



Fire Management Plan



Mt Kaputar National Park

NSW
NATIONAL
PARKS AND
WILDLIFE



**FIRE MANAGEMENT PLAN
for
MOUNT KAPUTAR NATIONAL PARK**

A draft Fire Management Plan was on public exhibition for four months from 26 February until 27 June 2003. The Plan has been amended to reflect the comments received from the public submissions on the draft Fire Management Plan.

This Plan has been endorsed by

Regional Manager
Northern Plains Region
NSW National Parks and Wildlife Service

FIRE MANAGEMENT PLAN MOUNT KAPUTAR NATIONAL PARK

NSW National Parks and Wildlife Service
Narrabri Area
November 2003

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EXECUTIVE SUMMARY

PLANNING AND CONSULTATIVE PROCESS

This Fire Management Plan has been developed to provide direction for fire management activities, including bushfire suppression, in Mount Kaputar National Park. The Plan will emphasise the protection of life and property as well as providing direction for NPWS in the protection of the natural and cultural heritage of Mount Kaputar National Park.

Mount Kaputar National Park has a number of threatened plants and animals, some of which are unique to the area. This Plan will deal with the protection of these species and communities through the implementation of appropriate fire management regimes to promote biodiversity.

In consultation with local Bush Fire Management Committees, NSW Rural Fire Brigades, Park neighbours and other stakeholders, areas have been assigned priorities for fuel management treatment by assessing bush fire threat to assets.

The cooperation of the community as expressed through the relevant Bush Fire Management Committee will be critical to the success of the Plan.

Although every effort has been made to ensure accuracy of details from existing databases, additional information is continually being collected and management concepts and practices evolving. Therefore, it is proposed that this Plan will have a life of five years before a review is undertaken.

FIRE MANAGEMENT OBJECTIVES

In accordance with Sections 63 & 64 and Part 1, Section 3 of the ***Rural Fires Act (1997)*** and also in accordance with the ***National Parks and Wildlife Act (1974)***; the primary objectives for fire management in Mount Kaputar National Park are:

- To minimise the occurrence of unplanned bushfires on the reserve.
- To contain unplanned bushfires occurring on the reserve.
- To minimise the potential for spread of bushfires on, from, or into the reserve.
- To protect from bushfires, persons and property on, or immediately adjacent to, the reserve.
- To manage bushfires to promote biodiversity of all species which occur naturally within the reserve.
- To protect from damage by bushfires all Aboriginal sites, historic places and culturally significant features known to exist within the reserve.

STRATEGIES FOR LIFE AND PROPERTY PROTECTION

Asset protection will be performed by:

- suppression or containment of fires, depending on:

- a) the time of year of the ignition, and
- b) assessment of seasonal conditions, fire history and fuel levels.
- maintaining existing fire trails along the Park boundary.
- maintaining radiation zones around historic structures and visitor facilities.
- designating safe areas for Park visitors and developing evacuation procedures as part of the *NPWS Northern Plains Region Incident Procedures*.
- maintain readiness of two fire units in Narrabri for the duration of the fire season.
- training NPWS staff on the location of all assets and suppression advantages.

STRATEGIES FOR FIRE MANAGEMENT

Strategic fire management will be performed by:

- maintaining existing fire trails
- prescribed burning in strategic fire management zones to provide safe access for fire fighters and to contain fires within the Park

STRATEGIES FOR CULTURAL SITE MANAGEMENT

- establishing and maintaining radiation zones around significant Aboriginal sites and historic structures

STRATEGIES FOR HERITAGE MANAGEMENT

The strategies for heritage management are:

- implementing a fire management approach which involves the development of containment and suppression strategies whilst encouraging a natural fire regime
- developing wildfire suppression strategies which will safely maximise the area burnt within a fire management area, where the acceptable fire-free period for a vegetation community is reaching its upper limit
- developing wildfire suppression strategies which will minimise the area burnt within a fire management area, where the acceptable fire-free period for a vegetation community is below its lower limit
- maintaining a diversity of fire intervals by conducting prescribed burning in areas where the acceptable fire-free period for a vegetation community is reaching its upper limit

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1.

INTRODUCTION

1.1 Scope and purpose

In accordance with the *Rural Fires Act 1997*, the National Parks and Wildlife Service (NPWS, or the Service) is a prescribed fire organisation and is responsible for the control and suppression of all fires on Service estate. This responsibility encompasses fuel management, and responsibility for the implementation of fuel management programs to protect life and property. Under the Act, the Service may also suppress or assist in the control and suppression of fires within eight kilometres of any land it manages, in conjunction with the appropriate controlling authority.

Section 50 of the *Rural Fires Act 1997* sets up provisions for the establishment of District Bush Fire Management Committees (BFMCs) with the task of developing and coordinating cooperative fire management between fire authorities across the state. The Service is a member of these committees which are responsible for the development of both cooperative fire-fighting and programs for the reduction of bushfire hazards.

Within the scope of this plan the Service is an active member of the following Bush Fire Management Committees that include Mt Kaputar National Park:

- Narrabri Bush Fire Management Committee
- Moree Plains Bush Fire Management Committee
- Cunningham Zone Bush Fire Management Committee (Barraba, Bingara, Yallaroi Shires)

Under Section 52 of the *Rural Fires Act*, each Bush Fire Management Committee is to prepare two kinds of bush fire management plans for the rural fire district or other part of the state for which it is constituted. These plans are:

- A plan of operations, and
- A bush fire risk management plan.

Also in accordance with the *Rural Fires Act*, the Fire Control Officer of a Rural Fire District must comply with the conditions set out by the agency appointed for managing 'prescribed land'. Such conditions must be outlined in the relevant bushfire management plan agreed to by the authority responsible for the prescribed land (Section 38 [4]). This Fire Management Plan is such a plan under Section 38 (4) of the *Rural Fires Act 1997*.

1.2 The planning environment

1.2.1 Legislation

The Service has statutory obligations under the *Rural Fires Act 1997* to protect life and property on its lands and to prevent fire from leaving its property. Under the *National Parks and Wildlife Act 1974* the Service is charged with the responsibility to conserve the natural and cultural heritage of NSW.

The Service must give appropriate consideration in its fire management planning to the requirements of protection for both human life and property in addition to the protection of the environment

Under the *Rural Fires Act 1997* the NPWS is a recognised Fire Authority. The *Act* provides for the Service to undertake appropriate measures to prevent fire from entering or leaving its estate. As a prescribed organisation the NPWS is required to implement the provisions of Bush Fire Management Plans.

Other Acts and Regulations that relate to fire management in Mount Kaputar National Park are:

- The *Wilderness Act 1987*, which limits the development of permanent trails and helipads to those required for necessary Park operations.
- The *Heritage Act 1977*, which makes provision for the protection and management of sites and areas of environmental and cultural heritage values.
- The *Environmental Planning and Assessment Act 1979*, which requires the Service to assess all environmental factors pertaining to any activity that will affect or be likely to affect the environment by reason of that activity.
- The *Threatened Species Conservation Act 1995*, which ensures that threatened species, both flora and fauna, as well as populations and ecological communities are protected, and considered in planning processes.
- The *Occupational Health and Safety Act 2000*, which provides for the safety of personnel, equipment and the work environment in which fire management operations are undertaken.

Other Acts and Regulations which may relate to fire management activities include the *Crimes Act 1900*, the *Coroners Act 1980*, the *Workers Compensation Act 1987* and the *Fire Brigades Act 1989*.

1.2.2 Management objectives of the reserve (Plan of Management)

The management of Mount Kaputar National Park is governed by objectives stated in the *National Parks and Wildlife Act 1974* and the *Mount Kaputar National Park Plan of Management*.

The general objectives for the management of national parks and nature reserves in New South Wales are:

- the protection and preservation of natural and special features.
- the conservation of biodiversity.
- the maintenance of natural processes as far as possible.
- the preservation of Aboriginal sites and historic features.
- the provision of appropriate recreation opportunities.
- the encouragement of scientific and educational research into environmental features and processes, prehistoric and historic features and park use patterns.

The policies contained in *Mount Kaputar National Park Plan of Management* which affect fire management are:

- protection of the Park as a representative sample of north-western slopes vegetation and as an outlier of northern tablelands vegetation
- protection of subalpine communities and relict rainforest elements
- protection of wilderness areas
- preparation of fire management guidelines (this Plan) which will ensure:
 - ◇ protection of human life and property.
 - ◇ maintenance of species and habitat diversity.
 - ◇ protection of rare species and communities of special significance.
 - ◇ protection of cultural resources.
 - ◇ protection of capital assets and recreational facilities in the Park.

Actions arising directly from the Plan of Management are:

- maintenance of perimeter fire trails
- extension of the perimeter trails where practicable
- rehabilitation of any trails constructed during fire suppression operations within wilderness areas
- exclusion of fire, as far as possible, from the following communities or areas, except where fire is required to protect facilities or to achieve specific resource management objectives:
 - ◇ cliff-edge and escarpment communities
 - ◇ gullies with closed forest communities

- ◊ subalpine area
- ◊ habitats of any fire-sensitive rare or endangered species
- ◊ fire-sensitive cultural resources
- encouragement of research into fire behaviour and fire effects in Park ecosystems.

1.2.3 Fire management policies of the NPWS

Service policies concerning fire and fire management include the following:

- Protection of life, property and community assets from the adverse impacts of fire
- Manage fire regimes within reserves to maintain and enhance biodiversity
- Protection of Aboriginal sites, historic places and culturally significant features from damage by fire
- The Service regards fire as a natural phenomenon, one of the continuing physical factors of the Australian environment.
- The Service recognises the evolutionary adaptation of many native species of plants and animals to fire regimes.
- The Service regards fire as an important management tool.
- Fire is and will be used as a fuel reducing agent where this does not conflict with other management objectives.
- Where life and property are directly threatened by fuel conditions, all steps will be taken to minimise risks, with other management needs regarded as secondary considerations.

All prevention and suppression works will, where possible, be pre-planned and coordinated with neighbours and other agencies likely to be affected by Service activities. The Service will undertake fire prevention programs, through public education and through supervision and enforcement of the Acts and Regulations applying to fires on NPWS estate.

The Service supports the principle of a cooperative approach to fire suppression to most effectively and efficiently utilise fire-fighting resources within the community.

1.2.4 Local – Regional Environmental Plans

The Local Environmental Plans for:

- Barraba;
- Bingara;
- Moree Plains;

assign Mount Kaputar National Park Zone 8 - National Parks, State Recreation Areas and Nature Reserves and other lands dedicated or reserved under that *National Parks and Wildlife Act*.

The Local Environmental Plan for Narrabri assigns Mount Kaputar National Park Zone 1 (a) General Rural.

1.2.5 State Environmental Planning Policies

There are currently no State Environment Planning Policies relevant to fire management within Mount Kaputar National Park.

1.2.6 NSW Biodiversity Strategy

The *NSW Biodiversity Strategy (1999)* was developed by the New South Wales Government and outlines a collaborative approach to biodiversity conservation. The primary objective of the document is: "to protect the native biological diversity of NSW and maintain ecological processes and systems".

The strategy has identified inappropriate fire regimes as one of the seven key threatening processes affecting the biological diversity of NSW. This issue is targeted within the Biodiversity Strategy by Objective 3.4 'Improve fire management regimes', and requires the following priority action:

Action 43: Manage fire in accordance with ESD principles.

and supporting actions:

Action 44: Improve the consideration of fire threat in land-use planning and incorporate the results of applied fire research, including the knowledge and experience of Aboriginal and local communities, in land management and land-use planning.

Action 45: Continue a research program to examine the effects of fire on biodiversity.

This Plan is intended to address the above in relation to Mt Kaputar National Park.

2. DESCRIPTION OF THE RESERVE

2.1 Location

Mount Kaputar National Park encompasses an area of 38,063 ha (2002) and is located on the Nandewar Range of northern New South Wales. The Park is located about 50 kilometres east of Narrabri (see Figure 2.1). It adjoins agricultural lands and forested country, including Deriah, Plagyan and Rusden State Forests to the south.

2.2 Terrain

The Nandewar Range is a western extension of the Great Dividing Range in New South Wales. Elevation within the Park ranges from 300 metres to 1510 metres.

The geology of the Park is dominated by various igneous strata which were associated with basaltic and porphyritic lava flows from the Nandewar Volcano, which was active over 17 million years ago. The Miocene volcanic activity overlayed carboniferous sandstones and coal measures, and Triassic conglomerates, sandstones and shales (Percival, 1985). Erosion has exposed tiered terraces, lava flows, dykes and necks, revealing a distinctive volcanic landscape. The sedimentary lithologies are exposed at lower elevations of the Park.

The terrain of the Park is rated as steep to very steep. About 63% of the Park has slopes in excess of 10°, with about 23% in excess of 20°. The steepest areas are located on the central range and associated spurs. The low gradient areas are associated with the plateau and the lower valley areas.

2.3 Biodiversity

2.3.1 Flora

Flora of the Park is botanically significant as it includes:

- a number of vegetation communities and species at the northern, southern and western limit of their distribution;
- a large range of vegetation zones in response to increasing altitude;
- large areas of semi-arid and north-west slopes vegetation, and cool highland communities typical of the northern tablelands;
- a number of endemic species.

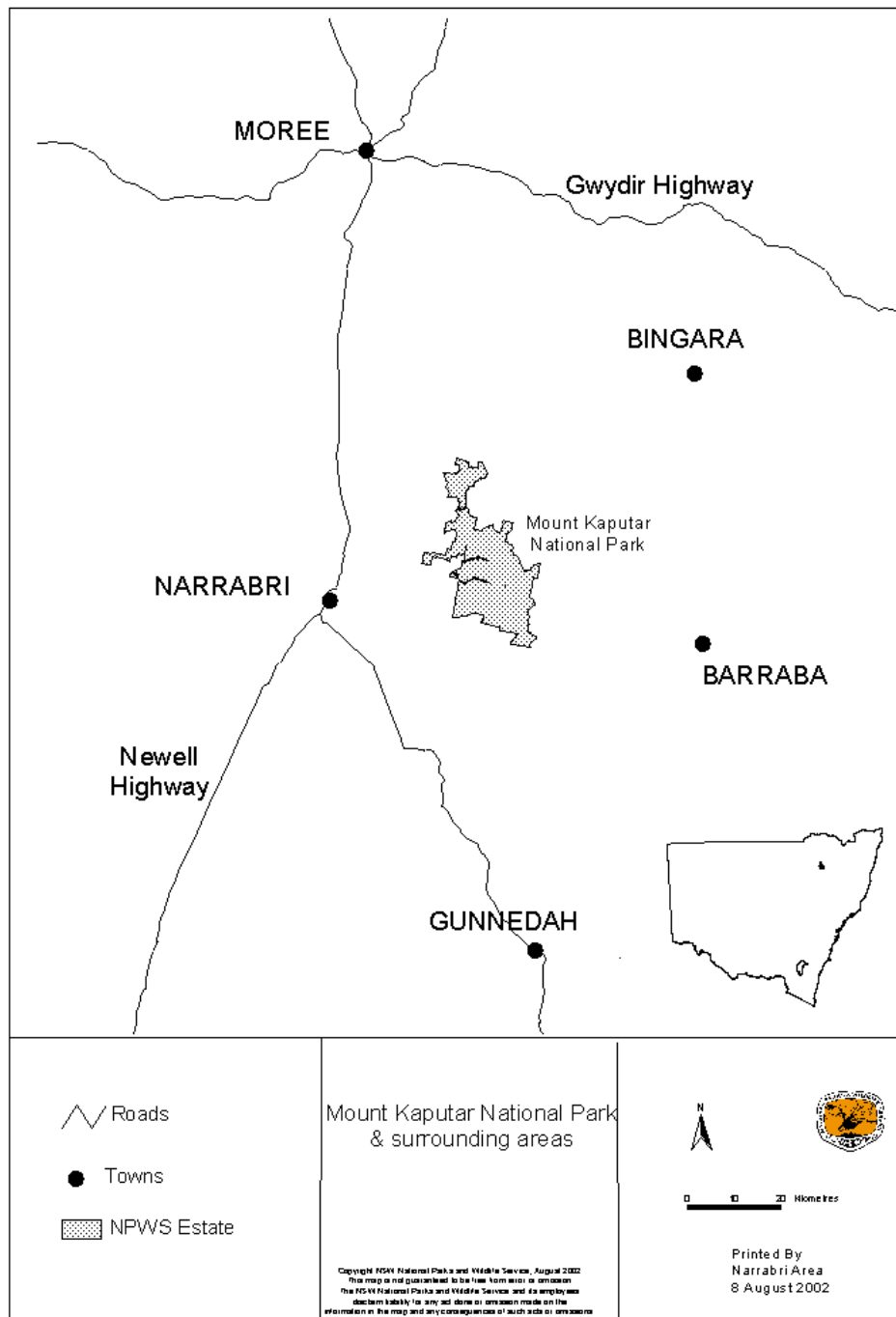


Figure 2.1 Location of Mt Kaputar National Park.

Vegetation communities are shown in Figure 2.2 with fire ecology considerations described in Table 2.1. The diversity of vegetation types is the result of the large elevation range, and substantial variations in relief, soil types and micro-climatic conditions. The Park is an important ecological island largely surrounded by plains cleared for agriculture.

The Park is within the North Western Slopes and Northern Tablelands botanical sub-divisions of New South Wales (Harden, 1990). The vegetation communities and species present in the Park are representative of these two botanical provinces. The area is within the Nandewar

Biogeographic Region (Thackway & Cresswell, 1995). Species reaching their northern, southern and western limits, include *Eucalyptus pauciflora*, *E. rubida*, *E. bridgesiana*, *E. cypellocarpa*, *E. dalrympleana* ssp. *heptantha*, *E. youmanii* and *Acmena smithii*.

Broad vegetation type	Vegetation associations and key species present	Vegetation Communities for Figure 2.2	% area	Fire ecology comments	Regime
Sub-Alpine	Sub-alpine forests and woodlands <i>Eucalyptus pauciflora</i> / <i>E. dalrympleana</i> / <i>E. viminalis</i>	2. Snow Gum / Ribbon Gum / Mountain Gum open-forest	1.5	<i>Poa sieberiana</i> requires fire exclusion at intervals greater than 5 years. High intensity crown fires will kill <i>E. pauciflora</i> with regeneration via lignotubers. Low to moderate intensity fires will kill juvenile individuals.	a
Moist Forest	Moist tall open forests <i>E. laevopinea</i> / <i>E. obliqua</i> / <i>E. volcanica</i>	3. Silver-top Stringybark open-forest	35	Decline predicted if more than two successive fires occur at intervals of less than 10 years apart and that totally scorch or consume the tree canopy. Decline predicted if there are no fires for more than 30 years.	b
	Riparian Forest	1. River Oak Riparian Forest			
	Open forests and woodlands <i>E. laevopinea</i> / <i>E. macroryncha</i> / <i>E. volcanica</i>	3. Silver-top Stringybark open-forest			
Dry Forest	Dry open forests and woodlands <i>E. andrewsii</i> / <i>E. aff. cypellocarpa</i> <i>E. albens</i> / <i>E. crebra</i> / <i>E. dealbata</i> / <i>Angophora floribunda</i> / <i>Callitris endlicheri</i>	4. Mountain Gum low woodland 8. White Box / Cypress Pine open-woodland 9. Narrow-leaved Ironbark / Cypress-Pine open-woodland 5. Tumbledown Red Gum / Dwyers Red Gum low open-forest	55	Canopy resprouts from epicormic growth. Shrub layer species regenerates from both resprouting and seed germination. <i>Fire requirement</i> Higher intensity burn once 30 - 50 years. Moderate intensity burn for shrub layer replacement after 20 years	c

The Park contains over 600 plant species. Of these:

- Eleven species are listed as rare or threatened under the ROTAP system.
- Four are endemic species.
- Five species are listed under Schedule 2 in the *Threatened Species Conservation Act 1995*.

Sightings have also been reported of *Cadellia pentastylis* (ooline), *Diuris aequalis* (double tail orchid), and *Eucalyptus rubida* ssp. *barbidgerorum* (candlebark gum), however their accuracy

Heath	Shrublands	7. Kunzea / Tea-tree wet heathland on rocky outcrops 6. Kunzea / Fringe Myrtle dry heathland on rocky outcrops	6.9	Decline predicted if more than two fires in succession occur at less than intervals of 8 years apart. Decline expected if more than two successive fires occur at intervals of more than 15 years apart.	d
	Acacia shrublands	(part of) 6. Kunzea / Fringe Myrtle dry heathland on rocky outcrops		Extensive canopy scorch and stand replacement will result from moderate to high intensity fires. Seed recruitment triggered by higher intensity fires. <i>Fire requirement</i> Stand replacing burn required once in 30 - 50 year period. Regeneration impacted if fire occurs 8 years after stand replacement.	
Cleared / Grassland	Grasses and/or various introduced species typical of pastoral land in the surrounding district. Slowly encroaching native regeneration occurring, pioneered chiefly by <i>Discaria pubescens</i> .	10. Cleared	1.9	Areas slowly returning to 'Dry Forest' Too frequent / intense fires will result in decline of juvenile native tree and shrub species.	e

has been questioned, as further specimens have not been found in recent surveys, and the environments are very different to their usual habitat (Porteners, 1997).

Rare and threatened flora species, and their fire ecology, are described in Table 2.2. Limited fire response information is available for the threatened species found in Mount Kaputar National Park. Responses tabulated are mainly extrapolated from similar species for which more detail is available. Consequently, it is difficult to ascertain accurate fire management requirements for many species and communities until further research has been conducted. The location of threatened flora is illustrated in Figure 2.3.

Table 2.1 Vegetation communities and fire ecology

Table 2.2: Rare and threatened flora

Species	Family	Conservation code*	Habitat and fire response
<i>Boronia rubiginosa</i>	Rutaceae	2RCa	Occurs in dry sclerophyll forests on skeletal soils, most likely to be on the western side of the Park at lower altitudes with a northern aspect. <i>Fire response</i> - Unknown. Similar species regenerate from seed after a 100% scorch kill. Others survive a 100% scorch and resprout from root suckers, basal sprouts, epicormics or large apical bud and/or from seed (facultative resprouters). Still others may have the canopy killed, but resprout vegetatively and from seed (these are fire resistant).
<i>Cadellia pentastylis</i>	Surianaceae	Sched. 2, TSC Act 3RCa	Appears to occur on upper or mid slopes of any aspect on lithic sandstone and conglomerate substrates at elevations between 300-450 m. (Benson, 1993). <i>Fire response</i> - Unknown, but has capacity to resprout from rootstock and coppice from stumps. High rate of seed infertility. Suspected that hot fires kill, particularly younger trees. However, it is possible that fire still plays major role in distribution, and repeated burning will eliminate the species (NSW National Parks and Wildlife Service Benson, 2000).
<i>Discaria pubescens</i> Australian Anchor Plant	Rhamnaceae	3RCa	Occurs at higher altitudes associated with grassy woodlands, sub-alpine and moist sclerophyll forests from Mt Lindsay to Yulladunidah. This is the northern limit of this species distribution. <i>Fire response</i> - regenerates from seed. Tasmanian studies have shown that burning is unlikely to stimulate seed germination and may even harm the population (Coates 1992).
<i>Diuris aequalis</i> Double tail Orchid	Orchidaceae	Sched. 2; Preliminary Sched. 1, TSC Act 3VC-	<i>Fire response</i> - Unknown. Similar species regenerate solely by resprouting after fire (obligate resprouter). Others may resprout from basal sprouts, while others are facultative resprouters.
<i>Eucalyptus elliptica</i> Bendemeer White Gum	Myrtaceae	3KC-	Occurs in grassy woodland on sandy soils, often granite or basalt derived, Nandewar Range and east of Armidale (Royal Botanic Gardens Sydney 2001, Harden 1991). <i>Fire response</i> – resprouts from lignotuber and epicormic shoots (Richards, 1999)
<i>Eucalyptus nandewarica</i> Nandewar Gum	Myrtaceae	3RCa	Occurs on skeletal sandy soils over rocky sandstone or trachyte soils (Harden, 1991) and is restricted to the Nandewar Range between Barraba and Bingara. Recorded on southern slopes of Mt Mitchell, Waa Gorge and east of Mt Lindsay. Also associated with intergrading populations of <i>E. dealbata</i> on rocky plateau between Camels Hump Mountain and Mt Mitchell (Porteners 1997). <i>Fire response</i> - unknown, probably resprouts from epicormic buds on branches. Similar species are also either obligate resprouters or facultative resprouters.
<i>Eucalyptus rubida</i> ssp. <i>barbigerorum</i> Candlebark Gum	Myrtaceae	Sched 2, TS Act 3V-	<i>Fire response</i> - Unknown, probably resprouts from epicormic buds on stems. <i>E. rubida</i> ssp. <i>?rubida</i> resprouts from epicormic buds (Strasser <i>et al</i> , 1996). Other similar species are also facultative resprouters.

Species	Family	Conservation code*	Habitat and fire response
<i>Euphrasia orthocheila</i> ssp. <i>orthocheila</i> Yellow-flowered Euphrasia	Scrophulariaceae	3RC-	Grows in moist, open situations. Extinct over much of its range, the Park is the western limit of its distribution (Harden 1990-93). Recorded near Dawson Springs Nature Trail and is locally frequent in open and grassy wet heathland - 200 live individuals with nearly as many dead ones (Porteners 1997). <i>Fire response</i> - Unknown, probably regenerates from seed but similar species are also obligate resprouters.
<i>Gonocarpus longifolius</i>	Haloragaceae	3RC-	Occurs in shrub communities on slopes and ridge tops associated with sandstone. Recorded in the upper reaches of Boomi Creek at the western limit of its range. <i>Fire response</i> - Unknown. Similar species are either obligate seed regenerators or facultative resprouters.
<i>Haloragis exalata</i> ssp. <i>exalata</i> var. <i>exalata</i>	Haloragaceae	3VCa; Sched 2 , <i>TSC Act</i>	Occurs on moist water courses and is thought to prefer southern and eastern aspects. Located in the Bark Hut/Dawsons Springs vicinity. <i>Fire response</i> - Unknown, probably obligate seed regeneration. Other similar species may also be regenerated from seed after a 100% scorch kill.
<i>Hibbertia kaputarensis</i> Kaputar Guinea Flower	Dilleniaceae	2RC-	Occurs on rocky sites in heath and open forest, from 500-1000m altitude. Restricted to Mt Kaputar NP (Harden, 1991). <i>Fire response</i> – unknown; similar species are facultative resprouters, but some are killed by fire. Conservative approach recommended.
<i>Muehlenbeckia costata</i>	Polygonaceae	3KC-	<i>Habitat</i> – Recently burnt rocky outcrops at altitudes above 1100 m, and generally areas larger than 10 ha. <i>Fire response</i> – germination stimulated by fire. Populations have been shown not to persist in the absence of fire, and the species displays a number of traits characteristic of an ephemeral species (Hunter <i>et al</i> , 1998).
<i>Leionema viridiflorum</i> (formerly <i>Phebalium viridiflorum</i>) Green Phebalium	Rutaceae	3RCa	Grows mainly in heath on trachyte outcrops (Harden, 1991). Recorded in the vicinity of Mt Dowe, Yulladunida and Waa Gorge. Recently recorded in low numbers Mt Mitchell-Camels Hump Mountain plateau in dry <i>Kunzea</i> heathland adjacent to <i>Eucalyptus nandewarica</i> - <i>E. dealbata</i> integrades (Porteners, 1997). <i>Fire response</i> - Unknown probably obligate seed regenerator but may also be facultative resprouter.
<i>Prostanthera cruciflora</i> Mint Bush	Lamiaceae	2RC-t	Occurs in heath on exposed trachyte and rhyolite outcrops, possibly widely distributed across the Park. Recorded near the Park entrance on Kaputar Road and near Gins Mountain in the Grattai Wilderness. <i>Fire response</i> - Killed by 100% scorch. Obligate seed regenerator but unknown if seed storage on plant, in soil or out of burnt area.

