> [http://audit.ea.gov.au/ANRA/vegetation/docs/biodiversity/bio\\_assess\\_contents.cfm](http://audit.ea.gov.au/ANRA/vegetation/docs/biodiversity/bio_assess_contents.cfm)

<sup>16</sup> <http://www.ea.gov.au/soe/2001/biodiversity/biodiversity04-1d.html>

<sup>17</sup> <http://www.ea.gov.au/biodiversity/threatened/action/birds2000/index.html>

<sup>18</sup> <http://www.ea.gov.au/land/bushcare/publications/bush/pubs/bush08.pdf>

notably the Ground Parrot and Southern Emu-wren. Over the last two decades, largely in response to research on the requirements of such species, control burning in heathlands has been reduced.<sup>19</sup>

Human induced fire regimes that are not based on a comprehensive scientific understanding of ecological systems can have a number of negative impacts. For example, poor fire regime management can lead to reduced resilience of ecosystems to withstand and recover from stress such as drought. Poor fire regime management can also lead to increased weed invasion, a loss of soil biomass and promotion of soil erosion.

The threat of inappropriate fire regimes to biodiversity is compounded when combined with other threatening processes including land clearing and other causes of habitat loss, invasive species and climate change.

Fire can be an effective management tool in some ecosystems and land managers can use and exclude fire for management purposes. Knowledge of the relationship between fire and biodiversity is at a very early stage. Fire management policies and strategies should integrate available scientific knowledge, together with a precautionary approach, to enable effective protection of biodiversity.

#### **Traditional fire management and biodiversity**

Knowledge of traditional burning practices still exists, particularly in central and northern Australia. However, while this knowledge exists it may be inappropriate to adopt such practices due to the nature of the altered landscape in which we now live. Still, knowledge of pre-European fire regimes remains an important way of informing management decisions. This can be achieved in two ways, by:

- Providing a better understanding of the environment in which species, communities and ecosystems evolved and became adapted to; and
- Alerting land managers to current practices that may threaten the persistence of species, communities and ecosystems.

#### **Implementation of hazard reduction strategies in Commonwealth managed parks and reserves**

Commonwealth managed parks and reserves where fire is an issue, have comprehensive fire management plans or strategies in place. However, effective implementation of prescribed burning strategies for hazard reduction or for other objectives, is dependent on suitable climate and weather conditions. The practical reality is that in some years, a prescribed burning program may not be achievable because of weather conditions. As the window of opportunity to undertake prescribed burning varies, fuel loads may increase in the interim period.

#### **Impact of hazard reduction strategies on air quality**

Air pollutant emissions from hazard reduction burning programs can, at times, have a significant impact on areas surrounding the burns and, occasionally, on a wider regional scale.

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<sup>19</sup> <http://www.ea.gov.au/biodiversity/threatened/action/birds2000/pubs/ground-parrot-e.pdf>

While it is acknowledged that air pollutant emissions from hazard reduction burns generally comprise only a small fraction of those produced during a single significant bushfire event, they can still contribute significant quantities of particles, carbon monoxide, air toxics and volatile organic carbons (VOCs) to air sheds, and strongly raise (ground level) ozone levels.<sup>20</sup>

Smoke from hazard reduction burns can disperse into urban air sheds resulting in air pollution levels that lead to poor visibility and/or exceedances of *National Environment Protection (Ambient Air Quality) Measure* ('Air NEPM') standards, in particular the PM<sub>10</sub> (particles 10 microns and less in diameter) standard. While the Air NEPM itself does not set control actions to reduce the impacts of hazard reduction burning, the standards have contributed to developing strategies to reduce the smoke impacts. The introduction of advisory reporting standards for PM<sub>2.5</sub> and the *National Environment Protection (Ambient Air Toxics) Measure* will provide additional pressure in this regard.

Fire management authorities across Australia now include smoke management considerations in planning and implementing hazard reduction burns to minimise the exposure of communities to smoke impacts. These authorities work closely with the Bureau of Meteorology and the local environment protection agency to determine the most appropriate burning methods and the most suitable times for burning.

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<sup>20</sup> <http://www.ea.gov.au/atmosphere/airquality/urban-air/>



*(d) appropriate land management policies and practices to mitigate the damage caused by bushfires to the environment, property, community facilities and infrastructure and the potential environmental impact of such policies and practices.*

### **Hazard assessment**

The first steps in fire management policy development for specific areas must be to determine the hazard, that is the risk of certain wildfires occurring and the risk from wildfire to identified 'life and property'. To determine the fire hazard for a particular area issues such as assessment of ignition potential, vegetation type, fuel loads and fire history need to be examined.

Planning should also assess the potential impact of fire on native vegetation, including collation of information regarding knowledge of fire regimes and known fire responses of species and communities. There are many other issues that should be addressed at the planning stage, such as potential of regular burning and construction of fire management trails to impact on catchment stability, water quality and establishment of introduced plants.

According to a recent report on fire values in Kosciuszko National Park,<sup>21</sup> specific areas prone to high intensity wildfires can be accurately predicted. Many land management agencies do this using Geographic Information Systems, remote sensing, fire modelling programs and other information management tools to contribute to effective fire management planning.

Effective measures to protect assets in areas identified with high bushfire threat could include:

- Strategic fuel reduction (including prescribed burning) in areas where it can be effective;
- Exclusion of residential and other asset development in fire prone lands;
- Making assets fire resistant; and
- Ensuring that those involved in fire management have a basic understanding of fuel dynamics and fire physics.

### **Biodiversity Conservation Principles for Fire Management**

To adequately manage fire as a process that can threaten biodiversity, it is suggested that fire management regimes should be based on a comprehensive scientific understanding of ecosystems. This includes recognising that biodiversity conservation in Australia's present landscapes requires a diversity of fire regimes including variation in type, intensity, frequency, seasonality, extent and burn mosaic applied to the geographic variability within landscapes. It is necessary to exclude fires from some ecosystems (e.g. those containing relictual biotic assemblages or areas that have evolved largely in a fire-free environment).

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<sup>21</sup> [http://www.npws.nsw.gov.au/parks/south/kosciuszko/pom/interim/12.Fire Values.pdf](http://www.npws.nsw.gov.au/parks/south/kosciuszko/pom/interim/12.Fire%20Values.pdf)

Adequate management of fire as a process that can threaten biodiversity should also balance biodiversity conservation objectives with objectives for protection of human life and assets, and be flexible to allow for unpredictable and unplanned events in natural resource management planning. It should also allow exploration of alternative management options under strict scientific guidance and rigor, in order to build a robust understanding and knowledge of the relationship between fire and biodiversity. Where available and appropriate, fire management regimes should incorporate indigenous knowledge of landscapes and the role of fire regimes into management objectives. Impacts of fire regimes on biodiversity must then be monitored to evaluate and direct the ongoing development of fire management practices.

#### **Policy imperatives for managing fire as a threatening process to biodiversity**

*The National Strategy for the Conservation of Australia's Biological Diversity*<sup>22</sup> recognises that altered fire regimes can have adverse impacts on biodiversity. The strategy recommends supporting further research into the role of fire in Australian ecosystems, as well as the development of management policies that seek to minimise the adverse impact of fire on biological diversity.

The strategy also recommends the development of prescribed burning practices that take account of the fire responses of different ecosystems, natural patterns of succession, and the role of fire in the maintenance of biological diversity. The strategy advocates promoting awareness on the part of property managers of the impact of fire on biological diversity on lands under their control, including providing extension services to advise on the timing and pattern of fire use to reduce fuel and promote pasture growth on rangelands.

The Commonwealth and most States and Territories agreed in the *National Objectives and Targets for Biodiversity Conservation 2001-2005*,<sup>23</sup> to protect and restore native vegetation and terrestrial and freshwater ecosystems. It is critical that Management Plans developed to meet these objectives, provide for the development and implementation of fire regimes designed to conserve biodiversity and soil, as well as other assets.

As our knowledge of the complex relationship between fire and biodiversity develops, fire management for protection of human lives and assets can be, and is beginning to be, better integrated with management for ecosystem conservation. The 2001 *Review of the National Strategy for the Conservation of Australia's Biological Diversity*<sup>24</sup> notes that fire regimes which take into consideration the frequency and extent of disturbance are, for the most part, being developed and implemented by forest and other land management agencies.