* Conservation coding for ROTAP species (Briggs and Leigh, 1996):

2 = Species with a very restricted distribution in Australia and with a maximum geographic range of < 100km.

3 = Species range > 100 km but in small populations restricted to highly specific and localised habitats.

R = Rare. May be represented by large population in restricted area, or smaller populations in larger range.

V = Vulnerable. Species at risk of disappearing from the wild over longer period through continued depletion.

C = Symbol used to indicate species is known to be represented in a National Park or reserve.

a = Species with total population of more than 1000 plants reserved.

i = Species with total population of less than 1000 plants reserved.

t = Indicates total known population of species occurs within conservation area.

- = Reserved population size is unknown

Schedule 1 of *Threatened Species Conservation Act 1995* lists **Endangered Species**.

Schedule 2 of *Threatened Species Conservation Act 1995* lists **Vulnerable Species**.

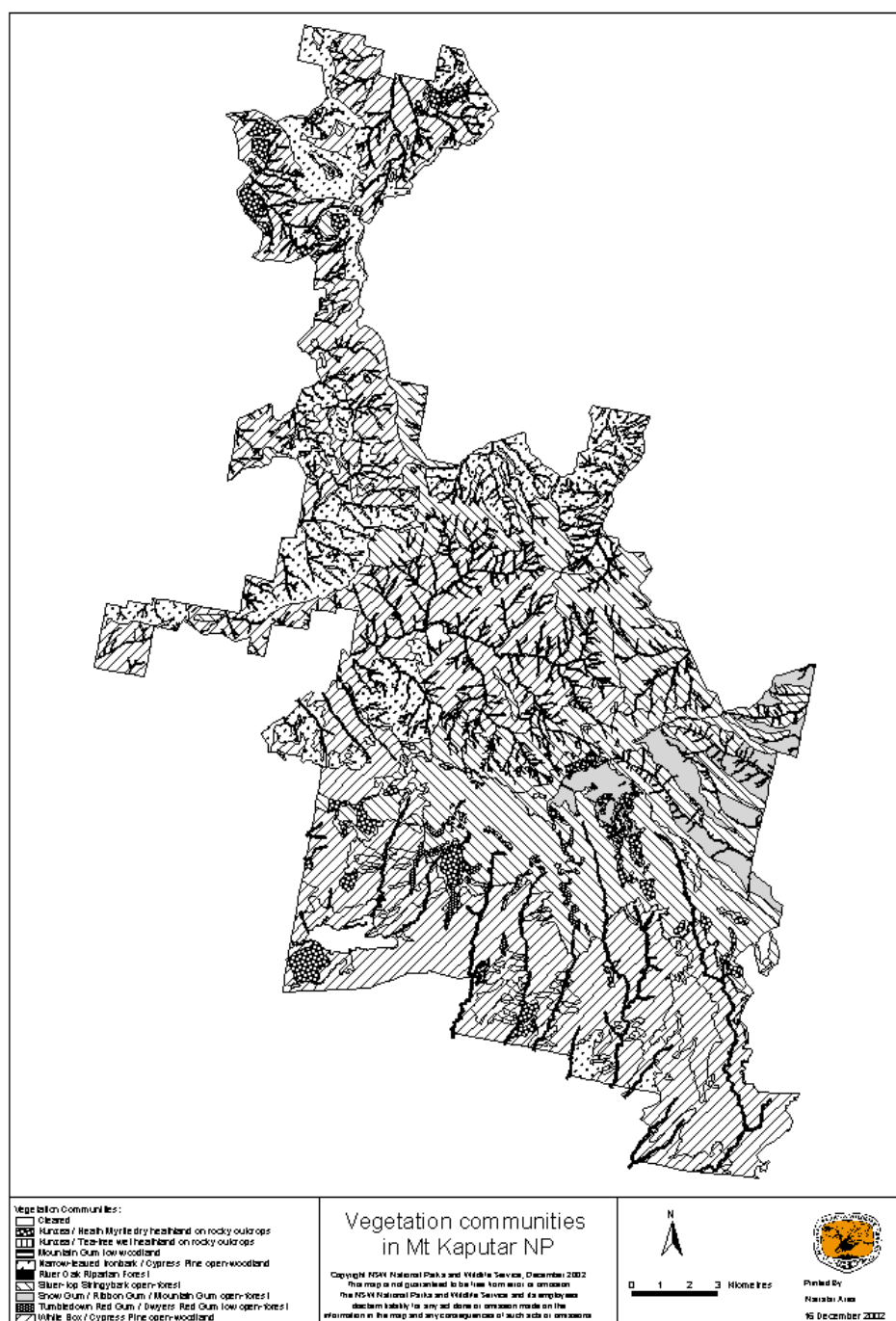


Figure 2.2: Vegetation community distribution.

Note that all maps are indicative only due to the scale of the maps.

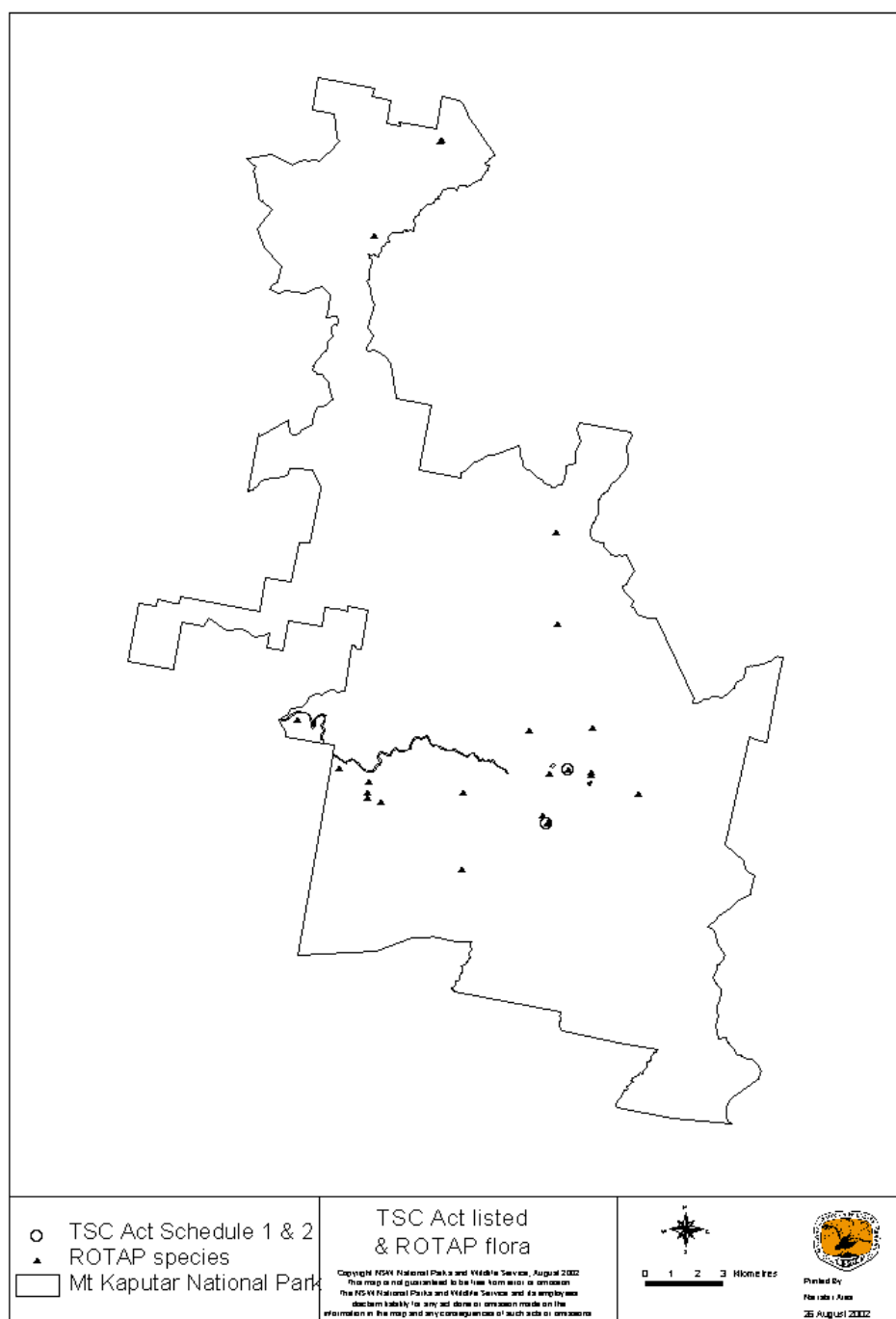


Figure 2.3: Known locations of threatened flora.

2.3.2 Fauna

The Park lies on the transition area between the Bassian and Eyrean Zoographical Regions resulting in a diverse fauna assemblage. The total number of species recorded are 11 amphibian species, 169 bird species, 34 reptile species and 39 mammal species. A significant proportion of these species reach their western limit in the Park.

Twelve fauna species occurring in the Park have been listed under Schedule 2 of the *Threatened Species Conservation Act 1995*. These species and the effects of fire on their habitats are listed in Table 2.3. The location of threatened fauna in the Park is shown on Figure 2.4.

Table 2.3: Threatened fauna species

Species	Common name	Status *	Habitat and fire threat
Birds			
<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	Vulnerable	Breeds in spring/summer. Nests mostly in hollows of dead trees. <i>Fire threat</i> - unknown, but some evidence of threat to habitat by destruction of nesting trees (Joseph <i>et al</i> , 1991) Fire not listed a threat in Ayers, <i>et al</i>, 1997.
<i>Certionyx variegatus</i>	Pied Honeyeater	Vulnerable	<i>Fire threat</i> - Unknown. Other honeyeaters showed an initial decline in numbers and do not recolonise until at least 2-4 years post-fire (Brooker and Rowley, 1991; Reilly, 1991). Vital that frequent pockets of unburnt country of sufficient size including food source of manna, honeydew and lerps remain (Paton, 1980). Fire not listed a threat in Ayers, <i>et al</i>, 1997.
<i>Climacteris picumnus</i>	Brown Treecreeper	Vulnerable	Inhabits clearings in drier eucalypt woodlands and forests; prefers open areas with short grass; standing dead timber and fallen logs but few shrubs; nests in hollows in dead branches and fallen logs; feeds on the ground or on fallen logs; (NSW National Parks and Wildlife Service, 2003). <i>Fire threat</i> – unknown.
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable	<i>Fire threat</i> - Unknown. Other honeyeaters showed an initial decline in numbers and do not recolonise until at least 2-4 years post-fire (Brooker and Rowley, 1991; Reilly, 1991). Vital that frequent pockets of unburnt country of sufficient size including food source of manna, honeydew and lerps remain (Paton, 1980). Fire not listed a threat in Ayers, <i>et al</i>, 1997.
<i>Lathamus discolor</i>	Swift Parrot	Vulnerable	Migrates to mainland from its Tasmanian breeding site between March and October. Nests in tree hollows 6-20 metres high and eats blossom nectar, lerps, soft fruits, berries and forages in grass. <i>Fire threat</i> - Unknown, but possible threat from destruction of nesting trees and removal of food source. Fire not listed a threat in Ayers, <i>et al</i>, 1997.

* Status under *Threatened Species Conservation Act 1995*.

<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	Breeds in northern portion of the Park (Morris, <i>pers. comm.</i>). Also recorded in the upper Horton Valley. Species prefers open forests and woodlands, timbered water courses, rocky hills and gorges (Simpson and Day, 1993). Fire threat - Fires may affect breeding success during summer. Fledglings at greatest risk due to potentially low, combustible nesting sites. Fire not listed a threat in Ayers, <i>et al</i>, 1997.	Mammals <i>Chalinolobus dwyeri</i>
<i>Melanodryas cucullata</i>	Hooded Robin	Vulnerable	Inhabits drier eucalypt forests, woodlands and shrubs with fallen logs and debris; forages on the ground or from a stump or dead tree for insects; breeds between July and December; nests 0.5 to 4m above the ground on a fork or in a cavity in dead wood (Pizzey, 1997). Fire threat – unknown.	<i>Dasyurus maculatus</i>
<i>Melithreptus gularis</i>	Black-chinned Honeyeater	Vulnerable	Inhabits drier eucalypt forests, woodlands, timber on watercourses, scrubs and ironbark forests on the Western Slopes (Pizzey, 1997); primarily feeds upon insects acquired by gleaning in foliage and under bark and honeydew in summer; breeds between July and December; nests 3 to 15m in the outer foliage of trees (Pizzey, 1997). Fire threat – unknown.	<i>Macrotis lagotis</i>
<i>Neophema pulchella</i>	Turquoise parrot	Vulnerable	Resident species associated with woodlands adjacent to cleared areas. Fire threat - Fires may affect breeding success during summer. Fire not listed a threat in Ayers, <i>et al</i>, 1997.	<i>Miniopterus australis</i>
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	Vulnerable	Inhabits open forests, woodlands, scrublands, and farmlands; forages mostly upon the ground in the leaf litter and soil, under sticks, logs and under rough bark of live or dead trees and shrubs; feeds on insects, spiders and small lizards; breeds between June and October; nests in the fork of a tree 4m high (Pizzey, 1997). Fire threat – unknown.	<i>Miniopterus schreibersii</i>
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	Vulnerable	Inhabits eucalypt woodlands, gullies and rocky ridges with open, shrubby understorey; forages for insects, insect larvae and seeds amongst the leaf litter under, and around, bushes and trees; breeds between August and January; nests either on the ground, in low shrub or tree trunk (Pizzey, 1997). Fire threat – unknown.	
<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable	Inhabits open eucalypt forests and woodlands and grasslands, river red gums, mallee, buloke, cypress pine and acacia scrubs; feeds exclusively upon the ground for ripe and part-ripe seeds and occasional insects; breeds between August and January; nests up to 10m above the ground in dense eucalypt foliage; mistletoe or shrubs (Pizzey, 1997). Fire threat – unknown.	

<i>Petaurus australis</i>	Yellow-bellied Glider	Vulnerable	Inhabits temperate and sub-tropical tall eucalypt forest in high rainfall regions. Recorded in the Bark Hut area of the Park, further distribution unknown; likely to be limited to areas with overlapping blossoming periods providing food over the greater part of the year. <i>Fire threat</i> - Direct from intense crown fires; destruction of habitat and food sources. Fire not listed a threat in Ayers, et al, 1997.
<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	Inhabits dry sclerophyll forest and woodland; shelters in tree hollows; feeds on nectar, pollen, flowers, acacia gum, sap, caterpillars and other insects; require at least one species that flowers heavily in winter, and at least one smooth-barked eucalypt (NSW National Parks and Wildlife Service, 1999). <i>Fire threat</i> – High frequency fire resulting in the disruption of life cycle processes is a Key Threatening Process.
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	Vulnerable	Small colonies recorded in and adjacent to the northern side of the Park. Colonies are located in very steep rocky areas on volcanic lithologies. <i>Fire threat</i> - Fire over the entire home range of colonies may affect food availability. Rocky area will shelter animals during fire events. Fire not listed a threat in Ayers, et al, 1997.
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Common in valley and alluvial areas with red gum species. Occurs in low numbers in most forest and woodland vegetation types on volcanic soils. Recorded in Killarney Gap, Coryah Gap, Barraba Track and Yulludunida. <i>Fire threat</i> - Low risk of high intensity burns in valley areas. High intensity burns in other areas may result in short-term reduction of numbers. Fire not listed a threat in Ayers, et al, 1997.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	Vulnerable	Roost in large hollow trees (Reardon & Flavel, 1987); insectivorous and forage above the tree canopy (Churchill, 1998). <i>Fire threat</i> – unknown.
Amphibians			
<i>Litoria booroolongensis</i>	Booroolong Frog	Endangered	Found on or under debris and boulders in the beds of mountain streams; breeds in summer (Cogger, 2000). <i>Fire threat</i> – unknown.
Reptiles			
<i>Underwoodisaurus sphyrurus</i>	Border Thick-tailed Gecko	Vulnerable	Inhabits exfoliating rocky outcrops, stony hills and deep leaf litter in eucalypt and <i>Callitris</i> woodland; feeds on insects. <i>Fire threat</i> – unknown.

- Status under *Threatened Species Conservation Act, 1995*

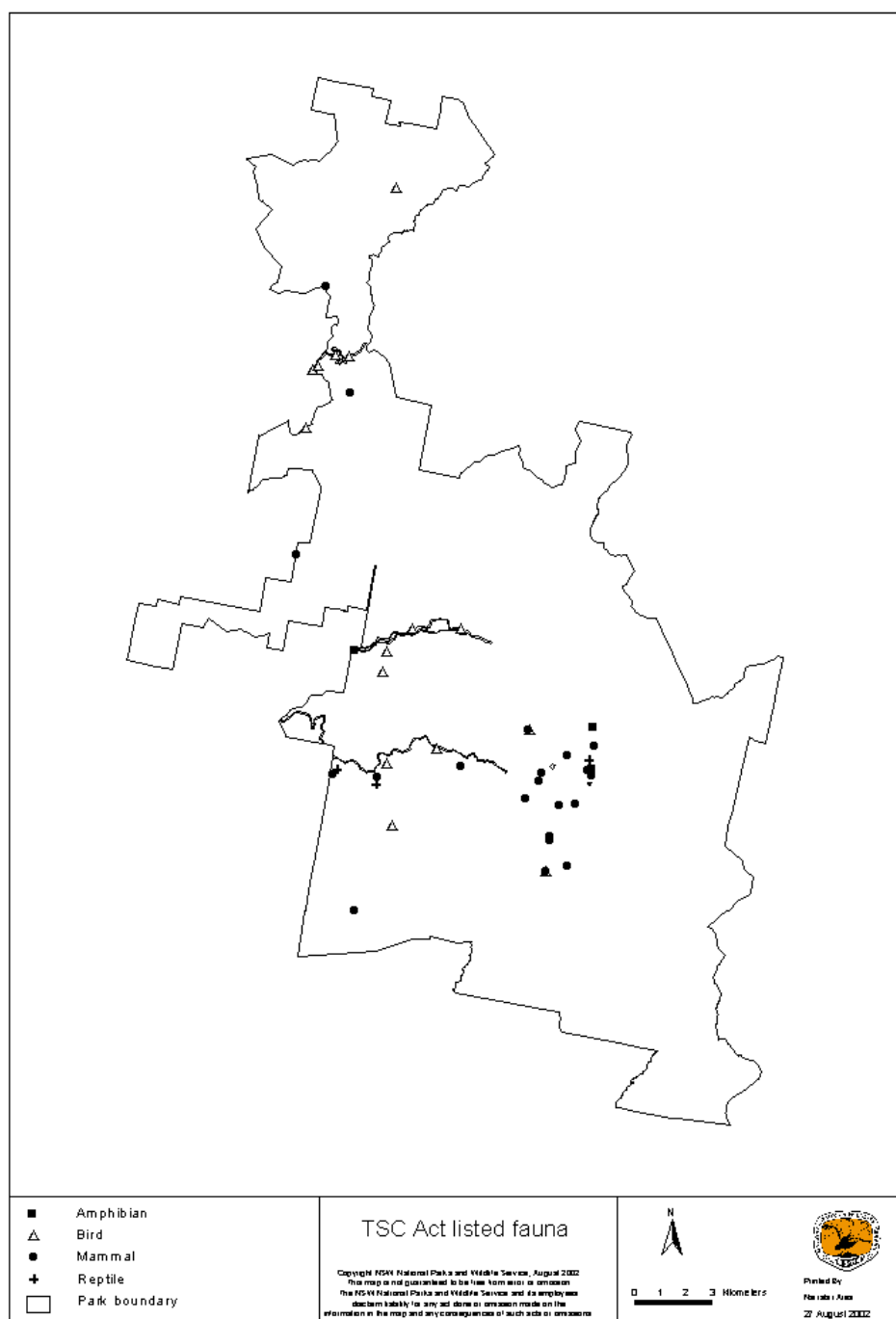


Figure 2.4: Known locations of threatened fauna in Mt Kaputar NP

2.4 Cultural heritage

2.4.1 Aboriginal

Mt Kaputar National Park lays within the boundaries of the Kamilaroi nation. Only a limited number of sites have been found that record their use of the lands within Mt Kaputar National Park, including camp sites, shelters with deposits and scarred trees. The approximate location of these sites is identified in Figure 2.5. Particular attention should be given to culturally sensitive landscape areas containing sandstone outcrops, rock shelters and overhangs, old growth trees (predominantly box communities), sand bodies and ground adjacent to creeks, rivers and swamps. These areas have a high probability of sites occurring. Potential vulnerability of Aboriginal sites to fire and fire related activities is listed in Section 4.5.

2.4.2 European

There are numerous European historic sites in the Park. These are generally associated with early pastoral and recreational activities. Sites include huts and sheds, cabins, surveyors' trigonometric stations, wooden watering troughs, mine shafts, woolsheds and fences.

Identified sites of significance are Scutts Hut, Koala Hut, Ningadoo Shearing Shed, the Chinese Fence, the Euglah Surveyor's Tree and Foggy Dell Woolshed.

Their location is illustrated in Figure 2.5. Potential vulnerability of European cultural sites to fire and fire related activities is listed in Section 4.5.

2.4.3 Wilderness

Three areas in the Park have been gazetted as wilderness areas under the *National Parks and Wildlife Act 1974* and *Wilderness Act 1987*.

Grattai Wilderness Area	4,285 ha
Nandewar Wilderness Area	13,303 ha
Rusden Wilderness Area	12,656 ha

The location and extent of these areas is illustrated on Figure 2.6.

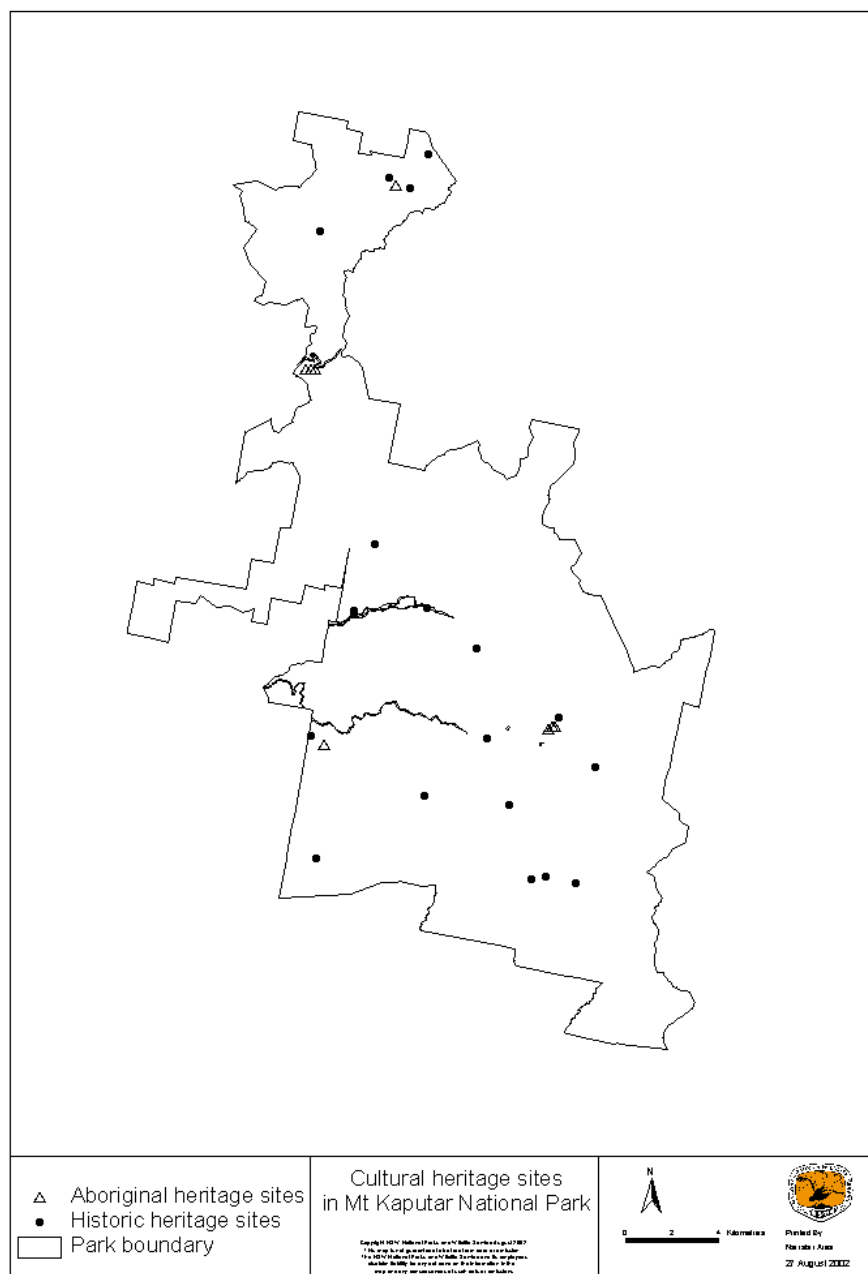


Figure 2.5:

Location of known cultural heritage sites.

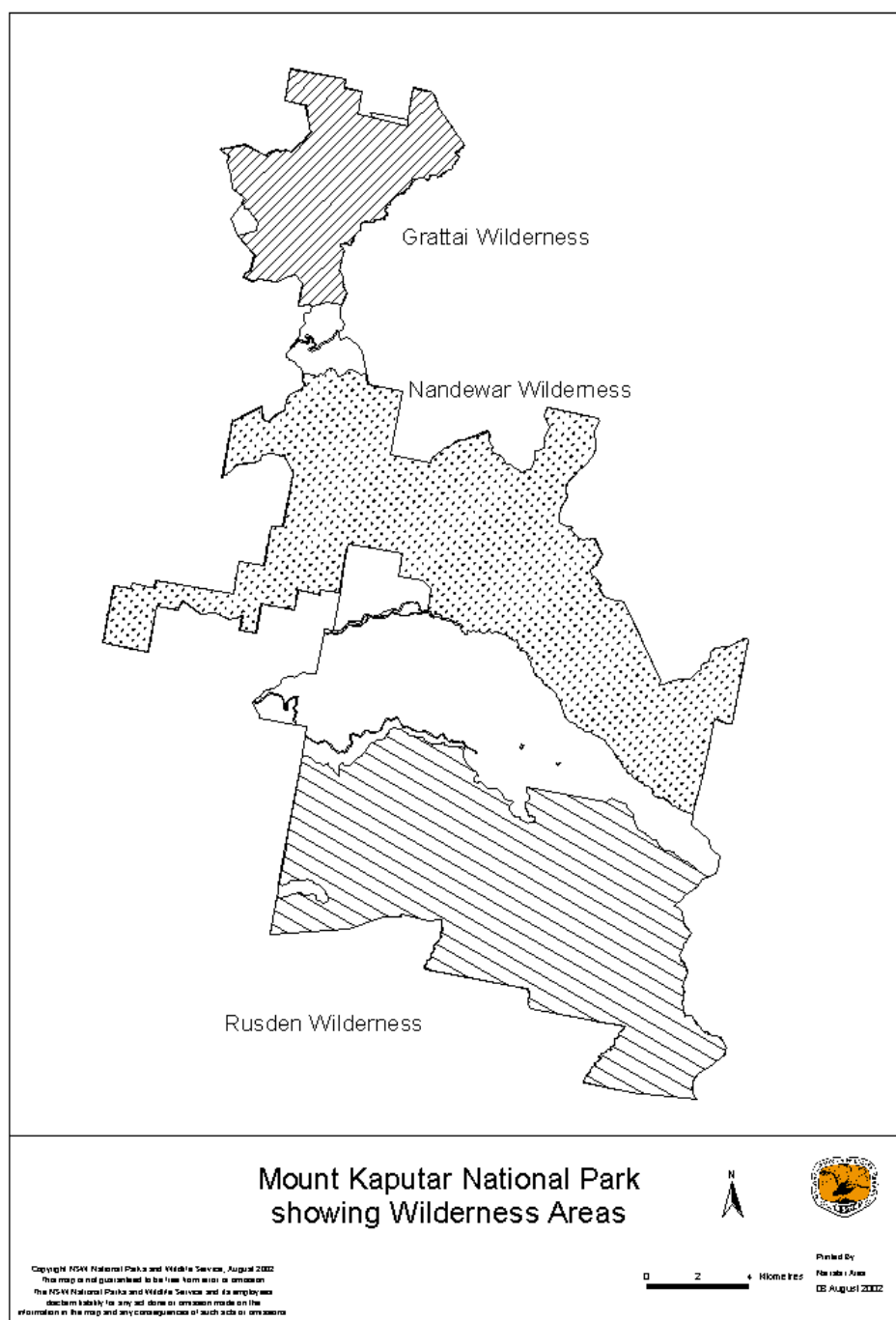


Figure 2.6: Wilderness areas within Mt Kaputar NP.