#### **Threatened species management - Recovery Plans**

The *Environment Protection and Biodiversity Conservation Act 1999*, requires that Recovery Plans for threatened species and communities identify threats to the species or

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<sup>22</sup> [http://www.ea.gov.au/biodiversity/publications/strategy/chap3.html#ob\\_3\\_5](http://www.ea.gov.au/biodiversity/publications/strategy/chap3.html#ob_3_5)

<sup>23</sup> <http://www.ea.gov.au/biodiversity/publications/objectives/index.html>

<sup>24</sup> <http://www.ea.gov.au/biodiversity/publications/review/index.html>

ecological community, and actions to address that threat. In many cases fire is identified as a threat. Any changes to fire management/hazard reduction policies and practices need to be consistent with actions identified in Recovery Plans for nationally listed threatened species and communities.

Recovery Plans can also identify fire as an important habitat management tool, as appropriately managed fire can have positive benefits for threatened species recovery. For example, the recovery plan for the endangered Orange-bellied Parrot<sup>25</sup> includes a recovery action to 'maintain food supplies at breeding sites with appropriate moorland fire regimes.' It notes that appropriate fire regimes are essential to maintain food plant requirements in the breeding habitat at two sites, and planned patch burning by the Tasmanian Parks and Wildlife Service is done when the birds are absent between April and September every year. A review showed strong evidence that Orange-bellied Parrots were selecting recently-burned sites for feeding.

#### **Pest species management**

Management Plans should also take advantage of the opportunity provided by fires (whether naturally occurring or purposely lit), to deal with pest species that have been displaced by the fires.

#### **Management actions for heritage places**

Day-to-day responsibility for State World Heritage Properties lies principally with State governments and is applied through various management agencies or authorities. The Commonwealth exercises its World Heritage obligations through cooperative management, administrative and financial arrangements with the States that reflect World Heritage management priorities. Management priorities are usually identified in statutory Management Plans prepared in accordance with relevant State legislation and agreed, non-statutory strategic plans that coordinate management policy and activities across different administrative or management jurisdictions.

The Commonwealth also has a role in relation to the conservation of heritage places listed in the Register of the National Estate. Under the *Australian Heritage Commission Act 1975*, Commonwealth agencies must avoid damaging places in the Register and must consult with the Australian Heritage Commission (AHC)<sup>26</sup> about any action they propose that might affect a place in the Register. The Commission also provides heritage advice to any State and local agencies and private companies and individuals who seek it. In addition, the Commonwealth provides funds for the conservation of cultural places in the Register through the Cultural Heritage Projects Program.<sup>27</sup>

#### **Ramsar wetlands**

The Management Plan for the Ginini Flats Wetland Complex Ramsar site was published in 2001.<sup>28</sup> The plan identifies the occurrence of an unplanned fire within the wetlands or

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<sup>25</sup> <http://www.ea.gov.au/biodiversity/threatened/recovery/orange-bel-parrot/index.html>

<sup>26</sup> <http://www.ahc.gov.au/>

<sup>27</sup> <http://www.ea.gov.au/heritage/programs/chpp/index.html>

<sup>28</sup> <http://www.environment.act.gov.au/ic4/corporate/polplans/leg/gininiflatpdm.html>

in the adjacent Snow Gum woodlands as the greatest threat to the integrity and maintenance of the wetlands. The plan includes fire management objectives and actions to minimise the impacts of fire to the area. The actions include implementation and contribution to the Bushfire (Fuel) Management Plan in conjunction with other land managers, pursuing a no management burns policy for the life of the plan as a part of the no-fire policy of the Cotter catchment, and undertake fire fuel level reduction measures as necessary.

***(e) any alternative or developmental bushfire mitigation and prevention approaches, and the appropriate direction of research into bushfire mitigation***

#### **Bushfire Cooperative Research Centre**

The Commonwealth has acknowledged that there is a need for a coordinated approach to bushfire research in Australia. On 10 December 2002, Commonwealth Science Minister Peter McGauran announced new Commonwealth Government funding of \$25 million for a Bushfire Cooperative Research Centre (Bushfire CRC). Participating agencies include State and Territory land management agencies and fire authorities, CSIRO, seven Australian universities, Emergency Management Australia, and the Bureau of Meteorology.