2.4.3 Recreational use and facilities

The Park receives approximately 45,000 visitors a year, of which about 25% camp in the Park. Most visitation occurs around the facilities on the Kaputar Plateau.

The main camping facilities are located in the central area of the Park, at Dawsons Spring and Bark Hut. A bush camping area is at Scutts Hut. There are also cabins located at Dawsons Spring.

Picnic facilities are located at the main camping areas and at Waa Gorge, Sawn Rocks, Green Camp and Upper Bullawa Creek.

There are 13 walking tracks in the Park. The majority are located on the Kaputar Plateau and adjacent valleys. Two tracks are located in the northern section of the Park.

2.4.4 Alien tenures

Other infrastructure within the Park includes powerline easements, telecommunications tower at Mt Dowe and radio repeater station at The Governor. There are also minor transmission line and telephone line easements at Bullawa Creek/Foggy Dell and Killarney Gap. These are predominantly along the road easement.

3.

BUSHFIRE ENVIRONMENT**3.1 Fire history and frequency****3.2 Wildfires**

Recorded fire history in the Park dates back to 1937. These are shown in Figure 3.2. Prior to 1982, fire records are incomplete, include anecdotal reports and only include large fires. A total of 21 fires have been recorded in the Park, with 14 fires occurring since 1980. Annually, there is a low incidence of fires in the Park, with an average of less than one fire per season. There are years when no fires are recorded, and the maximum recorded in one year since 1980 is four (see Figure 3.1).

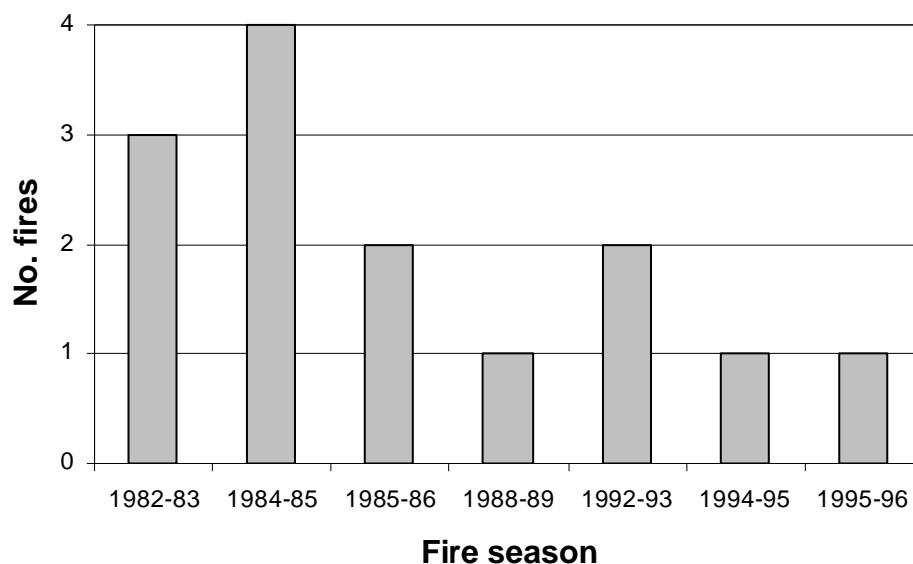


Figure 3.1: Annual incidence of fires

Of the fires recorded, areas burnt are generally minimal. The majority are less than 1000 hectares, 50% less than 100 hectares. Four major fire events were recorded with fires exceeding 10,000 hectares in 1951, 1957, 1974 and 1986 (see Figures 3.3 and 3.4). The interval for large fires that burn at least a third of the Park is about fifteen years. These larger fires were of low to moderate intensity, creeping over the rugged terrain for periods of several weeks before being extinguished by rain. The time of last fire is shown in Figure 3.5.

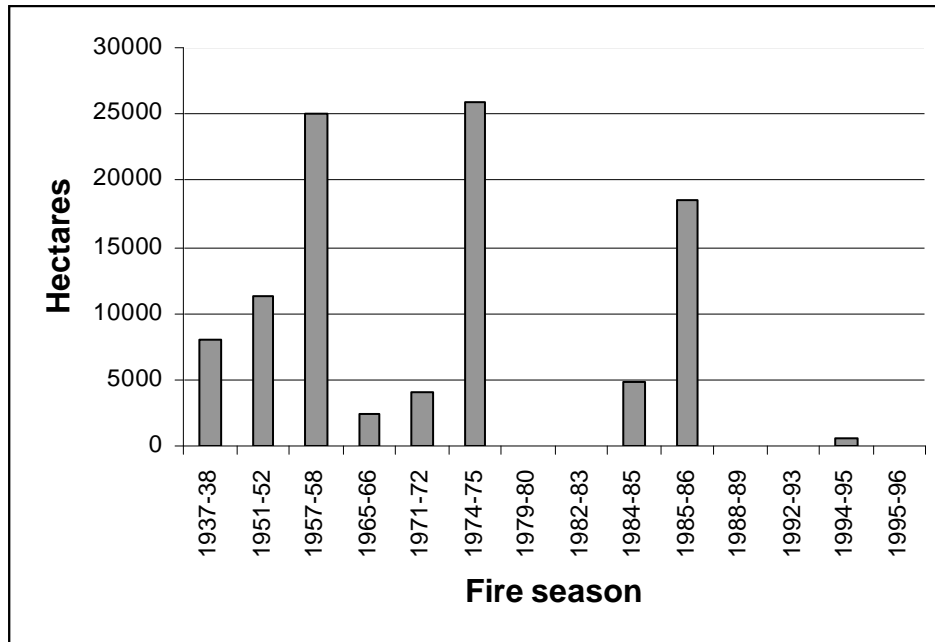


Figure 3.3 Fire seasons showing area burnt by wildfire

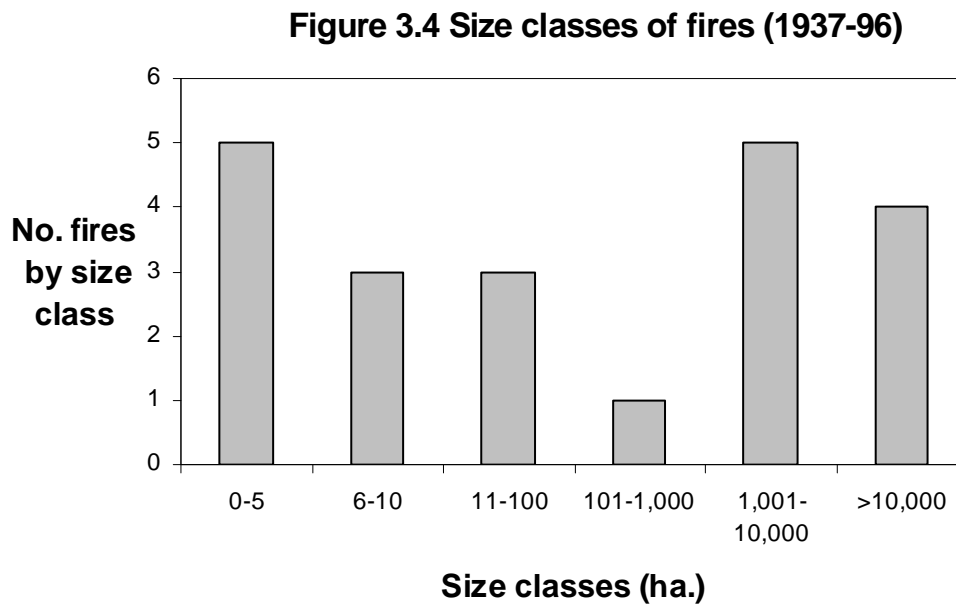


Figure 3.4 Size classes of fires (1937-96)

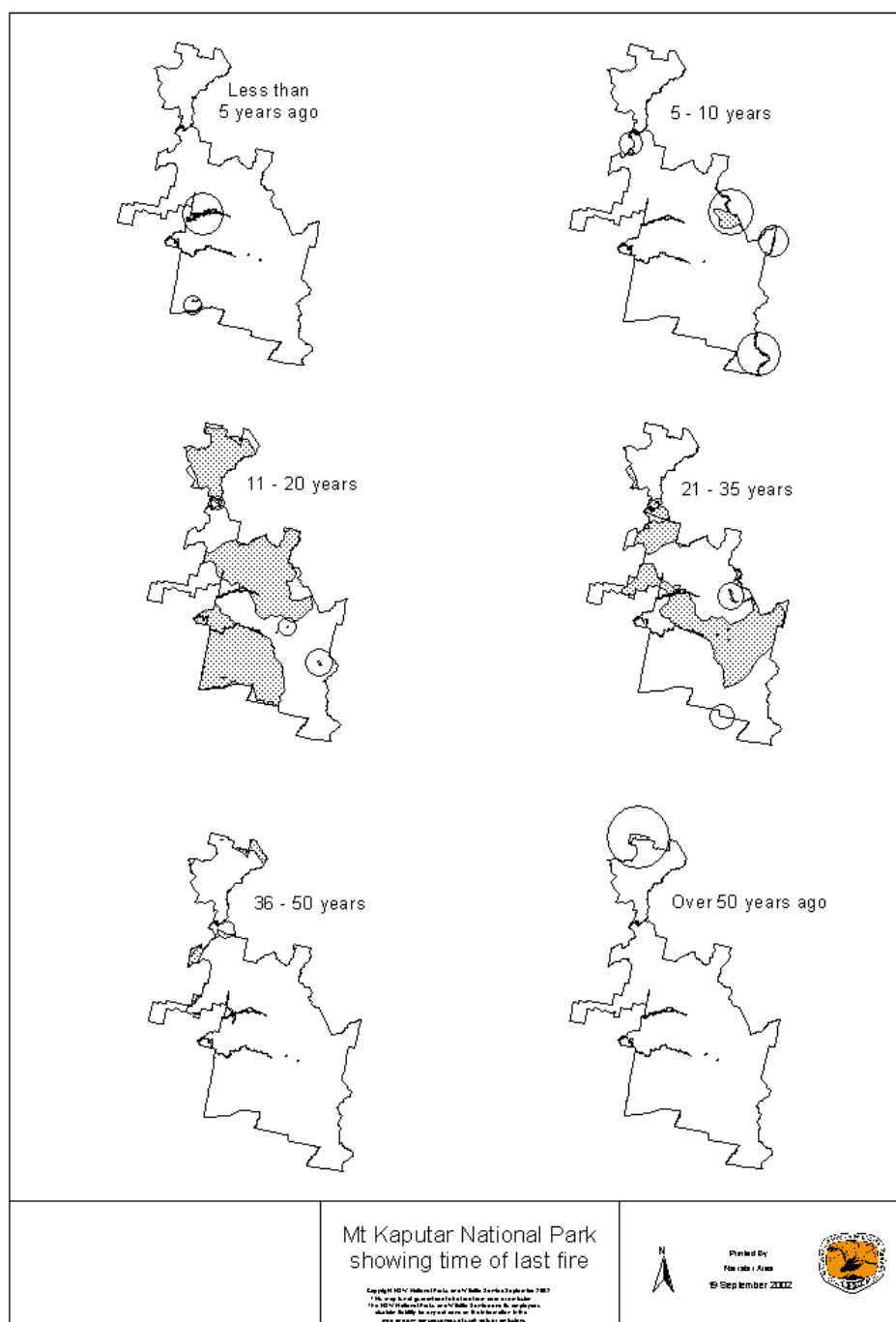


Figure 3.5: Time of last fire.

Records illustrate approx. 72% of the fires in the Park have been the result of lightning strikes. The next highest cause of fires is unknown, but are suspected of also being lightning strikes (see Figure 3.6), therefore increasing lightning ignition to 88%. The peak months for wildfire occurrence is from October to March, with the highest incidences occurring around December and January, just prior to the summer rains (see Figure 3.7)

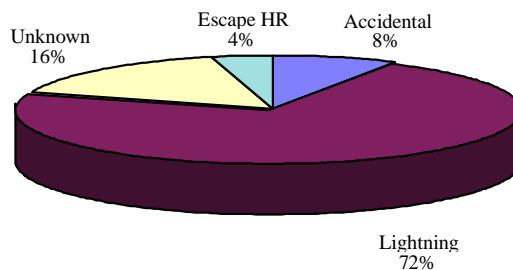


Figure 3.6: Ignition sources of wildfires

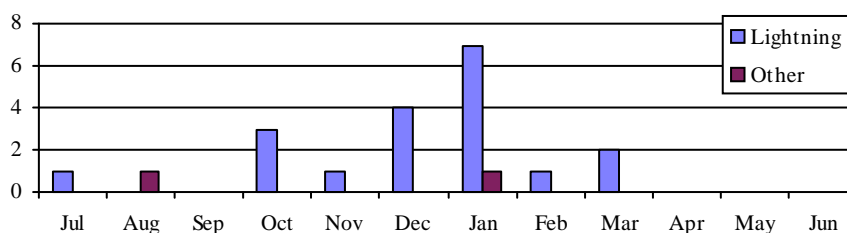


Figure 3.7: Frequency of wildfire ignition

3.2.1 Prescribed burning

Prescribed burning conducted in the Park, has been concentrated along the eastern Park boundaries and around assets and visitor facilities.

Difficulties arise in conducting burns due to the narrow time frame between the potential for wildfires and high fuel moisture. This tends to be in autumn and occasionally into winter. More often than not, the favourable window to safely carry out these operations has been closed by inclement weather.

3.2.2 Fire frequency

Most of the Park has been burnt by wildfire over the last 40 years (see Figures 3.8 and 3.9). The frequency of fires has been low except for the plateau and ridges near Mount Lindsay. The southern area has not experienced a major burn since before 1936. Three major burns have been recorded in the northern and central areas during this period (1957, 1974, 1986). Parts of Grattai have had three and four burns. The central Nandewar Range area has also experienced three and four burns, with five in the east near Boomi Creek. A small area on the eastern boundary has had six fires. This is probably an underestimate of the fires experienced as anecdotal reports tell of regular burning when the area was grazing land. Small fires that have self-extinguished are also regularly observed.

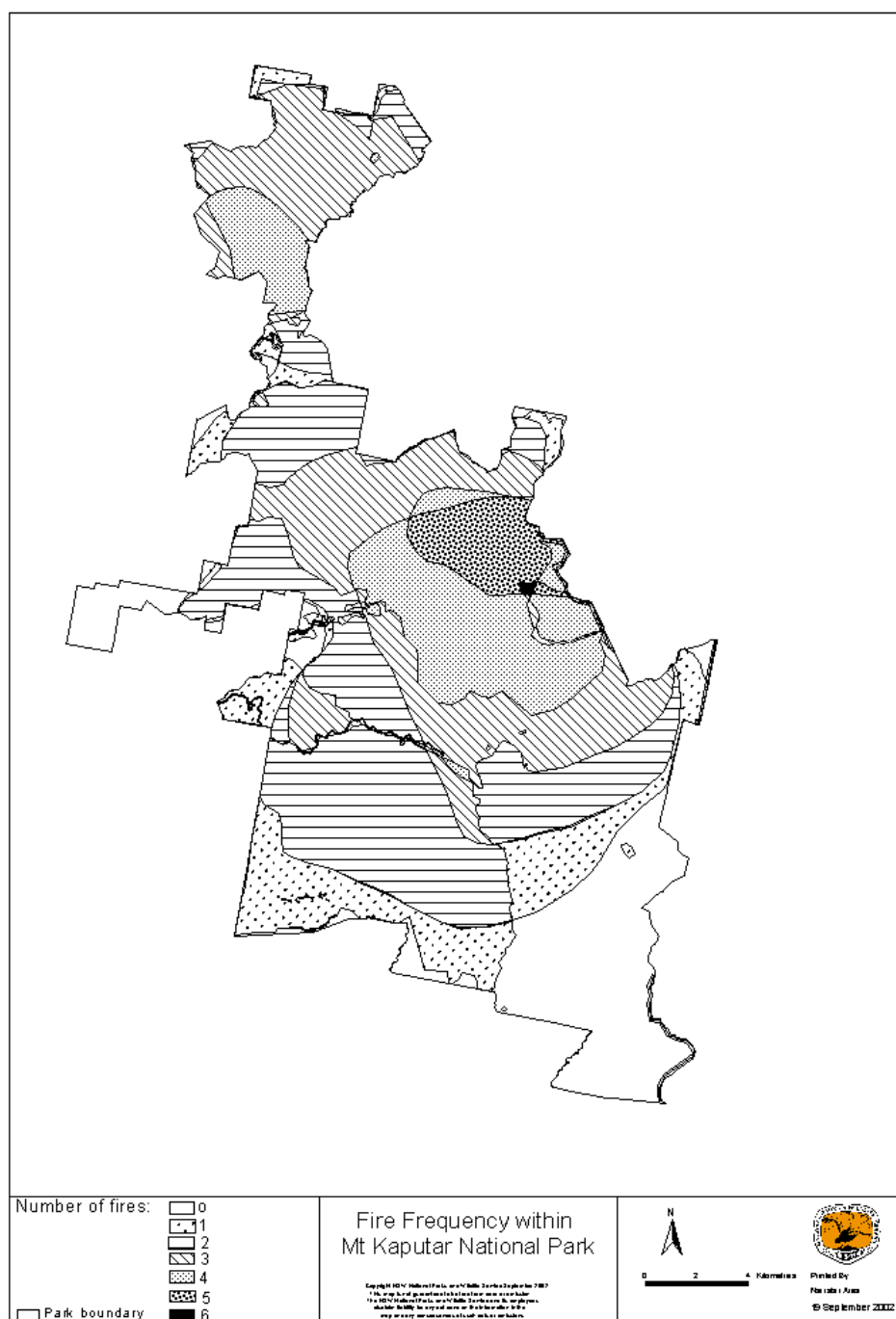


Figure 3.8: Recorded fire frequency in Mt Kaputar National Park since 1937.

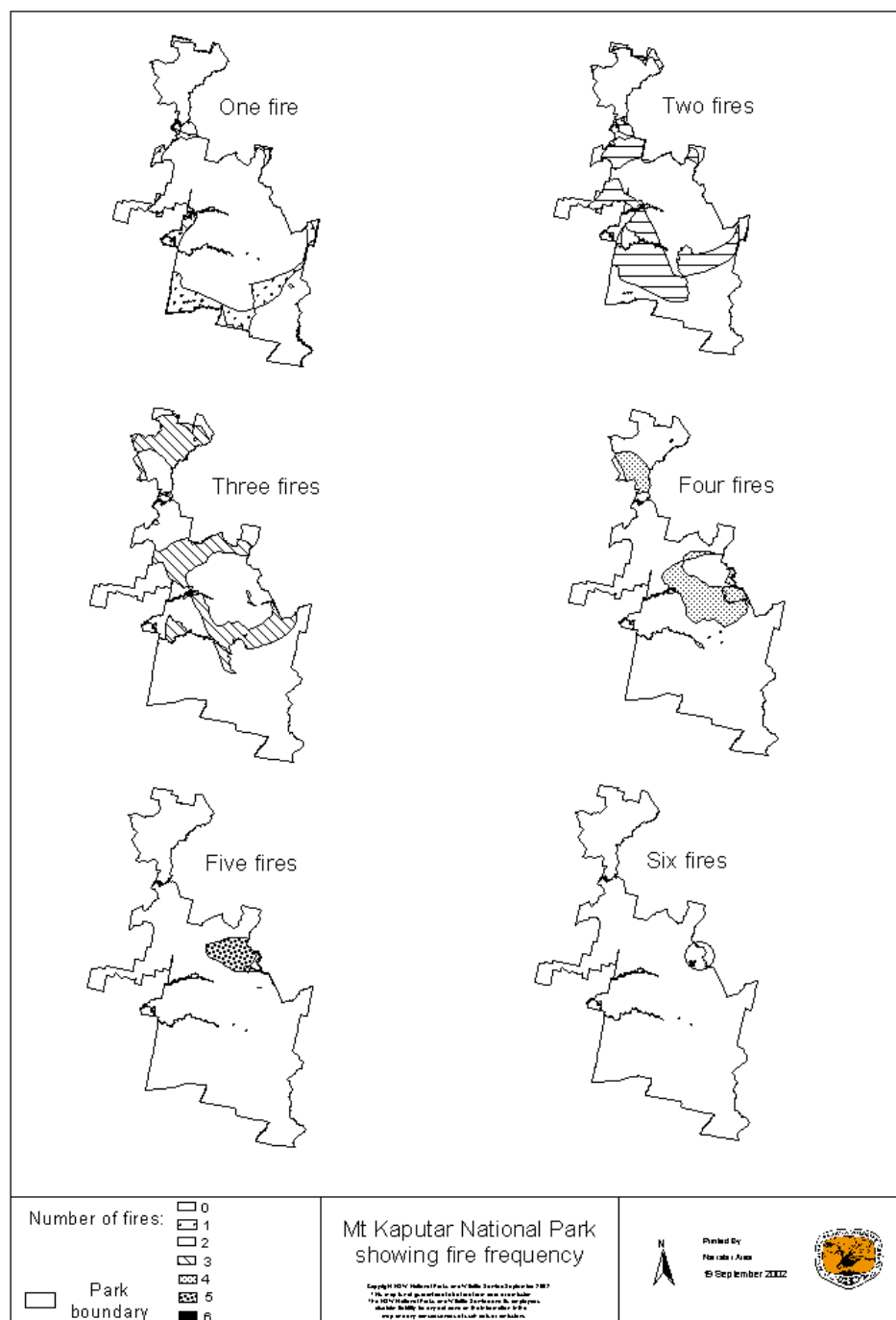


Figure 3.9: Fire frequency.

3.3 Fire weather

3.3.1 Climate

3.3.1.1 Microclimate

The Park has a large range of microclimates which vary according to the factors of elevation and aspect. The range of climatic conditions to date have not been concisely documented. The climatic analysis described below has been based on the weather data for Narrabri, and provides for broad climatic trends.

Ongoing data collection from remote weather stations will assist in painting a clearer picture of micro-climatic patterns in selected areas of the Park.

3.3.1.2 Rainfall

The mean annual rainfall in Narrabri is 671mm with a summer maximum. This is highly variable and is often characterised by prolonged dry periods. The highest mean annual rainfall period is from December to February (see Figure 3.10).

Rainfall records for the Park are inadequate, but the dissected nature of the terrain with a broad elevation range results in a highly variable rainfall pattern. The central plateau receives about 1200mm annually, while the lower elevations on the western side receive about 800mm.

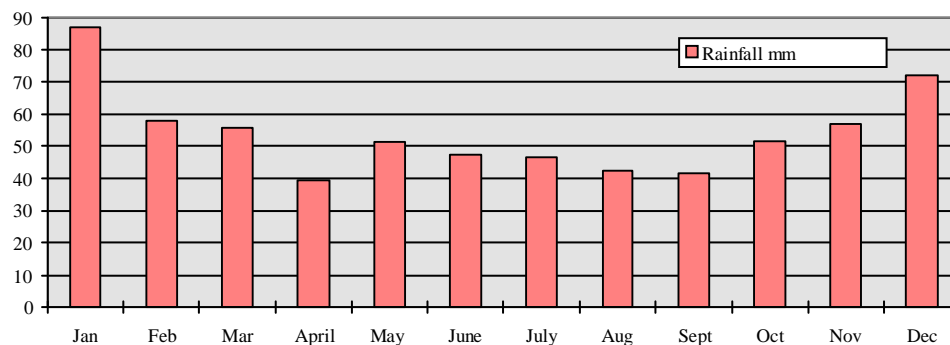


Figure 3.10: Mean monthly rainfall (for Narrabri)

3.3.1.3 Storms

Warm season rainfall is associated with the high pressure systems commencing to track through the central latitudes of the Australian continent. This increases the probability of warm maritime or subtropical air masses from northern and north eastern Australian coasts dominating the weather pattern over the Park. The preceding cool season is characterised by dry continental air masses. The transition from the dry air masses to the maritime air masses is accompanied by higher lightning activity.

The transition period is highly variable, it may occur from October to January. The occurrence of thunder storms and lightning events slightly precede or coincide with the peak rainfall periods as reflected in the number of days in which thunder is noted (see Figure 3.11).

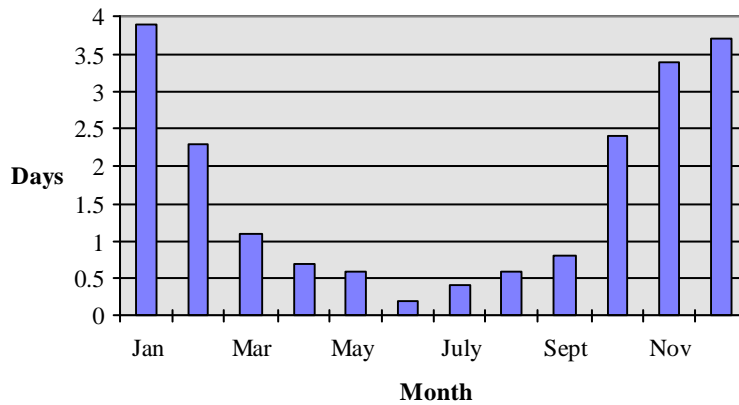


Figure 3.11: Mean incidence of thunderstorms (for Narrabri)

3.3.1.4 Temperature

The mean maximum temperatures are greater than 30°C from November through to March. Over this period, temperatures can be expected in the high 30's and low 40's for extended periods. The diurnal temperature range is approximately 15°C consistently throughout the year. The mean minimum temperatures drop below 10°C from May to September (Figure 3.12). The temperature at the top of Mt Kaputar is generally about 10°C lower due to the higher elevation.

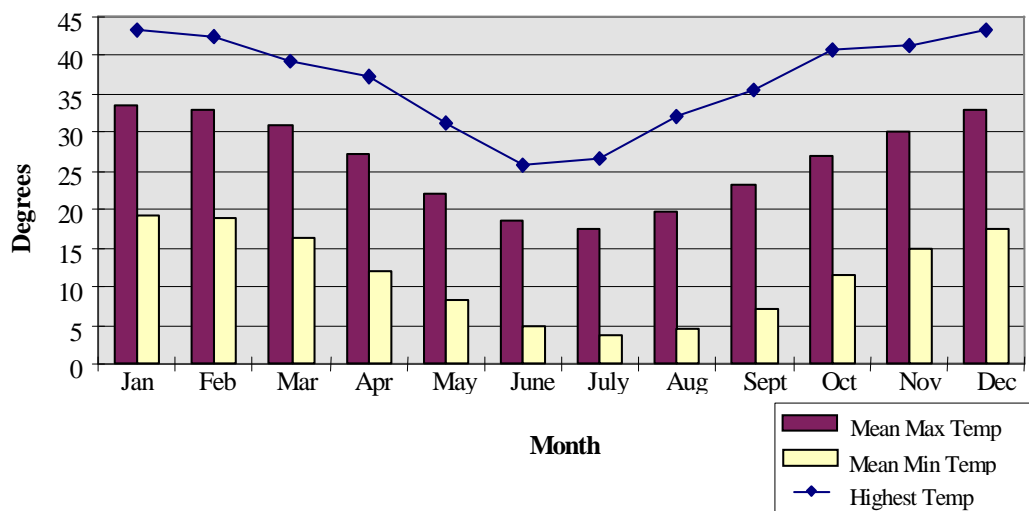


Figure 3.12: Mean temperatures (for Narrabri)

3.3.1.5 Relative Humidity

The relative humidity is at its lowest in December with a mean measurement of 32% (see Figure 3.13).

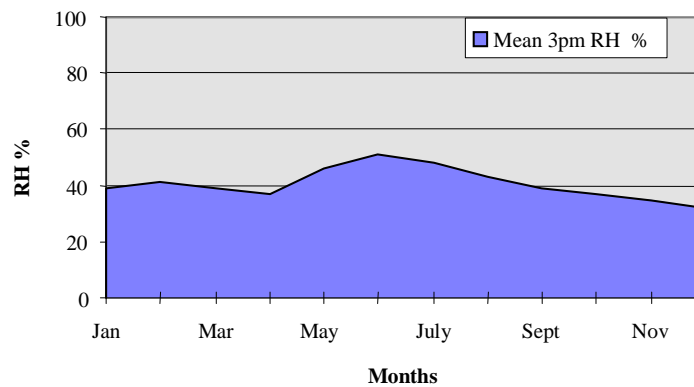


Figure 3.13: Mean monthly relative humidity (for Narrabri, 3pm)

3.3.2 Conditions associated with bush fires

These long term weather trends indicate that the period of highest fire danger occurs in the summer months, when the chance of an ignition from lightning is the greatest, relative humidity at its lowest, temperatures are at the highest and winds are from the north, northwest or northeast. This fire threat is periodically moderated by the summer rainfall maximum.

The period with the highest probability of lightning-caused fires is in late December and January, when there is a higher incidence of troughs and prefrontal troughs moving over the Park. The ignition risk is increased when there is a high prevailing drought index and a low Southern Oscillation Index.

The greatest danger of large fires started from ignition sources other than lightning, is during the dry prefrontal weather systems in the period October to early January. This is when the probability of very dry air masses with gusty north-westerly winds is the greatest. These events are often followed by frontal systems which may bring a dry air mass with gusty south-westerly winds.

A general trend has developed whereby large scale fires which burn significant portions of the Park occur once in a 15 year interval. These events have occurred one or two seasons after very high rainfall periods. It has also been reported that big fires occur after heavy snow falls. The weather conditions that will precede a fire of this nature are associated with an extended dry period producing low soil moisture and low fuel moisture.

3.3.3 Conditions suitable for prescribed burns

The most favourable periods for prescribed burning in the Park occur when there is:

- dry surface fuels and low day-time fuel moisture;
- a high level of moisture recovery in fine fuels at night; and
- a low probability of dry north-westerly winds.

The main periods of the year where these conditions may occur is in early to mid-autumn.

Prescribed burns may be lit outside these periods where there are secure boundaries, and the area can be completely burnt before the passage of very high to extreme fire weather.

The primary limiting climatic factor for burning in late autumn and winter is the high probability of rain. The prevailing temperatures and humidity prevent drying of surface fuels, particularly on southerly aspects.

The window of opportunity for prescribed burning is narrowed further when considering impacts on Park visitors. Invariably the most suitable conditions for prescribed burning will present themselves around Easter – conflicting with one of the highest visitation periods in the Park. Careful planning may allow burning immediately prior to Easter (if appropriate) in areas distant to main visitor nodes and where smoke levels will dissipate quickly.

Other periods that may be suitable for prescribed burning are those immediately preceding rain depressions and rain bearing troughs during late November to March. The weather systems may completely extinguish any burn, with minimal risk of any re-ignition. Implementing burns preceding these weather systems requires careful monitoring to ensure that the burning opportunity is utilised and that there is a forecast probability of rains that will extinguish the burn.

3.3.4 Micro-climatic influences

Topographic impacts on prevailing weather patterns can produce a localised effect on fire behaviour and, consequently, fire suppression strategies.

Valleys tend to funnel the wind, resulting in ground winds which can vary up to 90 degrees from the prevailing winds. Winds passing over ridges and the main range produce wind rotors on the lee side, resulting in unpredictable air movements around sections of the Park.

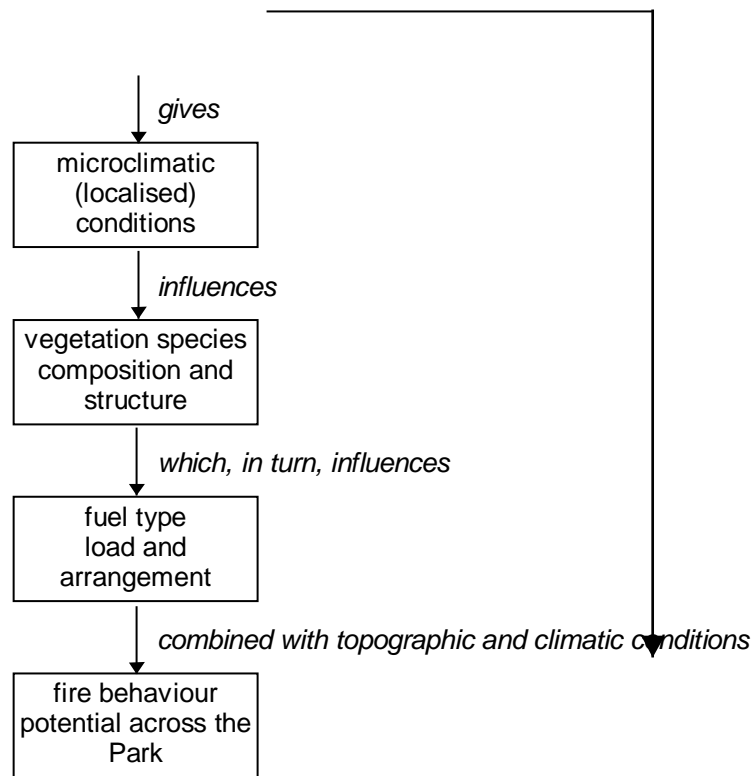
The high relief and steep terrain can produce strong anabatic (warm air rising) and catabatic (cold air draining) wind effects.

The steep terrain also results in a high local variation in rainfall patterns. A higher rainfall band extends along the north eastern boundary of the Park, west for approximately 5 kilometres (RFS, *pers. comm.*). The higher elevations of the Park on the southern and eastern aspect receive higher rainfall than the western side of the Park.

3.4 Fire behaviour potential

The fire behaviour potential for any area is determined by a combination of climate, terrain characteristics and vegetation/fuel types, as illustrated in the following flow diagram:

combination of topographic and climatic conditions
--



3.4.1 Terrain classes

Delineating terrain classes according to slope and aspect is an essential step in determining potential fire behaviour. Aspect affects the moisture content of fuel due to exposure to sunlight and drying winds. Consequently, more fuel will be available for fire events on dry aspects. Slope affects the intensity of a fire, with rate of spread and flame height increasing with the gradient.

The terrain in the Park has been broken into four terrain classes, which are listed in Table 3.1.

Table 3.1: Terrain classes

Terrain Class	Aspect	Slope	% area
Dry Aspects (steep slopes)	SW 225° - 45° NE	> 10°	34.9
Dry Aspects (gradual slopes)	SW 225° - 45° NE	1 - 10°	18.7
Sheltered Aspects (steep slopes)	NE 45° - 225° SW	> 10°	28.1
Sheltered Aspects (gradual slopes)	NE 45° - 225° SW	1 - 10°	18.3

The coverage of the dry aspects includes the south westerly aspects, as well as the northerly aspects. This takes into account the lower humidity of south westerly winds in this region, and the drying affect of the sun on northern aspects.

There are four main areas of dry aspects with steep slopes. These are located in the northern section of the Park, upper Spring Creek and Paleroo Creek catchments and the northern slopes of the Central Plateau. The southern end of the Park is predominated by sheltered aspects. Where dry aspects adjoin the eastern boundary, sheltered aspects occur immediately to the east.

3.4.2 Fuel

The vegetation communities and their structure vary considerably over the Park. Community composition, structure and microclimatic conditions influence the bushfire potential across the Park.

Vegetation types in the Park have been classified into broad fuel classes according to the method used for south-eastern New South Wales, and are listed in Table 3.2. The classes provide an indication of the continuity, structure, quantity of fuels and the frequency of fuel availability during the average bushfire season (Dovey, 1994).

Table 3.2: Fuel classes (based on Dovey, 1994)

Fuel class No.	Fuel classes	Description	Broad vegetation types
1	Dry - high Dry forest type - high available fuels	Vegetation types producing fuels which are continuous, of relatively high quantity and dryness and available to bushfires during normal seasons	• Dry open forests
2	Dry - medium Dry forest type - medium available fuels	Vegetation types producing lower amounts of fuel	• Dry woodlands
3	Dry - low Dry forest type - low available fuels	Vegetation types producing discontinuous fuels due to topography, or produce compact ground fuels	• Sub-alpine forests and woodlands Sub-alpine mallee and heathlands Moist tall open forests Open forests and woodlands Acacia shrublands Shrublands
4	Minimal fuels	Vegetation types producing little or no available fuel during the average bushfire season	• Dry rainforests Rock outcrops
5	Grass	Areas cleared of natural vegetation.	• Cleared land

3.4.3 Analysis of likely fire behaviour

Dry air is associated with the passage of the leading edge of low pressure systems and continental high pressure systems and results in fast curing of fuels. This, combined with the steep slopes of much of the Park and the friable soils on the valley sides and ridges, results in a poor soil and fuel moisture holding capacity.

Bushfire behaviour potential combines fuel classes described in Table 3.2 with slope and aspect. Steep slopes with a north to north-westerly aspect have a higher potential for extreme fire behaviour than areas with a southerly aspect.

The areas with the highest potential fire behaviour are concentrated on the northern slopes of the Central Plateau, Spring Creek valley and Bobbiwaa Creek valley. Box and iron bark woodland on moderate to steep slopes with a northerly aspect can be expected to have moderate to high loadings of dry fuels available during a normal fire season. Under appropriate conditions, these areas can be expected to carry a relatively intense fire at a high rate of spread.

Whilst other areas have high potential fire behaviour, they are mostly isolated and remote which reduces their potential threat. The majority of the eastern boundary has low to moderate potential fire behaviour.

The definition of low fire potential is based on climatic conditions of a normal season. Fuel Class 3 consists of moist forest and subalpine woodlands with a southern aspect and shallow slope. However, in a dry season the fuel moisture of these areas can fall to levels that will

carry wildfires of high intensity even on the southern slopes.

3.5 Damage potential

3.5.1 Historical damage

There are few records available for historical fire damage in and around Mount Kaputar National Park. However, since 1937 there have been five large fire events which have crossed boundaries between the Park and neighbouring properties.

3.5.2 Economic

The immediate economic impact of a fire is associated with the loss of structures within the Park, and potential impacts on stock and/or stock feed on neighbouring properties. Cropping does not occur adjacent to the Park boundary, however the potential can exist in a severe season for continuous fuels to carry fire into crops.

The *Mansfield* rural-residential settlement is located approximately 5 km northeast of the Park, in continuous timbered country between the Park and Berrygill State Forest. The potential exists for fire starting on-Park to carry to this area.

The Park also adjoins large areas of timbered country. The fire behaviour potential for these areas is moderate, however one of the main species, cypress pine (*Callitris columellaris*), is fire sensitive and killed by high fire intensities. The fire history for this area indicates infrequent fires, resulting from low fuel loads and a low fire potential.

Tourism is an important component of the Narrabri economy. The scenic amenity of the Park is an important component of this industry. Large fires in the Park, particularly around the Dawsons Spring area and along the Mt Kaputar road could result in a short term reduction in visitation, and associated revenue.

Other costs associated with fire events include those incurred by the local community and agencies involved in fire suppression activities. These costs come by way of maintenance and replacement of equipment, additional resources, stores and consumables, resource and infrastructure support.

3.5.3 Natural heritage

The Park supports a broad range of vegetation communities, constituting a high biodiversity value. Effects of fire on biodiversity are discussed in Section 4.4. The Park also supports a number of known threatened species. Knowledge of the impact of fire on these species is limited within the Park environment.

The assessment of threat to these species is based on both the habitat preference and the response mechanism of the particular species. For example, the Coiled Greenhood (*Pterostylis longicurva*) is an orchid which occurs in the Horton Valley. The valley has very steep slopes on south-west aspects with low fuel moisture. Such an area may be expected to carry intense fires at a high rate of spread, and consequently exhibit a high fire potential. However, *P. longicurva* is a perennial herb which shoots annually from rhizomes. The fire may destroy the plant above ground but it will re-shoot the following year. Therefore the fire threat can be described as *low*.

Many of the known threatened flora species in the Park occur in habitats where there is low threat from fire. These include damp areas or subalpine areas with a low incidence of fire. However, others occur in areas where the threat is greater. Habitat preferences and fire response mechanisms are described in Table 2.2, and general fire threats are described in Table 3.3.

Table 3.3: Fire threat to Threatened Species

Species	Fire threat
<i>Boronia rubiginosa</i>	Moderate
<i>Cadellia pentastylis</i>	High
<i>Discaria pubescens</i>	Low
<i>Diuris aequalis</i>	Low
<i>Eucalyptus nandewarica</i>	Low - moderate
<i>Eucalyptus rubida</i> ssp. <i>barbidgerorum</i>	Low
<i>Euphrasia orthocheila</i> ssp. <i>orthocheila</i>	Low
<i>Gonocarpus longifolius</i>	Moderate - high
<i>Haloragis exalata</i> ssp. <i>exalata</i>	Low
<i>Macrozamia stenomera</i>	Low
<i>Muehlenbeckia costata</i>	Low
<i>Phebalium viridiflorum</i>	Low
<i>Prostanthera cruciflora</i>	Low
<i>Pterostylis longicurva</i>	Low

The potential impacts of fire on fauna in Mount Kaputar National Park are the short or medium term removal of habitat and food availability. The impact that fire has on the long term viability of species in a particular area is determined more by the changes in habitat and potential food sources than by the short term potential death of individuals in a fire event. It has been previously held that low intensity fires are not a major cause of mortality in animals (Catling, 1991). The potential fire threat to fauna is listed in Table 2.4.

3.5.4 Cultural heritage

There are a number of Aboriginal sites and historic heritage sites, found across the Park. The potential damage to each type of site is outlined in Table 3.4.

Table 3.4: Damage potential to cultural heritage sites.

Site Type	Wildfire	Low Intensity Prescribed Burn	Slashing/Mowing	Dozer Lines
Open camp site	* Post fire erosion may cause artefact movement and damage to archaeological deposits	* Probably low impact except if damaged by vehicle traffic	* Moderate to high impact if driven over	* High impact
Scarred tree	* Depending on intensity may cause tree death, erode tree stability or damage scar * Fire may lead to decline in tree health and promote rot * May destroy dead trees	* Low impact if site is protected from fire using buffer * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle	* As above
Rock engraving	* High intensity fire may damage rock and engraving * Post-fire soil erosion may cause soil build up and lead to chemical weathering.	* As above	* As above	* As above
Axe grinding groove	* As above	* As above	* As above	* As above
Shelter with deposit	* Post fire erosion may cause artefact movement and damage to archaeological deposits	* Low impact	* As above	* As above
Bora Ring	* May remove protective vegetation and promote post-fire soil erosion.	* Low impact, unless driven over	* Potentially high impact if driven over * May not be appropriate activity in area	* High impact * May not be appropriate activity in area
Burial area	* May promote post-fire erosion weakening soil structure around grave site	* May not be appropriate activity in area * High impact if potential to damage any grave features or soil structure	* As above * May not be appropriate activity in area	* High impact * May not be appropriate activity in area
Dwelling/structure (including boardwalks)	* Depending on intensity may destroy or damage.	* Low/no impact if protected from fire by clearing * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle (unlikely)	* Potential impact if contacted by plant (unlikely)
Fence	* Depending on intensity may destroy or damage.	* Low/no impact if protected from fire by clearing * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle	* Potential impact if contacted by plant
Trough	* Depending on intensity may destroy or damage.	* Low/no impact if protected from fire by clearing * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle	* Potential impact if contacted by plant
Logging area	* Depending on intensity may destroy or damage.	* Low/no impact if protected from fire by clearing * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle	* Potential impact if contacted by plant
Surveyor's tree	* Depending on intensity may cause tree death, erode tree stability or damage scar * Fire may lead to decline in tree health and promote rot * May destroy dead trees	* Low impact if site is protected from fire using buffer * Otherwise, as per wildfire	* Potential impact if contacted by slasher or vehicle	* As above

4. FIRE MANAGEMENT

4.1 Fire management units

4.1.1 Overview

In order to develop appropriate fire management planning for Mount Kaputar National Park, it is necessary to divide the reserve area into smaller manageable units and zones, which can be easily classified and identified. This is most effective when areas with similar characteristics warrant similar planning.

Any additions to the Park in the duration of this Plan will be managed in accordance with the principles included in the Plan.

4.1.2 Bush Fire Management Zones

Four major zone types have been identified within the Park:

- Asset Protection Zones (Figure 4.1)
- Strategic Fire Management Zones (Figure 4.2)
- Special Area Management Zones (Figure 4.3)
- Heritage Area Management Zones (Figure 4.4).

Asset Protection Zones (APZs)

These zones are generally point locations centred around a camping area, visitor day-use facility, or Park utility. Most are only a few hectares in size and require slashing, selective shrub removal and/or the maintenance of radiation zones around their perimeters for protection. Nine APZs have been identified. These are described in Appendix 2.

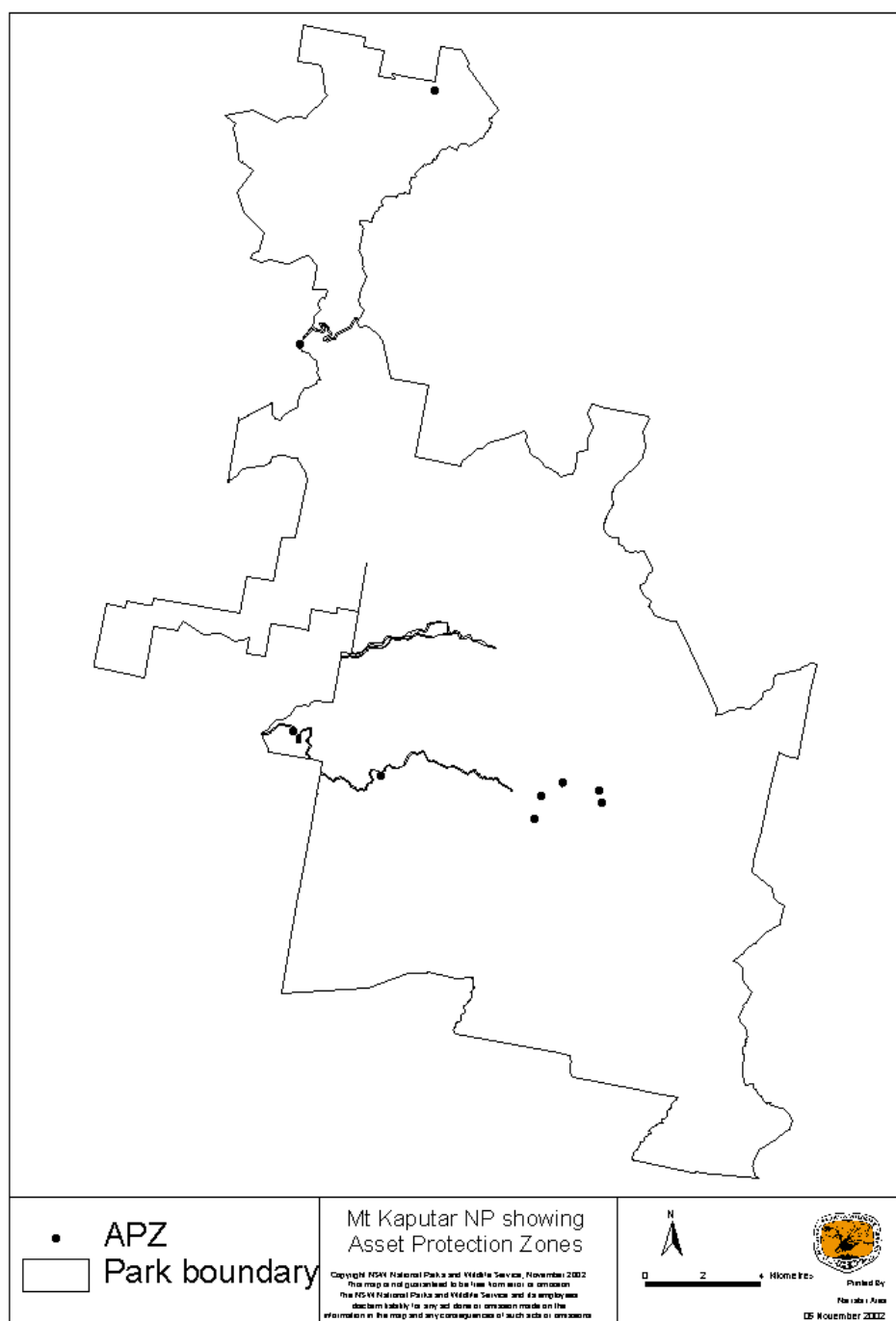


Figure 4.1: Asset Protection Zones within Mt Kaputar National Park.

Strategic Fire Management Zones (SFMZs)

These zones are based off existing fire trails or boundary clearings where a combination of the trail, clearing and adjacent hazard reduced area can significantly increase efforts to contain a fire before it enters or exits the Park, or continues to affect a significant portion of the Park. Twelve SFMZs have been identified. These are shown in Figure 4.2.

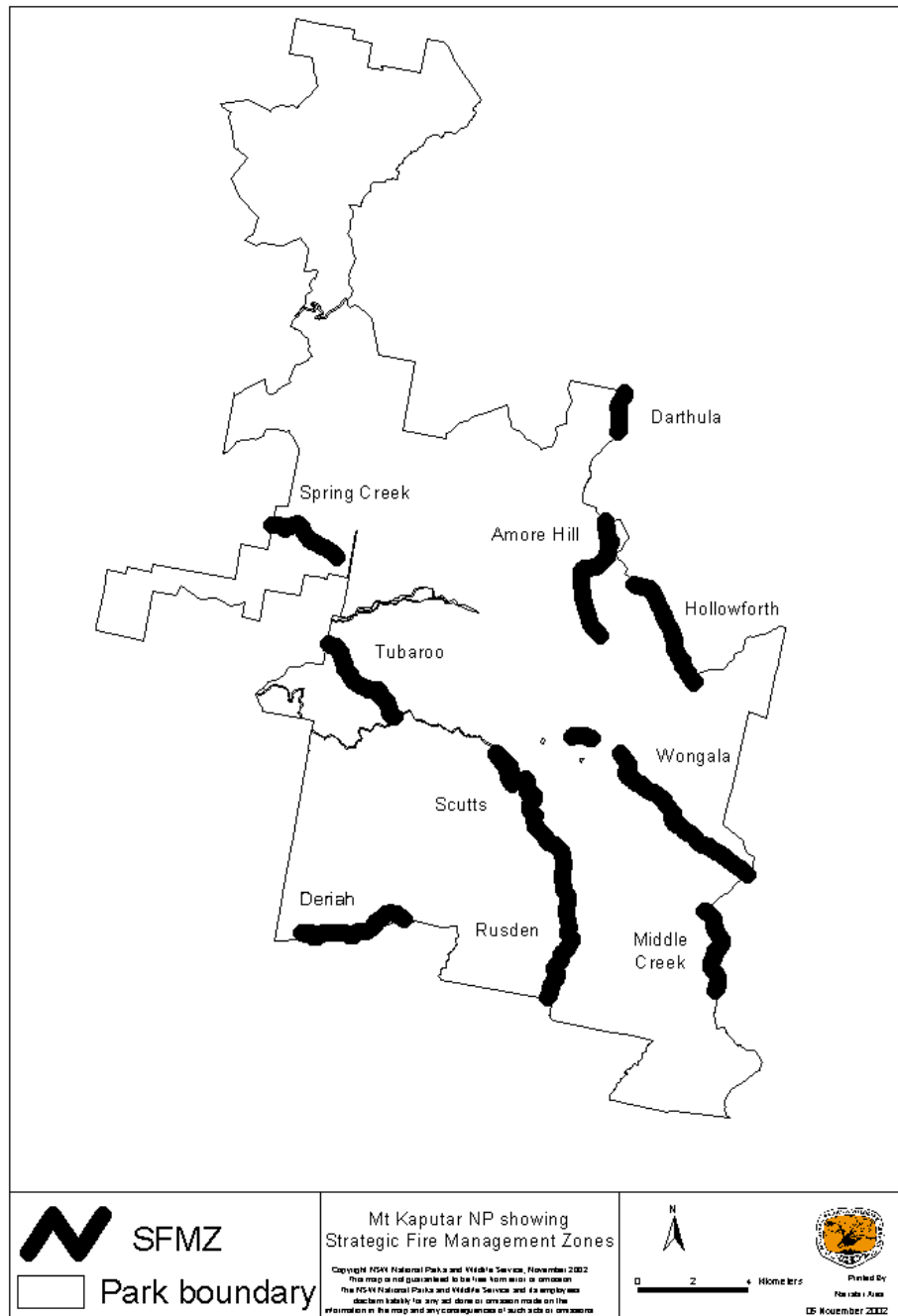


Figure 4.2: Strategic Fire Management Zones within Mt Kaputar National Park.

Special Area Management Zones (SAMZs)

These zones are generally point locations centred around Aboriginal and European cultural heritage sites. Most are only a few hectares in size and require slashing, selective shrub

removal and/or the maintenance of radiation zones around their perimeters for protection. Thirty SAMZs have been identified. These are shown in Figure 4.3.