The Bushfire CRC aims to develop a comprehensive and overarching understanding of bushfire behaviour and risk assessment, given local differences in vegetation, land management and weather. The research will have application in both the biophysical context (e.g. control of air quality, maintenance of biodiversity, prescribed burning) and the social context (e.g. enhancing the safety of people and buildings during bushfires). The outcomes of the research will be used to develop local management arrangements (e.g. prevention and suppression strategies, prescribed fuel reduction regimes) and enhance local community self-sufficiency.

#### **Future directions for fire management and biodiversity conservation**

While it is recognised that fire can be an effective management tool in some ecosystems and that land managers need to use and exclude fire for management purposes, it is widely accepted that we are at a very early stage in the pursuit of a comprehensive understanding of the relationship between fire and biodiversity. Future fire management and policies should be informed by a scientifically based and precautionary approach, planned in a strategic and integrated way, and implemented prudently and consistently with clearly enunciated goals and written prescriptions. The following need to be addressed in the development and implementation of fire policy for biodiversity conservation:

- Include an improved understanding about the response of biota to fire; the effects of fire on abiotic elements; factors influencing fire behaviour, fire type, intensity, frequency, season and extent; and an assessment of fire hazard, risk and threat;
- Allow exploration of alternative management options under strict scientific guidance and experimental rigor in order to build a robust understanding and knowledge of the relationship between fire and biodiversity as well as providing more diverse management options;

- Increase our knowledge of pre-European traditional firing practices used by Indigenous peoples;
- Undertake transparent, comprehensive trade-off processes to address conflicting management objectives; and
- Monitor the impacts of fire regimes on biodiversity to evaluate and direct the ongoing development of fire management practices.

It is important that future approaches to bushfire mitigation incorporate adequate pre-burn and post-burn monitoring, to better understand the effects on environmental assets including threatened species and communities. Research into bushfire mitigation should recognise that fire of some frequency and intensity is a natural feature of the Australian landscape, although land management practices since European settlement have changed the nature and frequency of bushfires. Further research is needed into the most appropriate fire regimes for different vegetation types and fauna species (e.g. the appropriate frequency, intensity and seasonality), in order to ensure the survival and recovery of threatened species and ecological communities and for the conservation of Australia's biodiversity.

#### **Future research for hazard reduction burning and air quality**

Smoke management strategies are informed by research into meteorological factors that influence the transport and dispersion of smoke plumes. This has led to advanced weather forecasting systems that are used for scheduling burns to avoid or reduce smoke impacts. For example, in Victoria, smoke modelling research with the Bureau of Meteorology has enabled the Department of Sustainability and Environment to predict smoke plume dispersion from proposed burning operations to aid decision making on burning operations near populated air sheds.<sup>29</sup>

However, the independent inquiry into Urban Air Pollution in Australia<sup>30</sup> questioned the extent to which weather forecasts can be used to ensure that smoke blows away from, rather than into, major population centres. It might be argued that for safe hazard reduction burns, the conditions of wind speed, humidity and moisture in forest litter occur so infrequently, that wind direction cannot be taken into account. Also, the calm conditions suited to hazard reduction burning usually correspond to periods of poor dispersion.

The inquiry concluded that options for reducing urban exposure to high levels of smoke from hazard reduction burning require further study.

Subsequently, the aim must be to find the balance between the risks of smoke impacts from hazard reduction burning on community health and the risk of major bushfires that threaten life and property. Further research is required to:

- Determine the full extent air pollution from hazard reduction burning activities and bushfires have on human health;

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<sup>29</sup> <http://www.ephc.gov.au/>

<sup>30</sup> <http://www.ea.gov.au/atmosphere/airquality/urban-air>

- Identify options that reduce the risk presented by bushfires but that do not lead to significant impacts on urban air quality. This may result in the consideration of other means of reducing forest litter and dry grass near urban areas; and
- Improve forecasting systems to better schedule hazard reduction burns at times that will avoid or reduce smoke impacts on urban air sheds.

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