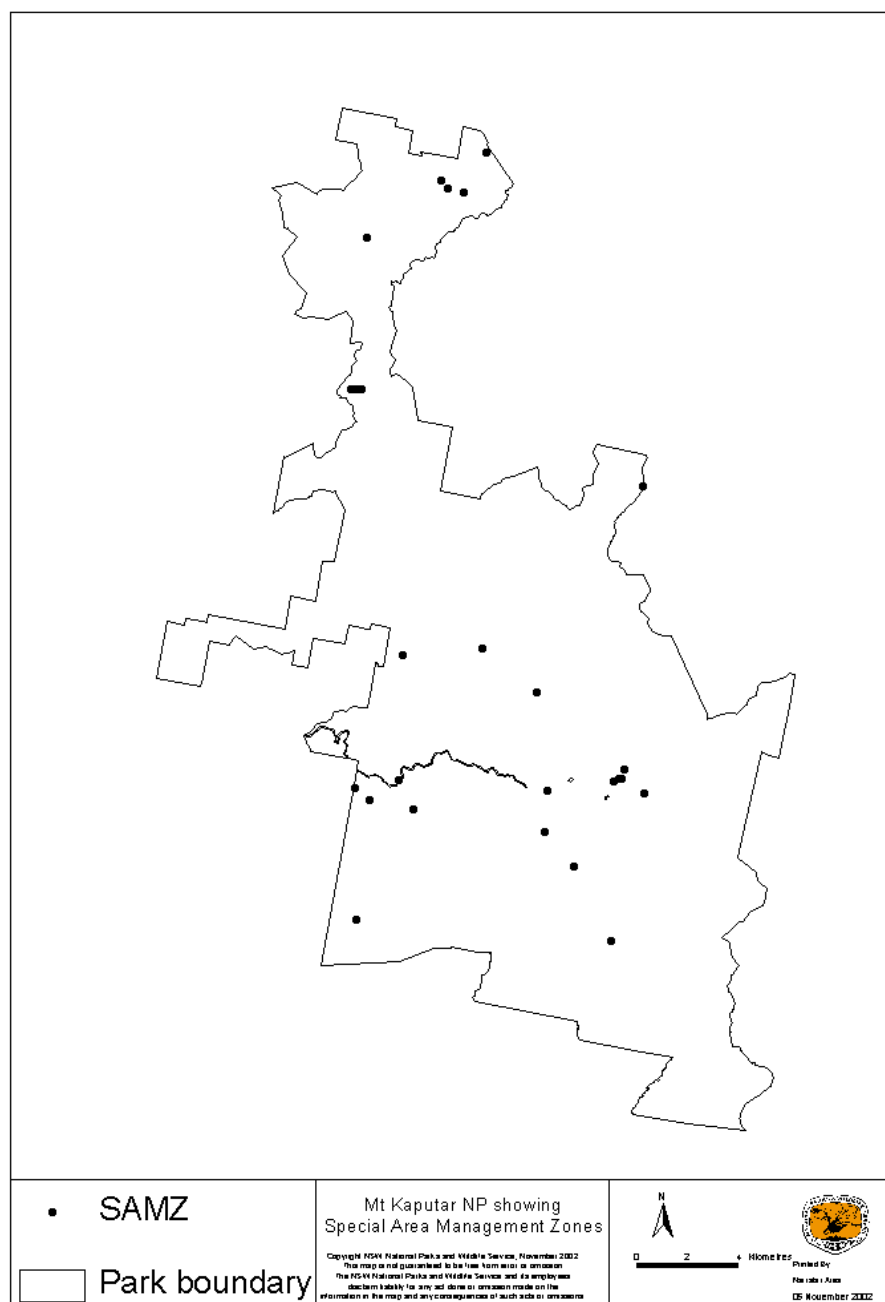


Figure 4.3: Special Area Management Zones within Mt Kaputar National Park.

Heritage Area Management Zones (HAMZs)

Heritage Area Management Zones make up the underlying layer of zoning (effectively apportioned to 100% of the Park). Twenty one HAMZs have been identified. Vegetation and fire history for each of the HAMZs is shown in Figures 4.5 – 4.25. The boundaries for HAMZs are based on one or a combination of the following parameters:

- Topography
- Potential operational burn units and containment areas
- Vegetation structural classes / communities

- Fire history (year last burnt and frequency)
- Tracks and trails.
- Detailed zone information is in Appendix 1.
- Fire Management Zone Profiles are in Appendix 2.

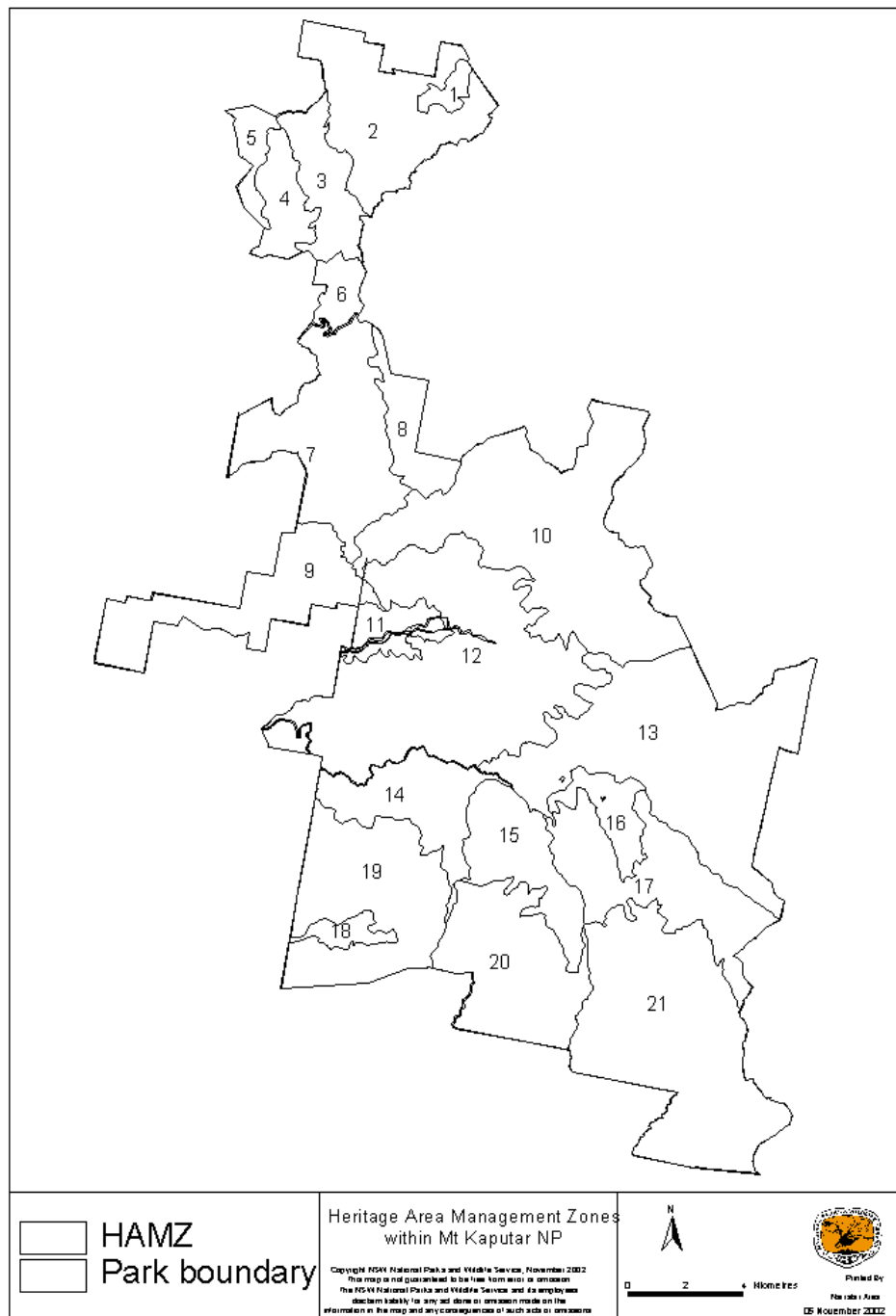


Figure 4.4: Heritage Area Management Zones.

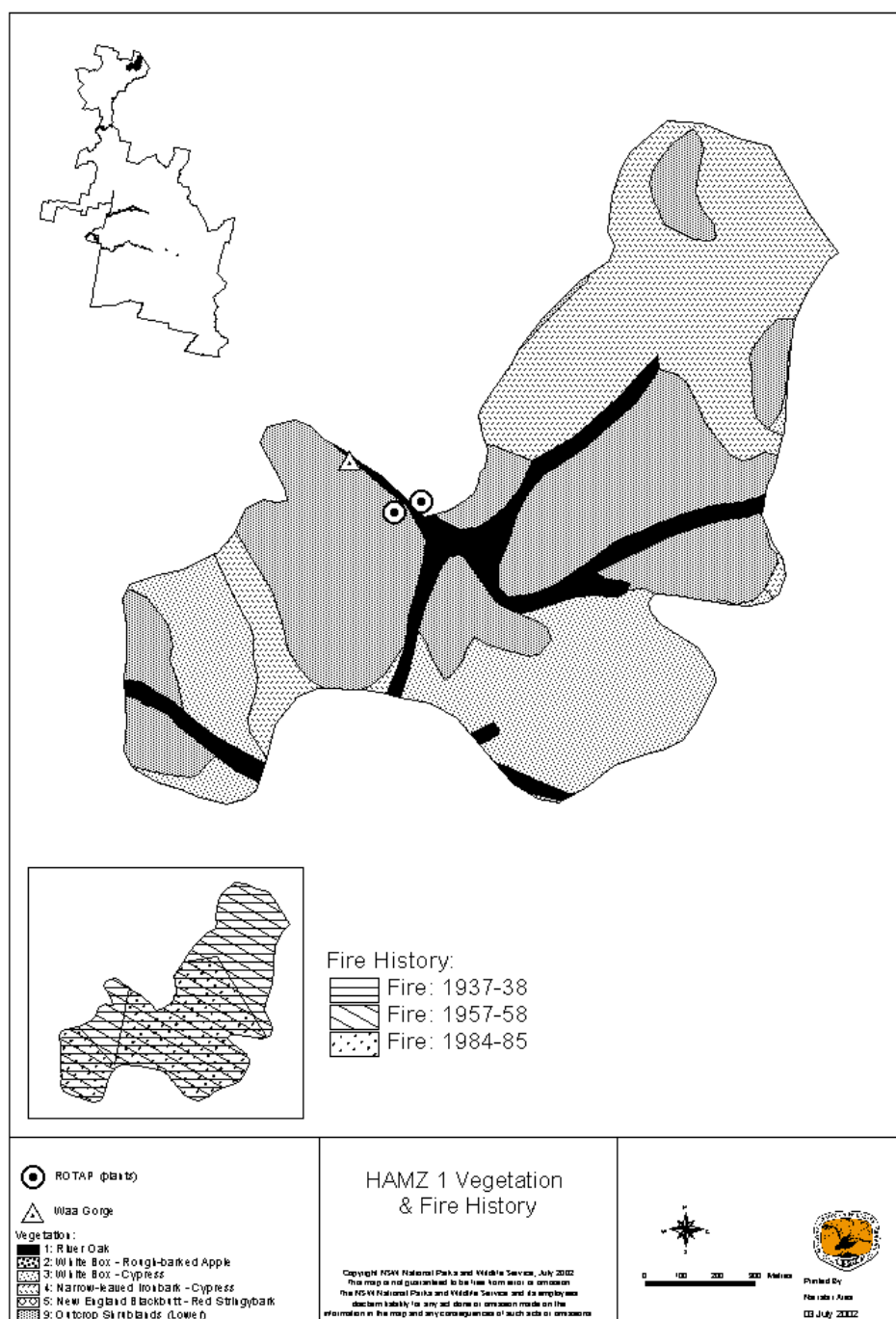


Figure 4.5: HAMZ 1 Vegetation and Fire History

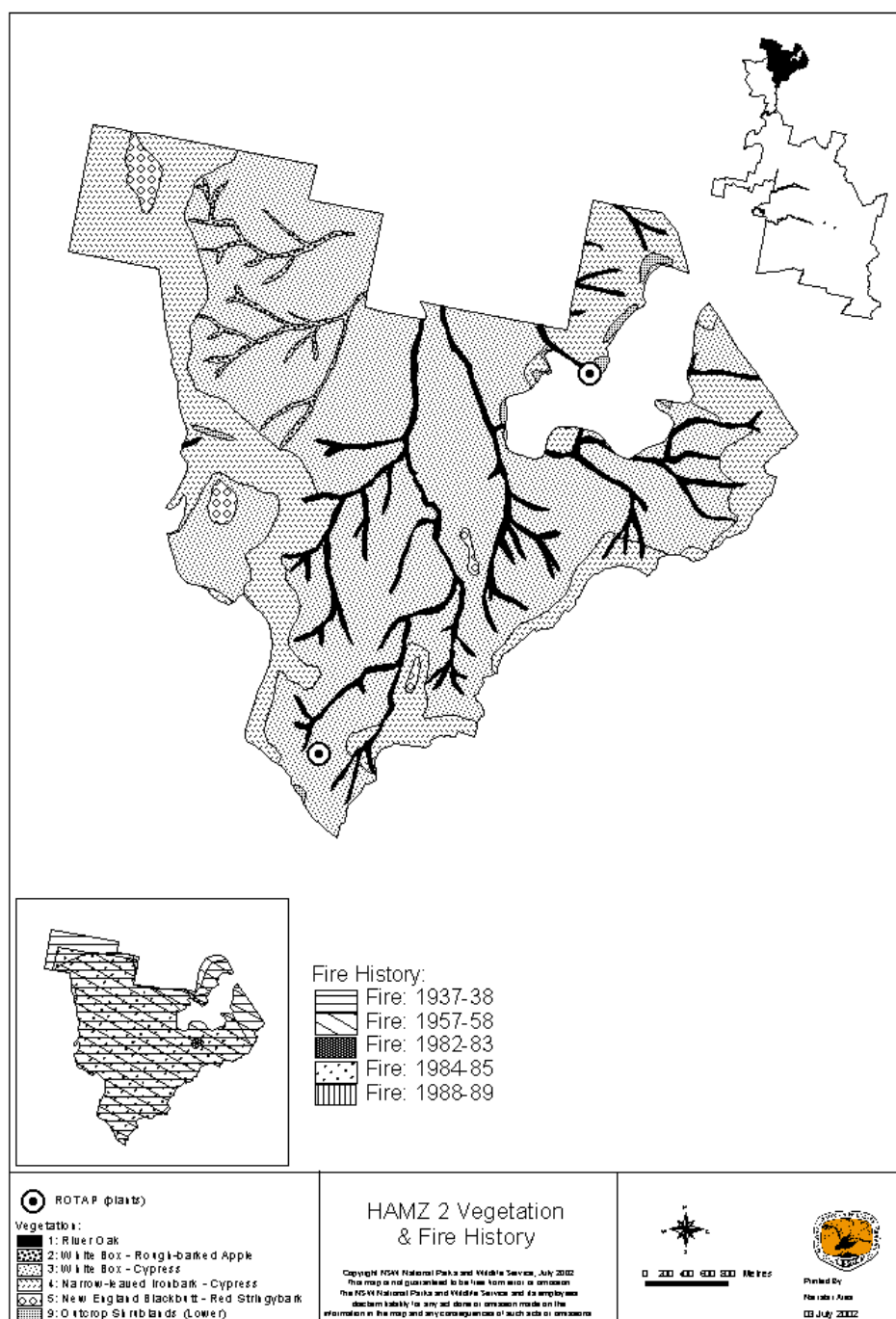


Figure 4.6: HAMZ 2 Vegetation and Fire History

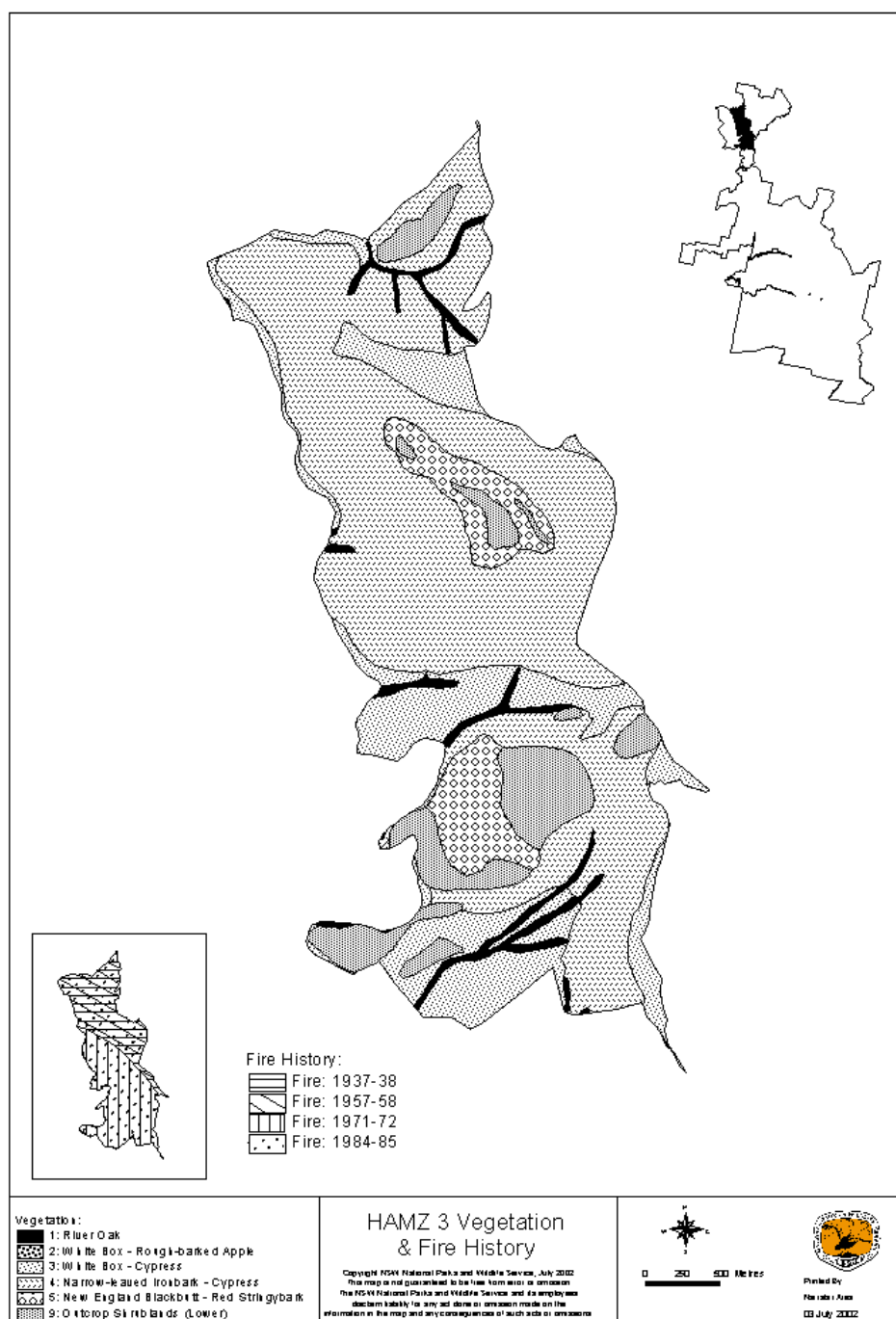


Figure 4.7: HAMZ 3 Vegetation and Fire History

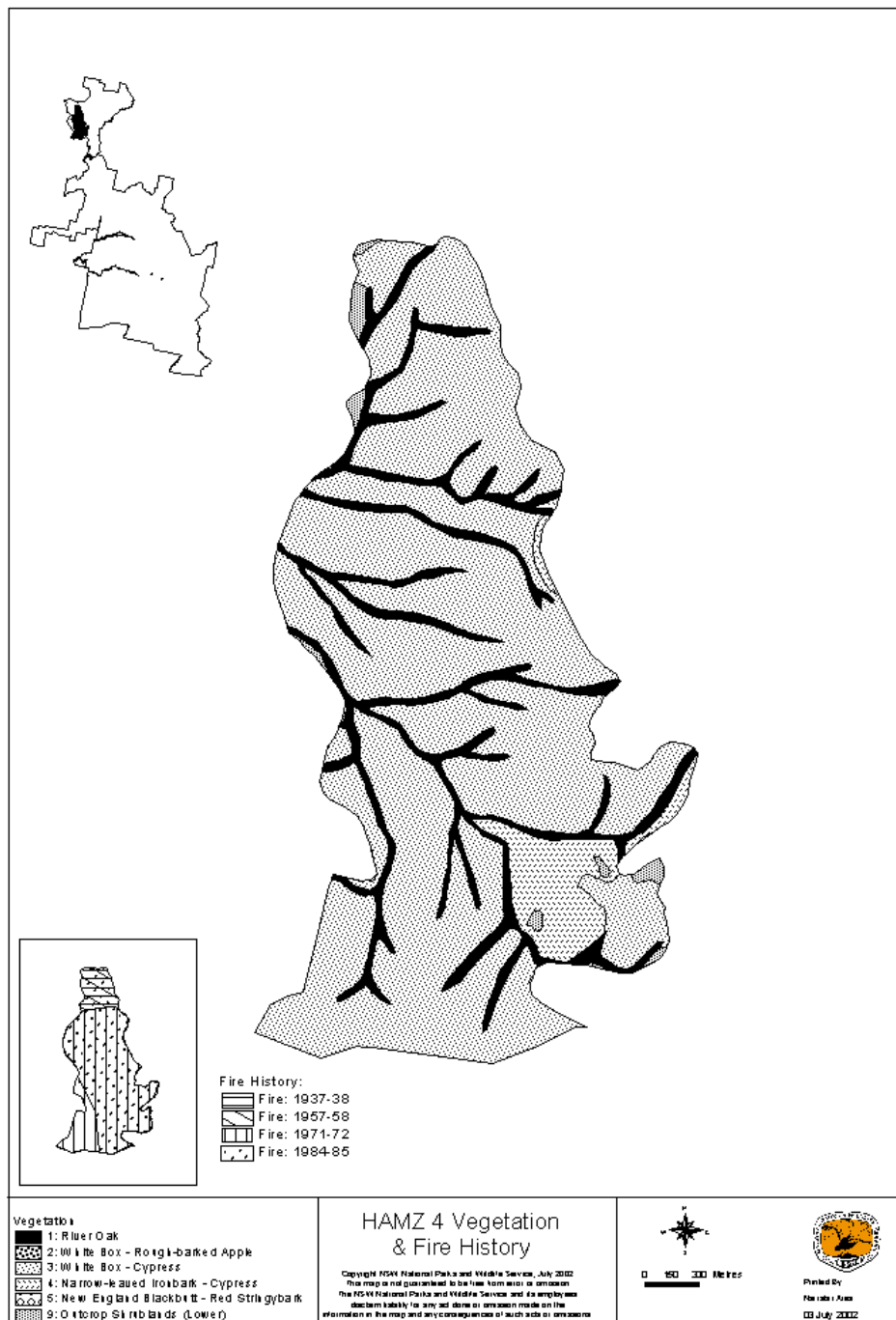


Figure 4.8: HAMZ 4 Vegetation and Fire History

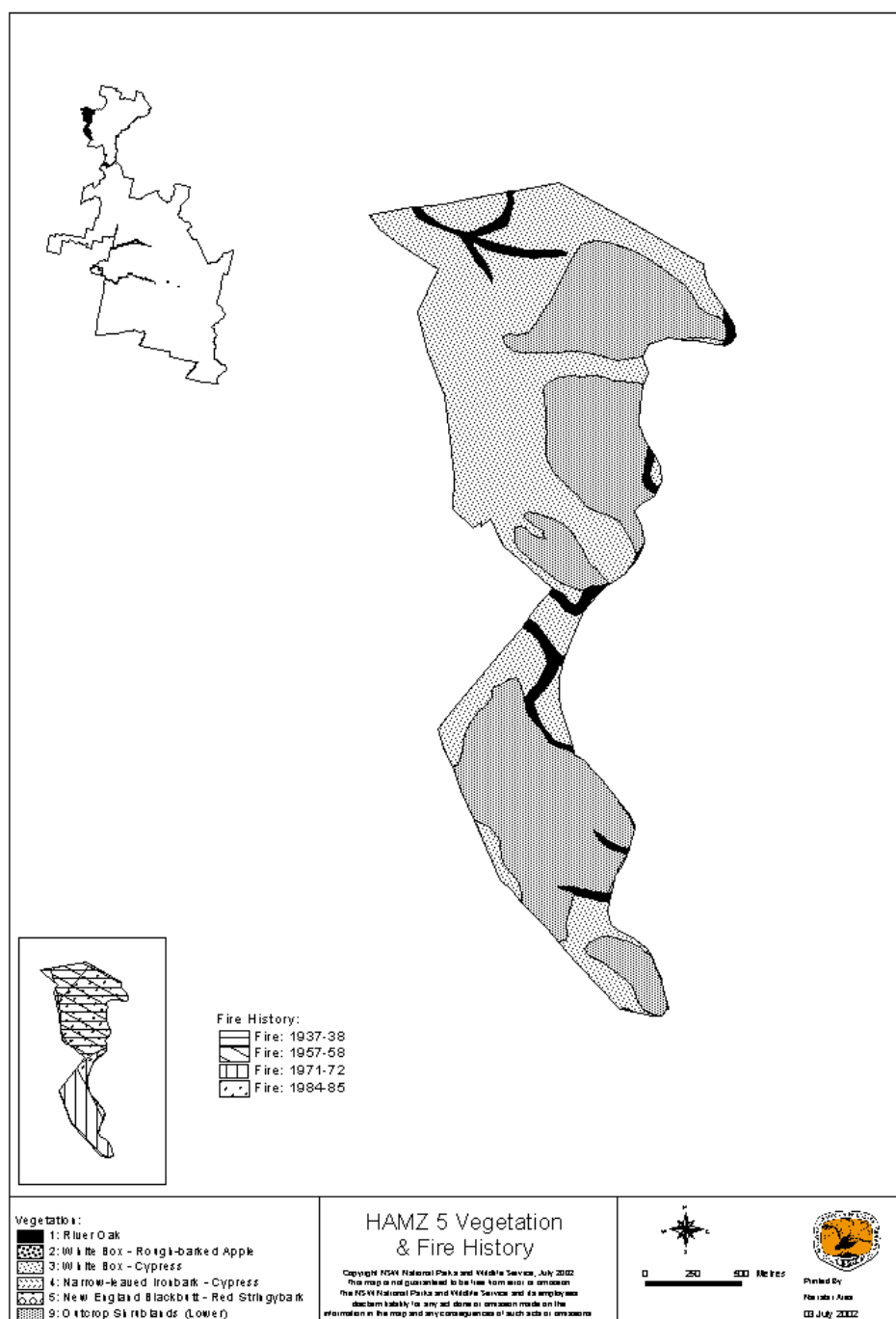


Figure 4.9: HAMZ 5 Vegetation and Fire History

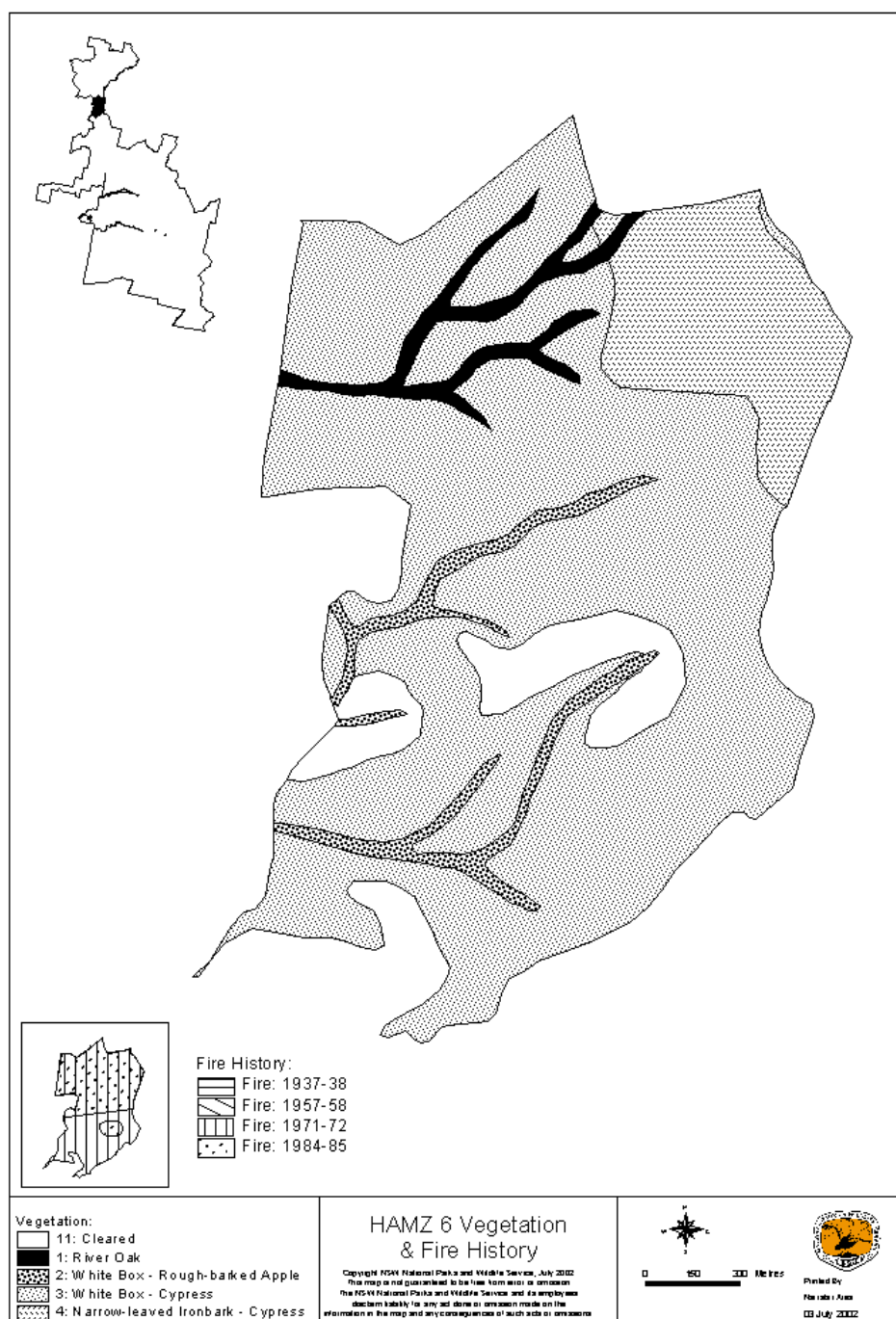


Figure 4.10: HAMZ 6 Vegetation and Fire History

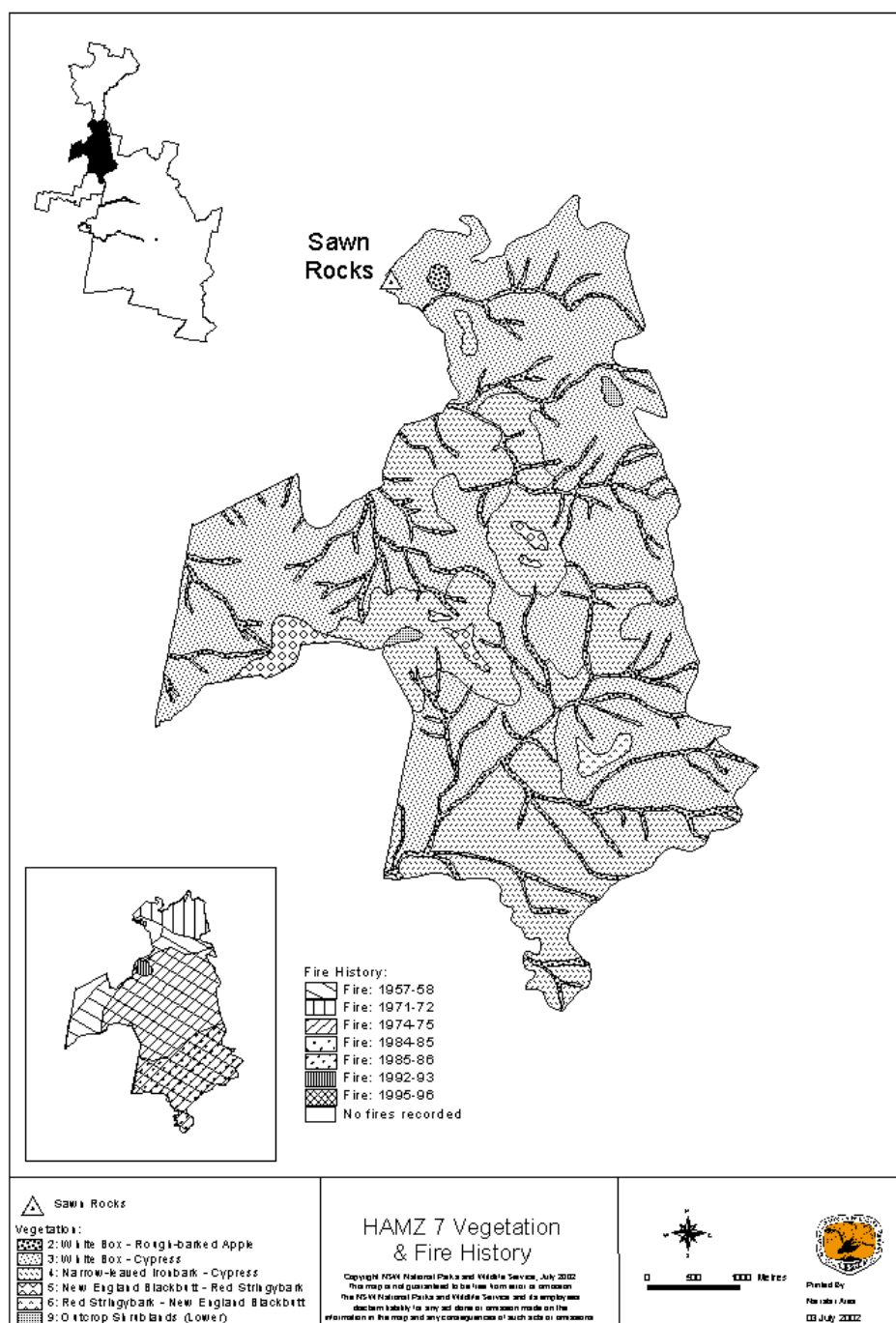


Figure 4.11: HAMZ 7 Vegetation and Fire History

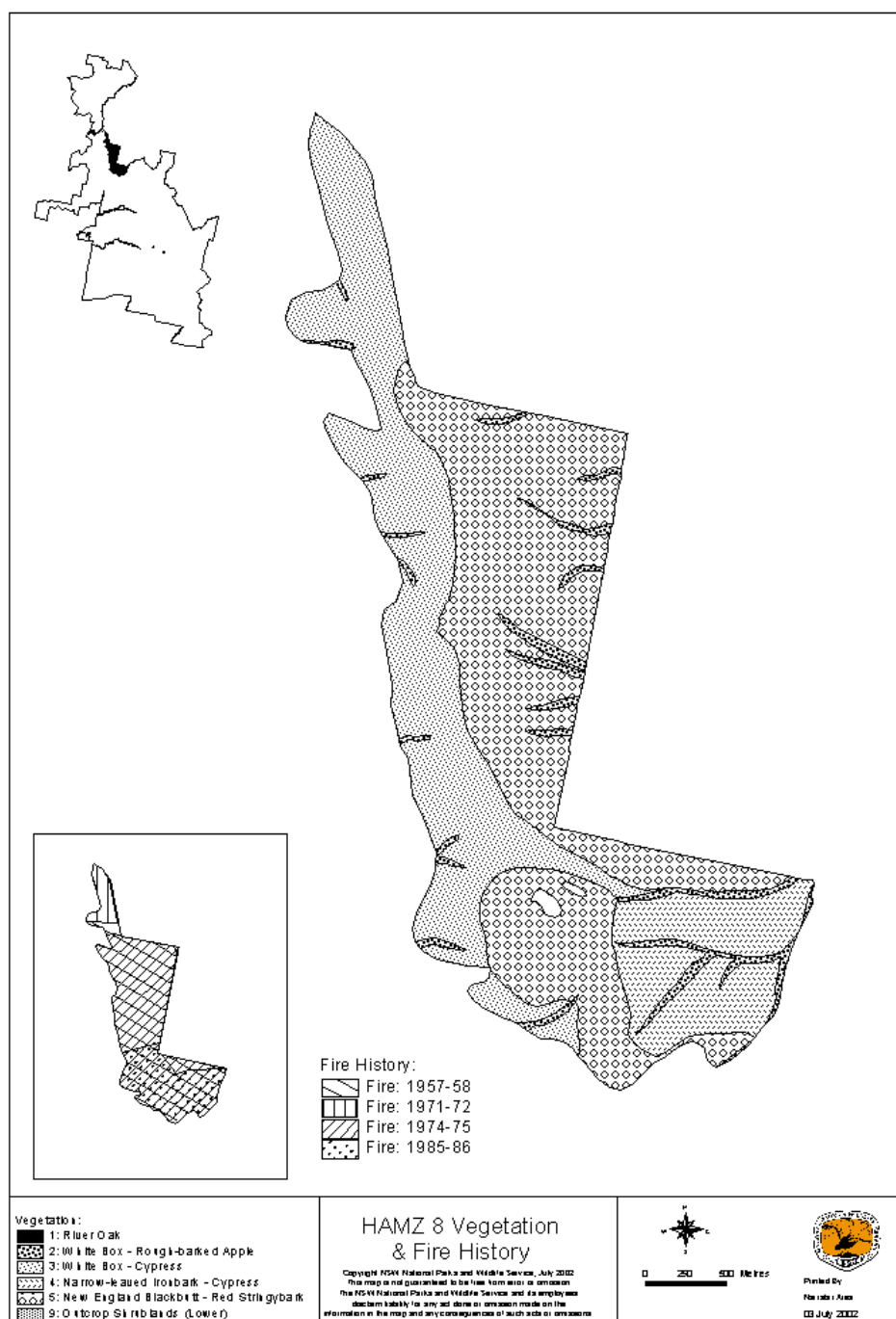


Figure 4.12: HAMZ 8 Vegetation and Fire History

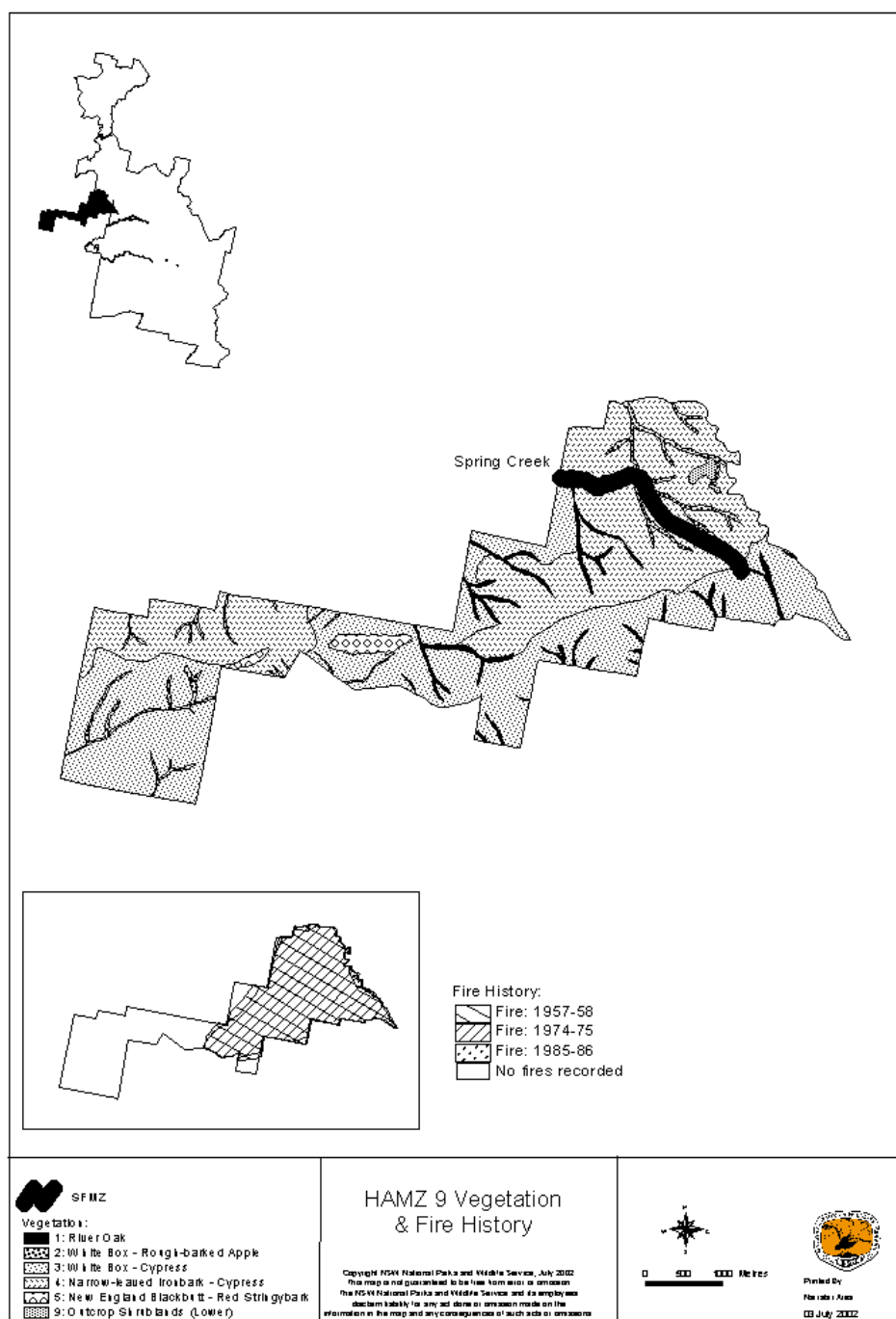


Figure 4.13: HAMZ 9 Vegetation and Fire History

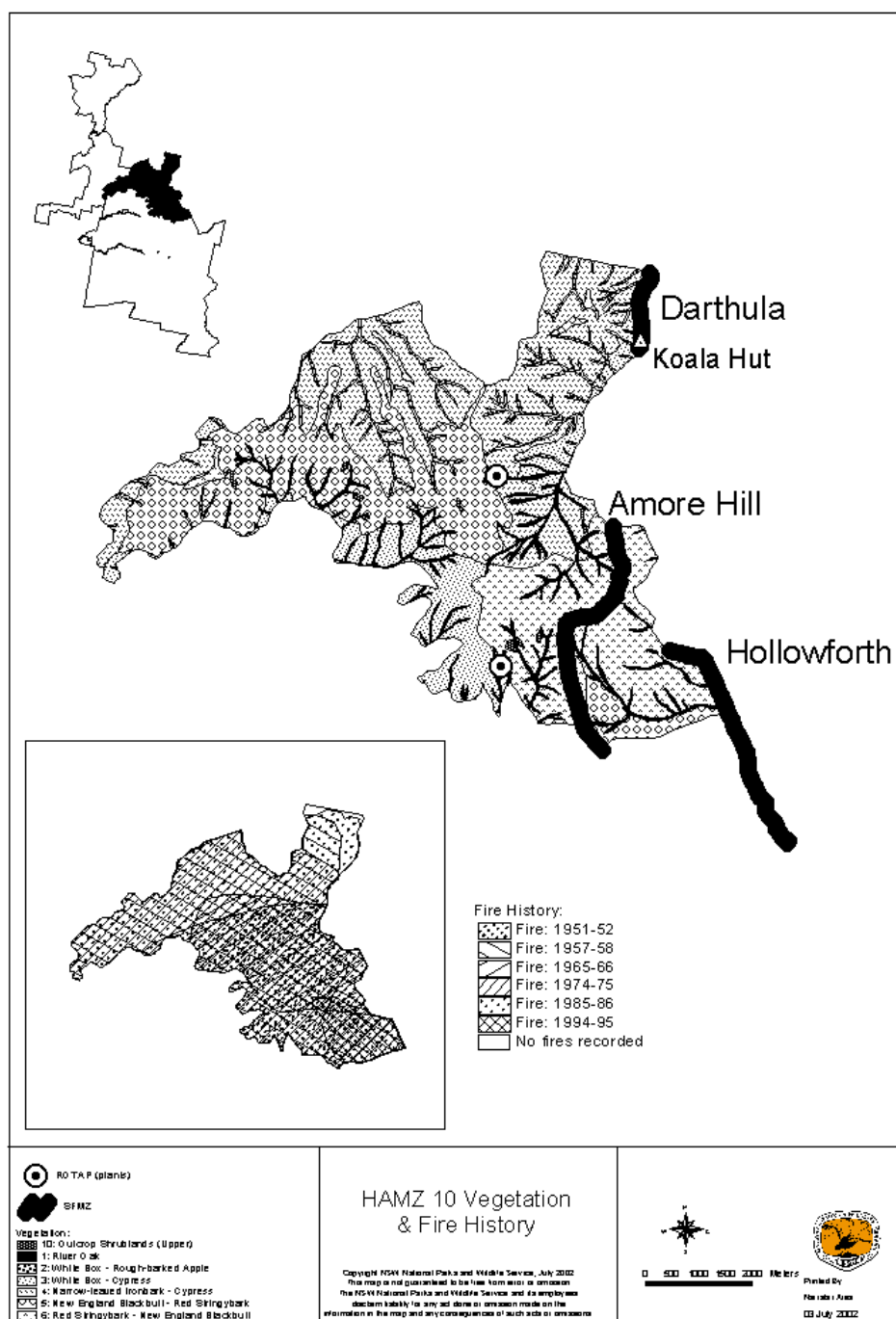


Figure 4.14: HAMZ 10 Vegetation and Fire History

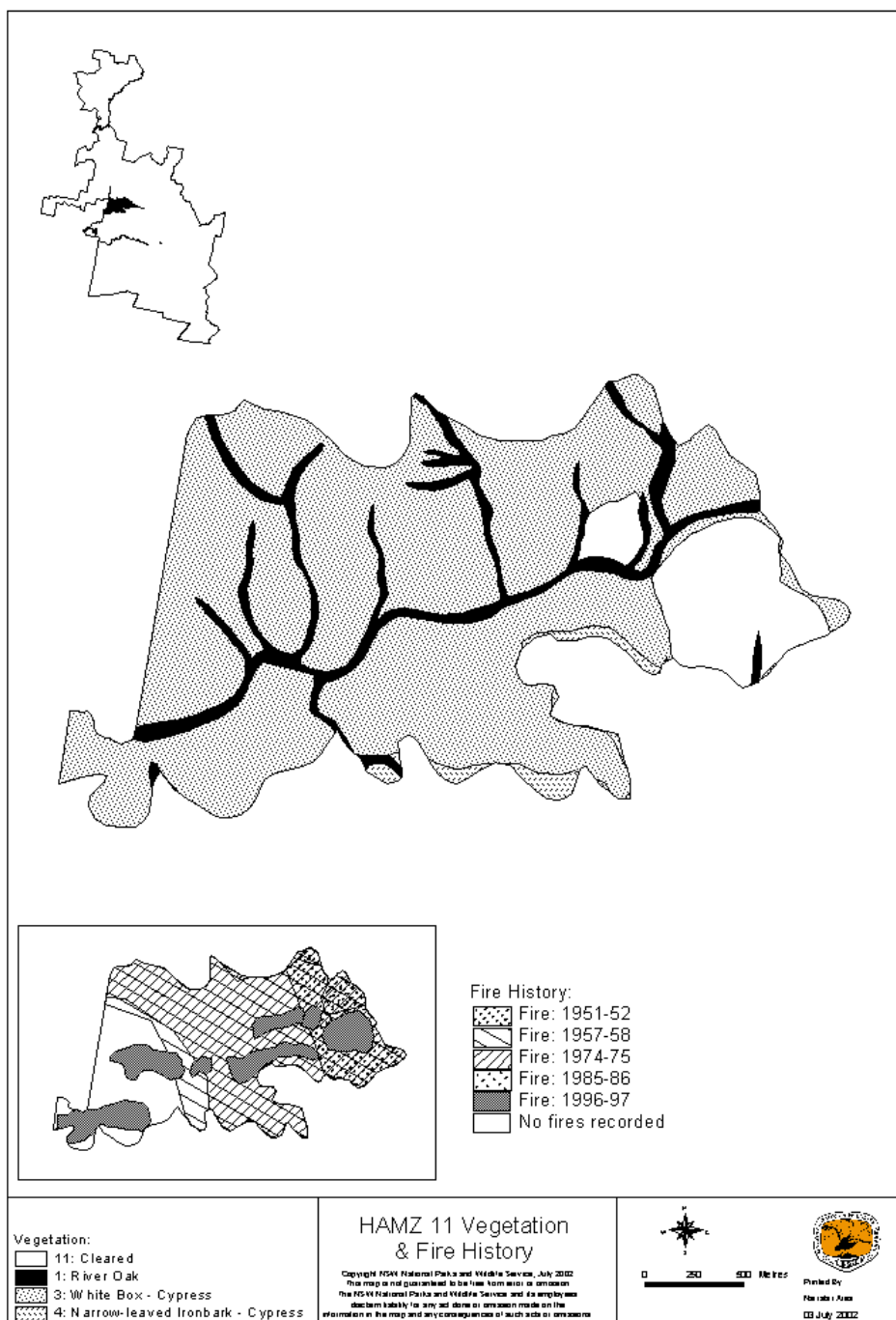


Figure 4.15: HAMZ 11 Vegetation and Fire History

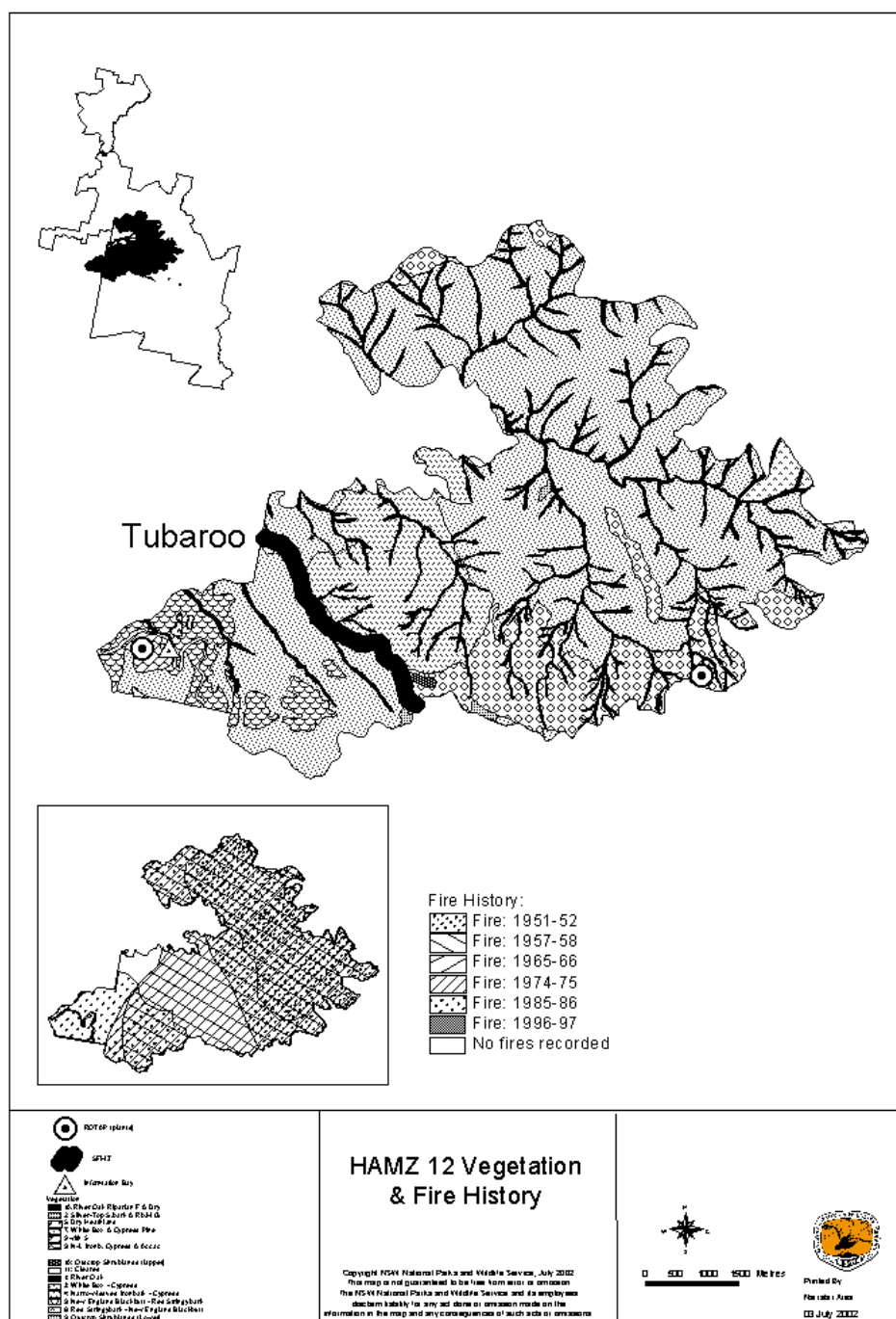


Figure 4.16: HAMZ 12 Vegetation and Fire History

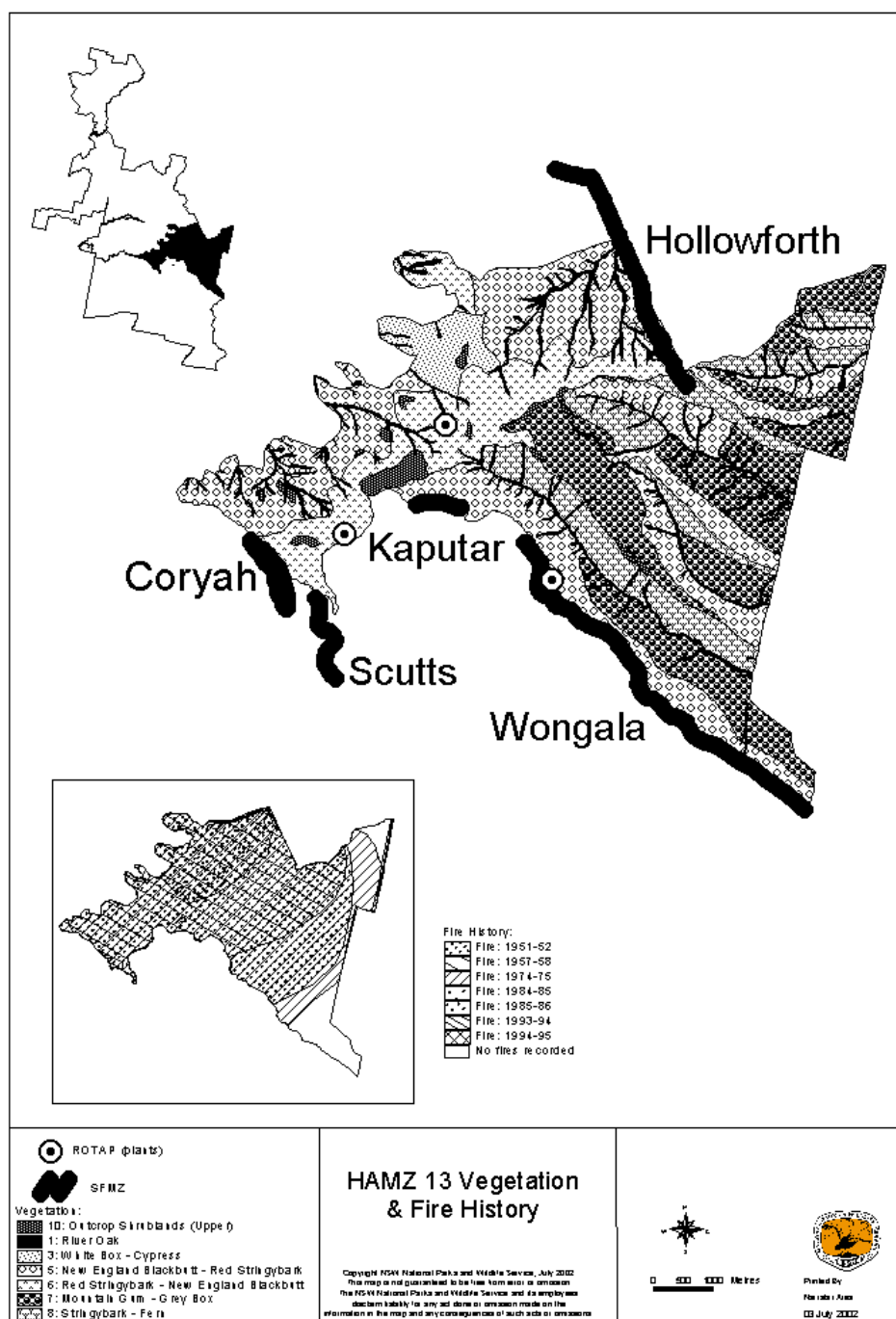


Figure 4.17: HAMZ 13 Vegetation and Fire History

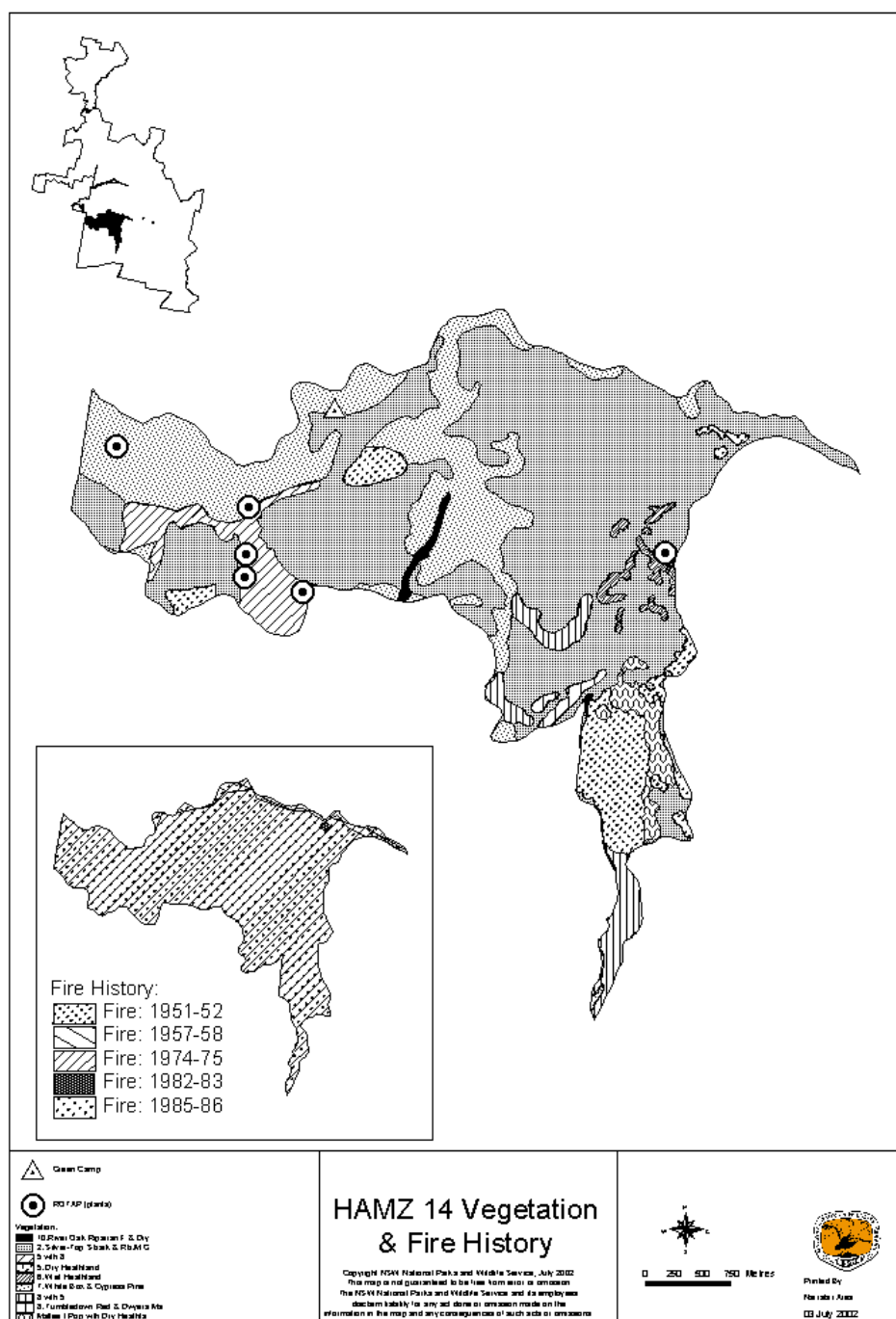


Figure 4.18: HAMZ 14 Vegetation and Fire History

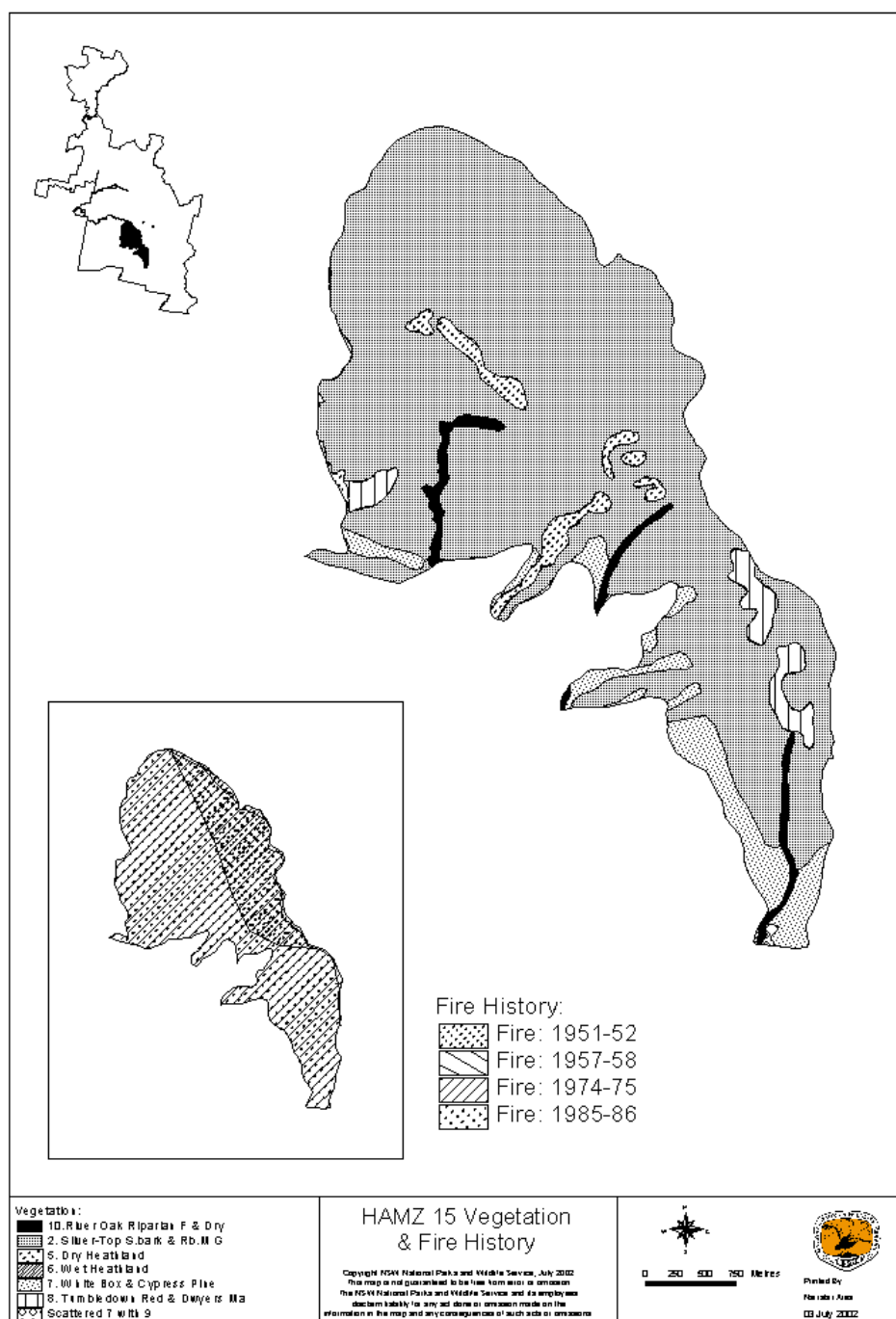


Figure 4.19: HAMZ 15 Vegetation and Fire History

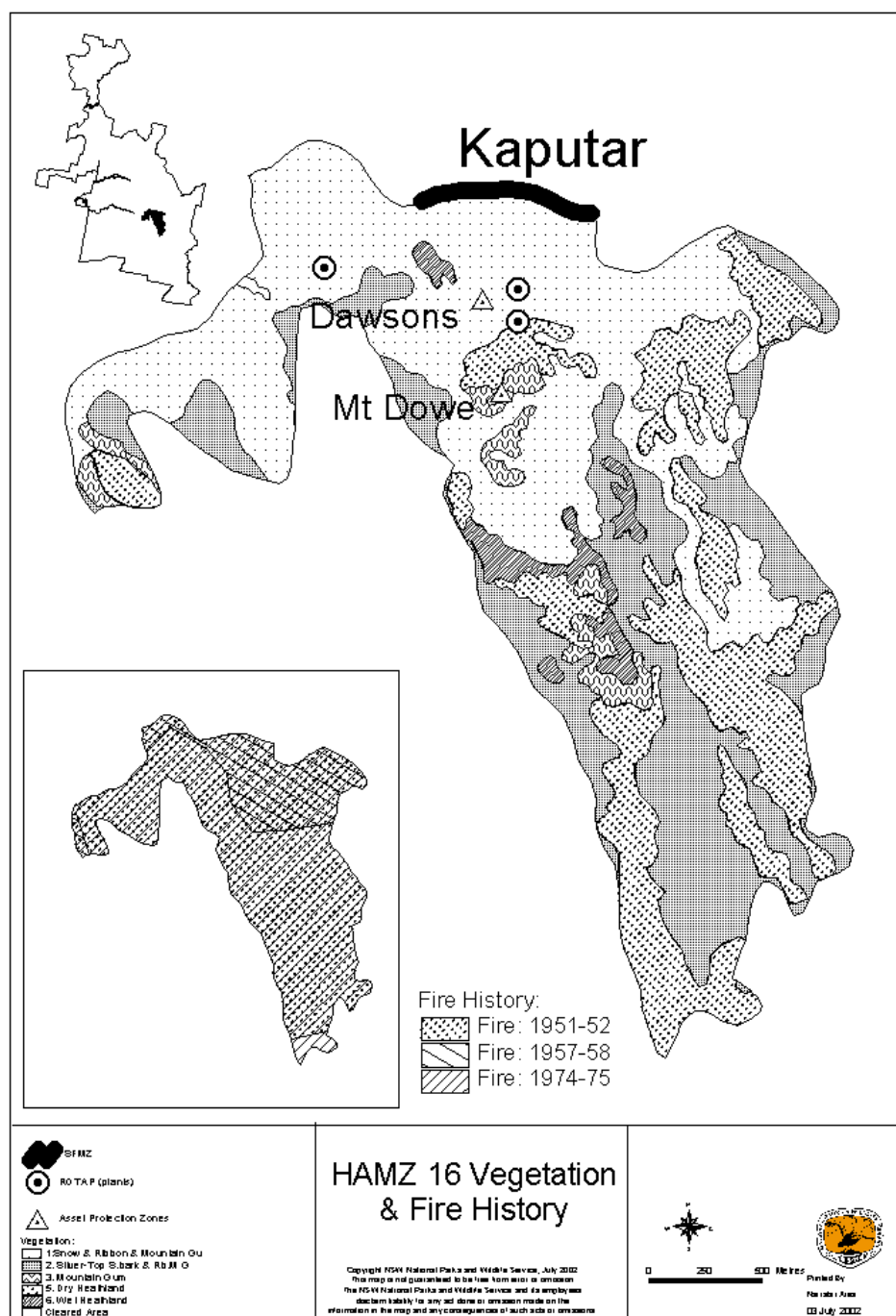


Figure 4.20: HAMZ 16 Vegetation and Fire History

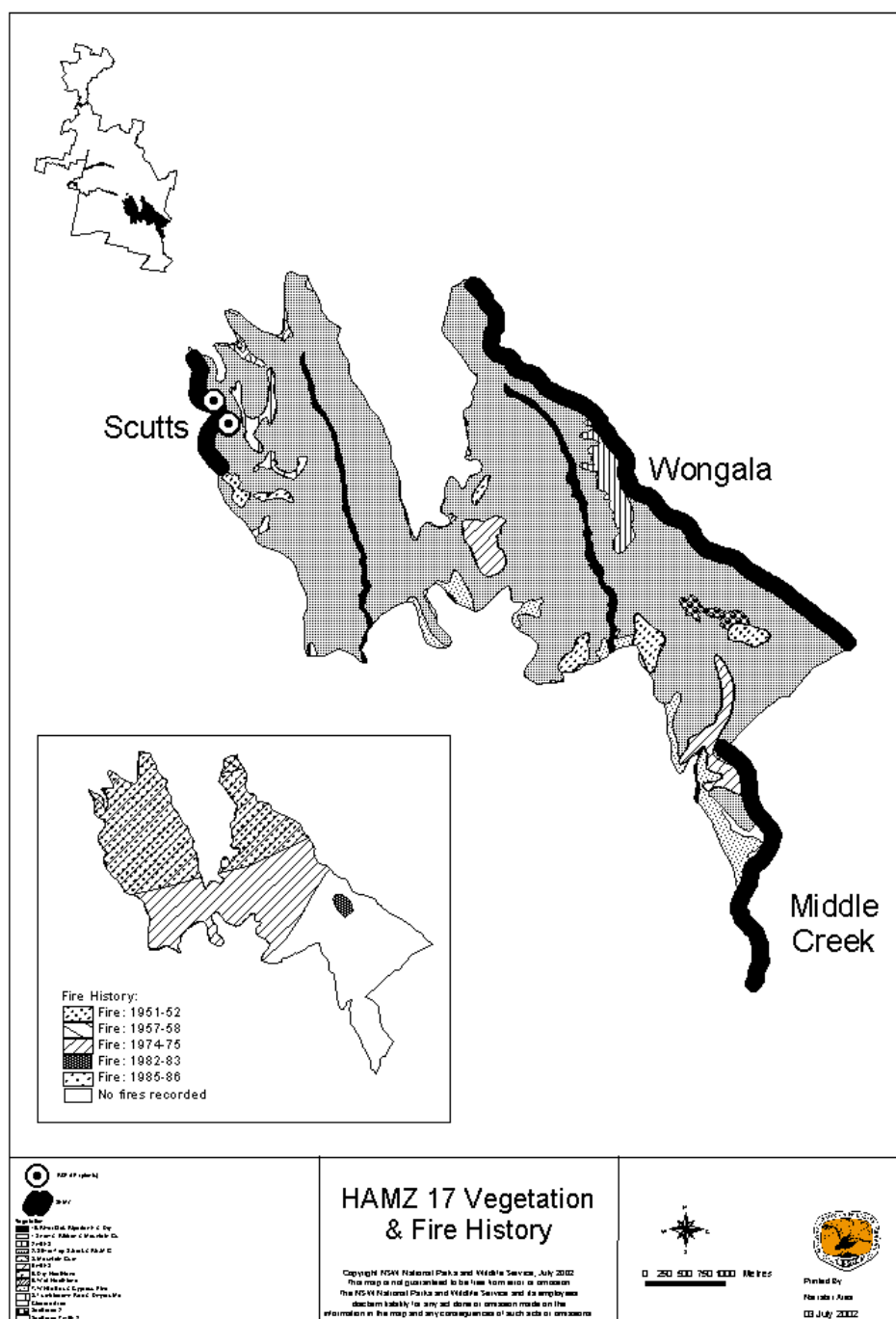


Figure 4.21: HAMZ 17 Vegetation and Fire History

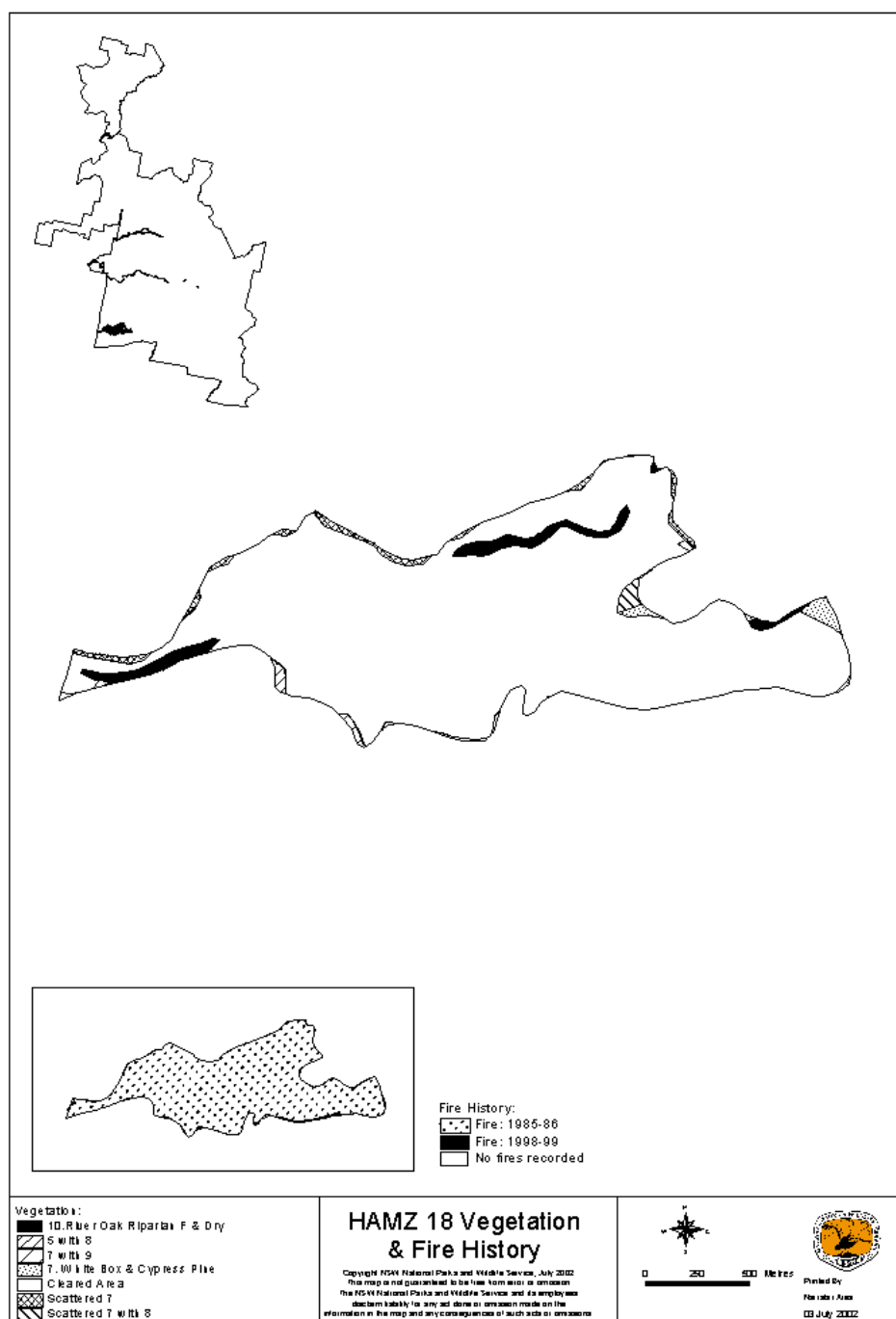


Figure 4.22: HAMZ 18 Vegetation and Fire History

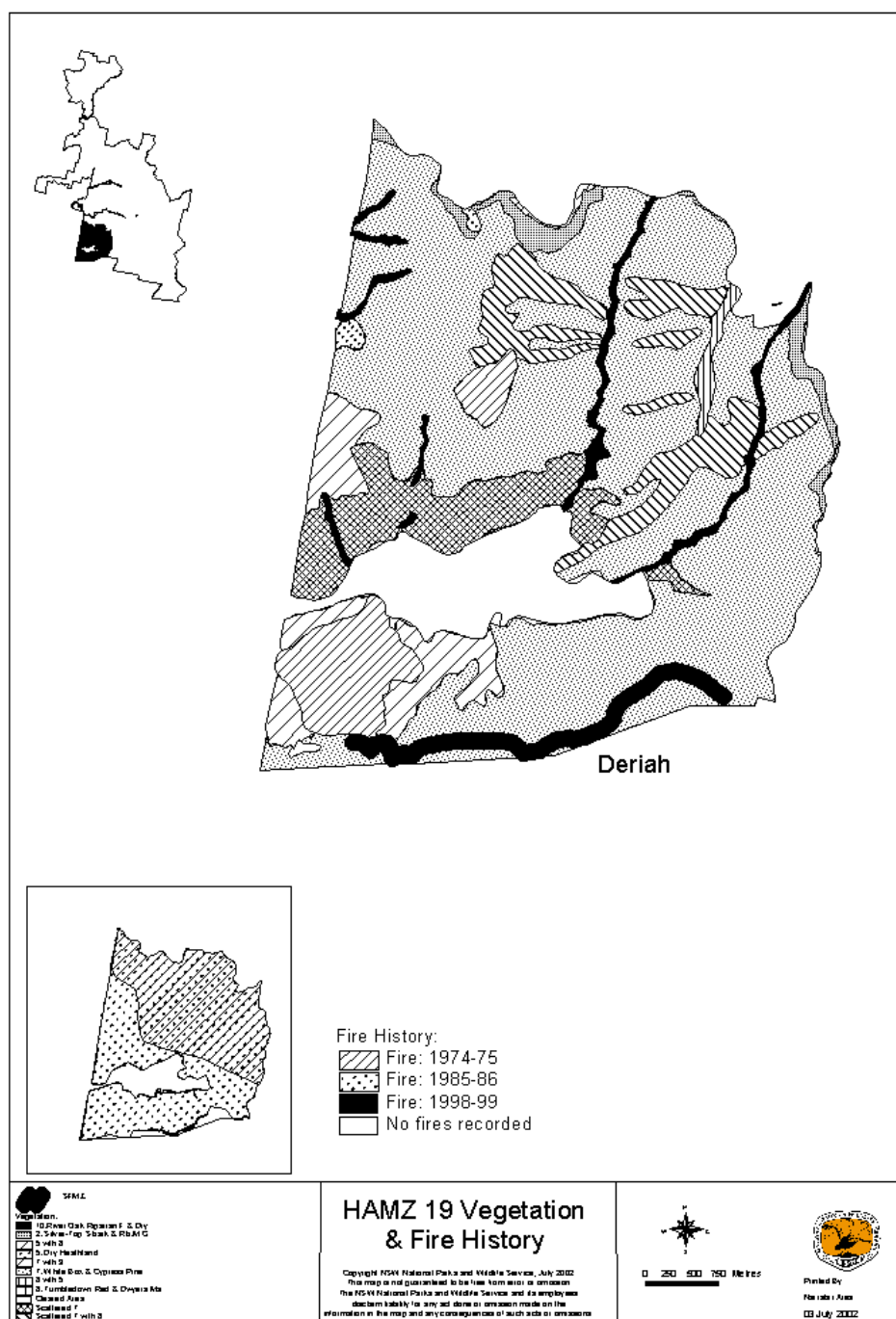


Figure 4.23: HAMZ 19 Vegetation and Fire History

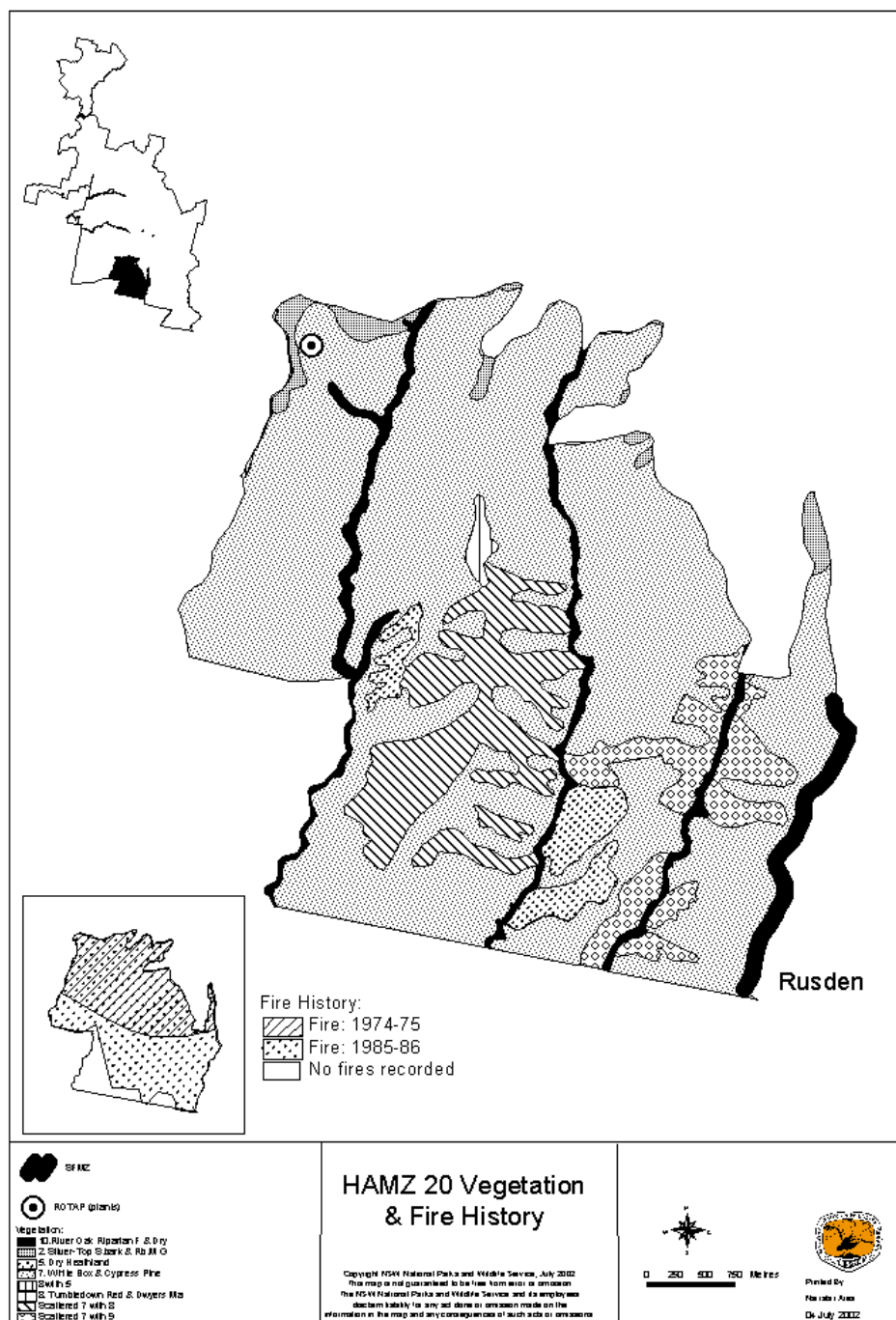


Figure 4.24: HAMZ 20 Vegetation and Fire History

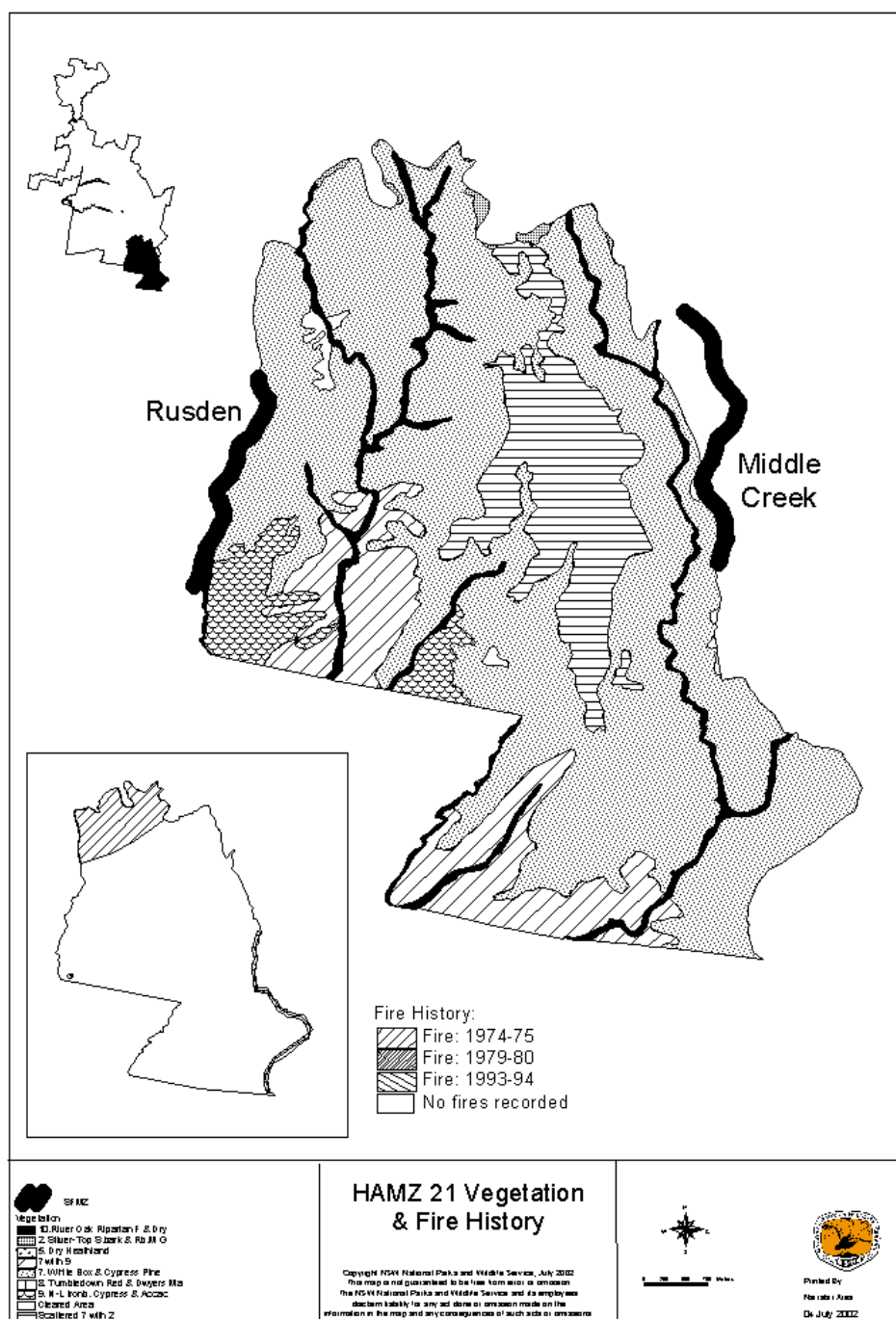


Figure 4.25: HAMZ 21 Vegetation and Fire History

4.2 Protection of neighbours, visitors and facilities

Within the Park, the primary focus of protection from fire is afforded to visitors and associated facilities. Strategies aimed at achieving this objective include the establishment and maintenance of radiation zones and annual activities to reduce the possibility of structural ignition by embers.

Adjoining properties will be protected by maintaining the existing boundary trails, and by extending the trails along the Park boundaries, where practical and permitted. The Service will negotiate with the Park's neighbours for siting trails on private property, where terrain or conservation values may prevent siting the trail within the Park area. These trails, when combined with Strategic Management Zones will improve protection from fires escaping or entering the Park.

The risk to visitors travelling along the Mt Kaputar Road can be high during wildfires. Procedures will be incorporated into the *Northern Plains Region Incident Procedures* for the closure of the road and the evacuation of visitors. Strategies will be implemented to reduce the hazard in the vicinity of Dawsons Spring, Green Camp and Bark Hut to establish safe areas/refuges for visitors.

4.3 Strategic fire management

Strategic management reduces the risk of fires entering or escaping the Park, assists in the strategic containment of wildfires, provides safe access to fire fighters, and assists in wilderness and wildlife management. This will be performed by prescribed burning for fuel management, and maintaining or establishing perimeter trails. The interval between prescribed burns will be based on management guidelines listed in Section 4.4.

Areas targeted for strategic fire management works are:

- For property protection, focussing on continuous fuel and vegetation along the eastern Park boundary, particularly the north-eastern boundary of the Nandewar Wilderness. This is due to the westerly winds characterising extreme fire weather.
- A number of small strategically located parcels of land surrounding the areas of Dawsons Spring/Mt Dowe and Bark Hut.
- The south-western corner of the Park on the northern aspect of the Ningadoo Valley, adjoining Rusden State Forest.
- The southern edge of the Spring Creek and Tubaroo fire trails, providing a fuel reduced corridor, impeding a potential front initiated in the Bullawa or Eulah Valleys progressing under a westerly influence.

The priorities for conducting strategic fire management works will be based on the classification of areas according potential fire behaviour, and the prognosis for large-scale fires during a season, based on the Southern Oscillation Index.

Where high fuel loads cross tenures, combined hazard reduction burns will be encouraged.

4.4 Biodiversity conservation

4.4.1 Principles and thresholds

The conservation objectives for fire management are to manage fire to avoid species extinction and maintain community composition. Generally, fires which deviate from the preferred frequency, season or intensity can have a harmful effect on species diversity resulting in local extinctions and progression towards a monoculture (HRSCEC, 1984). Maintenance of biodiversity can be achieved by ensuring that, as far as possible, fire regimes remain within the required thresholds for particular communities.

Fire regimes and thresholds for vegetation communities in Mount Kaputar National Park are outlined in Table 4.1. These can be described as management guidelines, and are based on the life history of the dominant species, the mechanisms of regeneration and the method of seed storage.

The effects of fire on fauna are not completely understood, but it is generally accepted that flora species are more susceptible to fire and different fire regimes. Most animal groups suffer some degree of population reduction either during or after fire. This can be through direct mortality by intense fire, or through starvation or predation following the loss of habitat. Wildfires have not been found to be responsible for the extinction of any species of bird or animal (HRSCEC, 1984). However, high frequency fire has been identified as a key threatening process for a number of species, some of which occur in or near the Park (*Calyptorhynchus lathami* - Glossy Black-Cockatoo, *Dasyurus maculatus* - Spotted-tailed Quoll, *Petaurus norfolcensis* - Squirrel Glider) (NSW Scientific Committee, 2000). Since fauna populations are dependent on vegetation for food and cover, the recovery of animal populations depends largely on the recovery patterns of the plant communities which in turn may be affected by the nature of the fire (Williams and Gill, 1995).

4.4.2 Distribution of biodiversity in fire management zones

Mt Kaputar National Park comprises a broad range of vegetation communities and associations. The diversity of these communities is based on geomorphological considerations such as elevation, aspect and soil types. Bush Fire Management Zones to manage fire regimes have been developed based on these environmental parameters as well as access and control restrictions.

A number of rare or threatened flora species occur in the Park. Though the spatial distribution of these species throughout the Park is not yet fully understood, a comprehensive survey has mapped vegetation communities. The management of fire within the Park must take into consideration the specific requirements of threatened species.

4.4.3 Evaluation of current fire regimes

Fire history indicates that fire frequency in the Park generally approximates that required for the conservation of biodiversity. There are a number of areas where the incidence of fire is outside the threshold range. These are:

- dry sclerophyll forests and woodlands in the southeast of the Park where the time since fire is much greater than the identified threshold of 30 years
- heath complexes with a lower than recommended fire frequency
- some subalpine communities with a higher than recommended fire frequency

The incidence of fire in most of the moist sclerophyll forests is within the thresholds for this community. The exception is along the Nandewar Range in the northern half of the Nandewar Wilderness where the intensities of fires will tend to lower and more varied in the higher elevations and aspects associated with these communities.

4.4.4 Effects of management for human protection and strategic wildfire control on biodiversity

Although protection of life and property, and conservation of biodiversity represent the fundamental legislative charter of fire management, it also raises a point of contention. Ecological burning operations may be carried out with a dual benefit of hazard reduction, however, hazard reduction does not always benefit biodiversity considerations. In some circumstances, a compromise must be reached where a decision is made about the ultimate objective of the burn.

Hazard reduction often results in compartmentalising areas on the basis of existing roads that are easier to burn from than natural features. Over time, these compartments are continually burnt on a set and managed regime with little or no contiguous burning with neighbouring compartments.

The very nature of a hazard reduction is of a less intense burn, often at a greater frequency, or non-preferred season than considered beneficial from an ecological standpoint. Burn objectives generally stipulate lighting patterns and conditions where a more total cover is achieved and a mosaic avoided, reducing structural diversity and reducing recruitment opportunities from unburnt areas.

In addition, the construction of control lines and the introduction of additional infrastructure (such as helipads, waterpoints) may also be considered as detrimental to the conservation of biodiversity.

Natural wildfire events may closely follow hazard reduction operations at a duration long enough to provide available fuels, but not long enough for particular species to mature. Two successive fires, in this manner, are likely to be detrimental to either seed or vegetative regeneration, thus influencing biodiversity of community composition.

4.4.5 Fire regime strategies for biodiversity conservation

The management guidelines for vegetation communities and identified species of special interest provide a basis for decision making for the programming of prescribed burns and suppression strategies. Management guidelines for the Park's vegetation communities are listed in Table 4.1, and for rare or threatened flora in Table 4.2. These guidelines are tentative and require considerable research and refining. They are based on very limited data, and specific studies are from other locations with different climate, soil, etc that are likely to influence general growth rates and fire responses.

Suppression strategies during wildfires should attempt to:

- maximise burn areas within fire management area boundaries, where the fire-free period acceptable for various vegetation types are approaching the upper limits
- minimise burn areas for areas with unacceptably high frequencies or the fire incidence is below the lower limit of an acceptable fire-free period.

- The principal objective will be to manage habitats to ensure a diversity of age classes of each habitat type, and reduce the potential of the entire range of each habitat type being affected by a single fire event.

Management requirements for threatened fauna species are listed in Table 4.3. These guidelines will also benefit other native fauna species. These are intended to augment the definitions of desirable fire regimes for plant communities listed in Table 4.1. As sightings of additional rare and threatened species are recorded, or as research provides a better understanding, there may be a need to modify these fire management guidelines accordingly.

Table 4.1: Management guidelines for vegetation communities

Broad vegetation type	Management guidelines	Min. time (yrs)	Max time (yrs)
Sub-alpine forests and woodlands	Low intensity understorey fires should be at least 20 years apart. Stand replacing high-intensity burns should be permitted once in a 200 year period.	20	200
Sub-alpine mallee and heathlands	Two consecutive fire events should be separated by at least 8 years in heaths, and 15 years in mallees. A fire-free interval of 25 years should be followed by a moderate to high intensity fire.	8	25
Moist tall open forests	Low intensity fires should be separated by at least 20 years. High intensity fires should be separated by at least 50 years. Stand replacing burns should be permitted once in a 200 year period.	20 50	200
Open forests and woodlands	Fire events should be at least 10 years apart. Two consecutive low intensity fires should be avoided. A fire-free interval of 30 years should be followed by a moderate to high intensity fire.	10	30
Shrublands	Two consecutive fire events should be separated by at least 8 years. A fire-free interval of 15 years should be followed by a moderate to high intensity fire.	8	15
Acacia shrublands	Two consecutive fire events should be separated by at least 15 years. Stand replacing burn required once in 30 - 50 year period	15	50
Dry rainforests	Decline predicted if successive fires result in crown scorch.	+	+

+ Insufficient information.

Table 4.2: Management guidelines for rare and threatened flora

Species	Management guidelines
<i>Boronia rubiginosa</i> <i>Discaria pubescens</i> <i>Euphrasia orthocheila</i> <i>orthocheila</i> Gonocarpus longfolius Haloragis exalata ssp. <i>exalata</i> var. <i>exalata</i>	Exclude fires from identified sites for a minimum period of 8 years.
<i>Cadellia pentastylis</i>	Exclude fire from known sites until further research is conducted to establish thresholds.
<i>Eucalyptus nandewarica</i>	Two consecutive fire events should be separated by at least 15 years. A fire-free interval of 30 – 50 years should be followed by a moderate to high intensity fire.
<i>Eucalyptus elliptica</i> Eucalyptus rubida ssp. <i>barbidgerorum</i>	Avoid consecutive high intensity fires until juvenile period is determined, at least 8 years (based on Strasser <i>et al</i> , 1996).
<i>Diuris aequalis</i> Leionema viridiflorum Prostanthera cruciflora	Two consecutive fire events should be separated by at least 10 years. A fire-free interval of 25 years should be followed by a moderate to high intensity fire.
<i>Hibbertia kaputarensis</i> Muehlenbeckia costata	No specific information, but responses of similar species suggests avoid both frequent and infrequent fire. Monitor response after any fire affecting this species.

Within this Plan, guidelines are provided for the management of animal species and their habitats that are subject to the *Threatened Species Conservation Act, 1995*. This *Act* provides the framework to protect and encourage the recovery of threatened species, populations and ecological communities. The development of *Recovery Plans* is a requirement under the *Act* to ensure the appropriate management and planning for the conservation of threatened species. As these *Recovery Plans* are developed there may be a need to adjust the fire management guidelines outlined in this Fire Management Plan.

Table 4.3: Management guidelines for threatened fauna

Species	Management guidelines
Black-chinned Honeyeater Booroolong Frog Border Thick-tailed Gecko Brown Treecreeper Common Bent Wing Bat Diamond Firetail Grey-crowned Babbler Hooded Robin Koala Large-eared Pied Bat Little Bent Wing Bat Painted Honeyeater Pied Honeyeater Red-tailed Black Cockatoo Speckled Warbler Swift Parrot Tiger Quoll Turquoise parrot Yellow Bellied Glider Yellow-bellied Sheath-tail Bat	<ul style="list-style-type: none"> Apply vegetation management guidelines for vegetation types where species are known or predicted to occur Avoid prescribed burning during breeding periods where possible Survey locations of known or potential habitat within prescribed burn area as part of Review of Environmental Factors Prevent a single wildfire or prescribed burn which will affect all known or potential habitats of the species
Square-tailed Kite	<ul style="list-style-type: none"> Prescribed burning to be conducted outside spring/summer breeding period in areas where nesting trees are located
Bilby Brush-tailed Rock Wallaby	<ul style="list-style-type: none"> Exclude fire from identified habitats and preferred feeding habitats
Squirrel Glider	<ul style="list-style-type: none"> Avoid high frequency fires in known habitats. Apply vegetation management guidelines for vegetation types where species are known or predicted to occur Avoid prescribed burning during breeding periods where possible Survey locations of known or potential habitat within prescribed burn area as part of Review of Environmental Factors Prevent a single wildfire or prescribed burn which will affect all known or potential habitats of the species

4.5 Aboriginal heritage

Aboriginal sites in the Park susceptible to fire damage have been identified in Special Area Management Zones. Actions listed for the zones will assist in the protection of these sites.

4.6 Historic heritage

Historic structures in the Park susceptible to fire damage have been identified in Special Area Management Zones. Actions listed for the zones will assist in the protection of these sites.

4.7 Smoke management

Westerly winds are predominantly associated with wildfire events. Resultant smoke is then directed towards Bingara and Barraba and on into Glen Innes and Armidale districts.

Ideally, under prescribed burning operations, conditions should be avoided where smoke persists for long periods or at low altitudes and is highly visible. Most favourable conditions are where smoke is transported up and away from the burn area, and neighbouring properties and towns. However, such conditions are usually characteristic of those considered unsuitable for prescribed burning.

With respect to smoke emitting from Mount Kaputar National Park, prescribed burning should be undertaken where prescriptions will allow for directing resultant smoke away from neighbouring properties and towns.

4.8 Summary of operational guidelines

Fire operations have the potential to impact on the environmental integrity of Mount Kaputar National Park. The guidelines listed in Table 4.4 will assist in avoiding or mitigating impacts.

The guidelines have been incorporated into the NPWS *Northern Plains Region Incident Procedures* and the *Plans of Operations* for the Cunningham Zone (Barraba, Bingara, Yallaroi), Moree Plains and Narrabri Bush Fire Management Committees.

Table 4.4: Summary table of fire management operational guidelines and considerations

Area/resource	Operational guidelines
General guidelines	<ul style="list-style-type: none"> for all ignitions: assess fuel levels, fire history, drought index, Southern Oscillation Index (SOI), seasonal prognosis and short term forecast for the likelihood of fire extinguishing rainfall events if low probability of fire-extinguishing rainfall event, implement strategies to suppress fire if high probability of fire extinguishing rainfall event - develop and implement containment strategies using fire trails and Strategic Fire Management Zones <p>liaise with neighbours and Executive Committees of Bush Fire Management Committees on proposed containment strategies</p>
Vegetation communities where the time since last fire is below the lower level threshold	<ul style="list-style-type: none"> minimise burn area, if possible <p>identify appropriate and defined control lines refer to general guidelines</p>
Vegetation communities where the time since last fire is approaching or exceeding the higher level threshold	<ul style="list-style-type: none"> maximise burn area with consideration to: <p>containing the fire within fire management area boundaries, and identify general control lines liaise with neighbours and Executive Committees of Bush Fire Management Committees on proposed containment strategies</p>
Known sites: threatened species of plants	<ul style="list-style-type: none"> brief all personnel involved in control line construction on the location of sites and required control line route <p>exclude sites from burn area if the fire-free interval has not reached the lower level threshold</p>
Brush-tailed Rock Wallaby habitats	<ul style="list-style-type: none"> exclude fire from identified habitats, as far as possible, and with due consideration to fire-fighter safety
Cultural heritage sites	<ul style="list-style-type: none"> brief all personnel involved in control line construction on the location of sites and required control line route
Use of earth moving machinery	<ul style="list-style-type: none"> exclude from slopes greater than 20° <p>exclude from wilderness areas where possible restrict use to existing or previous trail or control line routes, or identified negotiable routes rehabilitate control lines at the conclusion of operations</p>
Use of fire fighting chemicals	<ul style="list-style-type: none"> foam and wetting agents permitted in all areas of the Park <p>retardants will be excluded from heath areas</p>
Visitor safety	<ul style="list-style-type: none"> walking tracks and access roads to be closed during fire operations, where appropriate

4.8.1 Guidelines for cooperative fire fighting arrangements

Under the *Rural Fires Act 1997*, the Fire Control Officer has overall responsibility for suppression of fires within the rural fire district and for the protection of life and property in case of fire. However, when a fire occurs in a park or reserve, which is deemed to be “prescribed land”, the Fire Control Officer must comply with conditions set out by the Service

in this reserve Fire Management Plan. Table 4.5 outlines the cooperative fire fighting arrangements for Mt Kaputar National Park based on fire classes.

Table 4.5: Operational fire control classes

Class 1	NPWS will be the controlling authority for the suppression of fire.
Class 2	NPWS will be the controlling authority for the suppression of fire. The Incident Controller will be the NPWS representative identified in the relevant BFMC Operational Plan.
Class 3	<p>The Incident Controller will be the Section 44 Nominee identified in the relevant BFMC Operational Plan, preferably a NPWS nominee.</p> <p>Where the NPWS Section 44 Nominee is unavailable for any reason, another NPWS officer with appropriate experience will be provided as Liaison Officer or Deputy Incident Controller, to provide close advice and support to the Nominee chosen by the BFMC for endorsement by the Commissioner of the Rural Fire Service.</p>

Guidelines for other fire management activities are:

- The Service will work closely with the Rural Fire Service in respective hazard reduction (prescribed burning) programs and fire suppression operations.
- Notification of fires in Mount Kaputar National Park will be via arrangements specified in the relevant BFMC Operational Plans. The Fire Control Officer and NPWS Narrabri Area will inform each other of fire in Mount Kaputar National Park as soon as is practicable.
- The Service controls access to Mount Kaputar National Park and will make arrangements to provide access for both the Rural Fire Service Brigades and NSW Fire Brigades to respond to fire incidents or for training and orientation purposes.

5. FIRE MANAGEMENT ASSETS

5.1 Fire management access

Fire management trails include all roads, vehicular trails and walking tracks that may be used for fire management and fire control operations. These trails, in and adjacent to Mount Kaputar National Park, are listed in Table 5.1, with Fire Trails illustrated on Figure 5.1.

A detailed trail register is maintained in the Narrabri Area Office, and describes vehicular accessibility, condition, potential actions required on the trail during fire suppression operations and annual maintenance requirements. Trails will be classified in accordance with BCCC guidelines and mapped.

The existing trail system provides vehicle access to a number of strategic areas, namely the central portions and some perimeter localities. However, in keeping with the wilderness nature of the reserve, and legislative requirements, much of the Park is untracked.

Table 5.1: Fire access

Name	Class	Length (km) *	Location	Managed by
Mount Kaputar Road	1	29	western access to Kaputar Plateau from Narrabri	Narrabri Shire & NPWS
Mount Kaputar Summit Rd	1	2	Mt Kaputar Rd to Mt Kaputar summit	NPWS
Bingara Road	1	90	traverses Killarney Gap	Narrabri & Bingara Shires
Upper Bullawa Creek Road	1	5.5	access to Upper Bullawa Creek from Mt Kaputar Rd	Narrabri Shire & NPWS
Waa Gorge Road	1	1	northern access to Waa Gorge from Moree and Terry Hie Hie	Moree Plains Shire & NPWS
Barraba Track	2	9	along ridge southeast from Kaputar Plateau to Round Mountain	NPWS
Scutts Hut Fire Trail	2	9.6	along ridge south from Bark Hut to Rusden State Forest	NPWS & State Forests
South-eastern Fire Trail	2	12.6	southeastern boundary from Barraba Track to Plagyan State Forest	NPWS & Private
Eastern Fire Trail	2	33.7	eastern boundary from Barraba Track to "Darthula"	NPWS & Private
Spring Creek – Bobbiwaa Fire Trail	2	2.8	western boundary from Spring Creek to Bobbiwaa Creek	NPWS & Private
Spring Creek South Fire Trail	2	4.3	from Spring Creek towards Foggy Dell North Fire Trail	NPWS & Private
Foggy Dell North Fire Trail	2	3	from Upper Bullawa Creek towards Spring Creek South Fire Trail	NPWS
Tubaroo Fire Trail	2	5.3	from Mt Kaputar Rd north to Upper Bullawa Creek	NPWS
Deriah Fire Trail	2	9.5	Southwestern boundary	NPWS & Private
Rocky Plateau Fire Trail	2	3.5	Circuit trail from Kaputar Rd to Scutts Trail	NPWS
Box Hill Management Trail	3	2.5	from Kaputar Rd information bay north to Park boundary	NPWS
Ningadoo Management Trail	3	5.6	Ningadoo Valley from Eulah Creek	NPWS
Coryah Gap Management Trail	3	2	Circuit trail from Coryah Gap to Bark Hut	NPWS
Bark Hut North Mgmt Trail	3	0.5	access to Bark Hut holding dam	NPWS
The Governor Mgmt Trail	3	0.4	access to Governor walking track and repeater station	NPWS
Mount Dowe Mgmt Trail	3	0.4	links Kaputar Rd with Bundabulla Circuit	NPWS
Powerline trails	3	various	several along Kaputar Rd	Country Energy
Yulludunida Walking Track	4	2	from Green Camp to Yulludunida Crater	NPWS
Dawsons Spring Nature Trail	4	1.4	circuit track to the north around Dawsons Spring camping area	NPWS
Bundabulla Circuit	4	3	circuit track	NPWS
The Governor Walking Track	4	1	along the escarpment from the repeater station to The Governor summit	NPWS
Mt Coryah Walking Track	4	2	from Coryah Gap to the Mt Coryah summit	NPWS
Eulah Walking Track	4	0.4	from Bark Hut camping area to head of Horsearm Creek.	NPWS
Mount Kaputar Summit Walking Track	4	1	from Dawsons Spring to Mt Kaputar summit	NPWS
Lindsay Rock Tops Walking Track	4	1	from Mt Kaputar Rd to Lindsay Rock Tops	NPWS
Sawn Rocks Walking Track	4	.75	from Bingara Rd to Sawn Rocks	NPWS
Waa Gorge Walking Track	4	.75	from Waa Gorge Carpark	NPWS

* distances within Mt Kaputar National Park

1. *public road*: a good condition, formed 2-wheel drive all weather access road
2. *fire trail*: dedicated trail maintained for access to vehicles responding to fire incidents.
3. *management trail*: trail maintained for regular Service vehicle access
4. *walking track*: walk paths suitable for public access, and (in some instances) management vehicles

The declaration of three Wilderness Areas essentially precludes further permanent trail construction in large areas of the Park (under the provisions of s9. *Wilderness Act, 1987*). In other areas, new trail proposals include the investigation of boundary trails to improve protection of adjoining private property, and the linking of two trails to enhance fire fighter safety. These proposals are indicated in Table 5.2. . If suitable routes can be identified, Reviews of Environmental Factors will be prepared for their construction.

Table 5.2: Proposed trails

Name	Class	Length	Location	Action	Managed by
Foggy Dell North	2	~5 km	West of existing trail	Investigate a suitable route joining Foggy Dell North Fire Trail to a trail on <i>Box Hill</i> .	NPWS
Scutts Fire Trail	2	1 km	Mid-section existing trail, near dam and helipad.	Investigate re-routing to mitigate current erosion problems.	NPWS
Waa Gorge	2	5 km	In the vicinity of <i>The Glen</i> .	Investigate construction of boundary trail.	NPWS

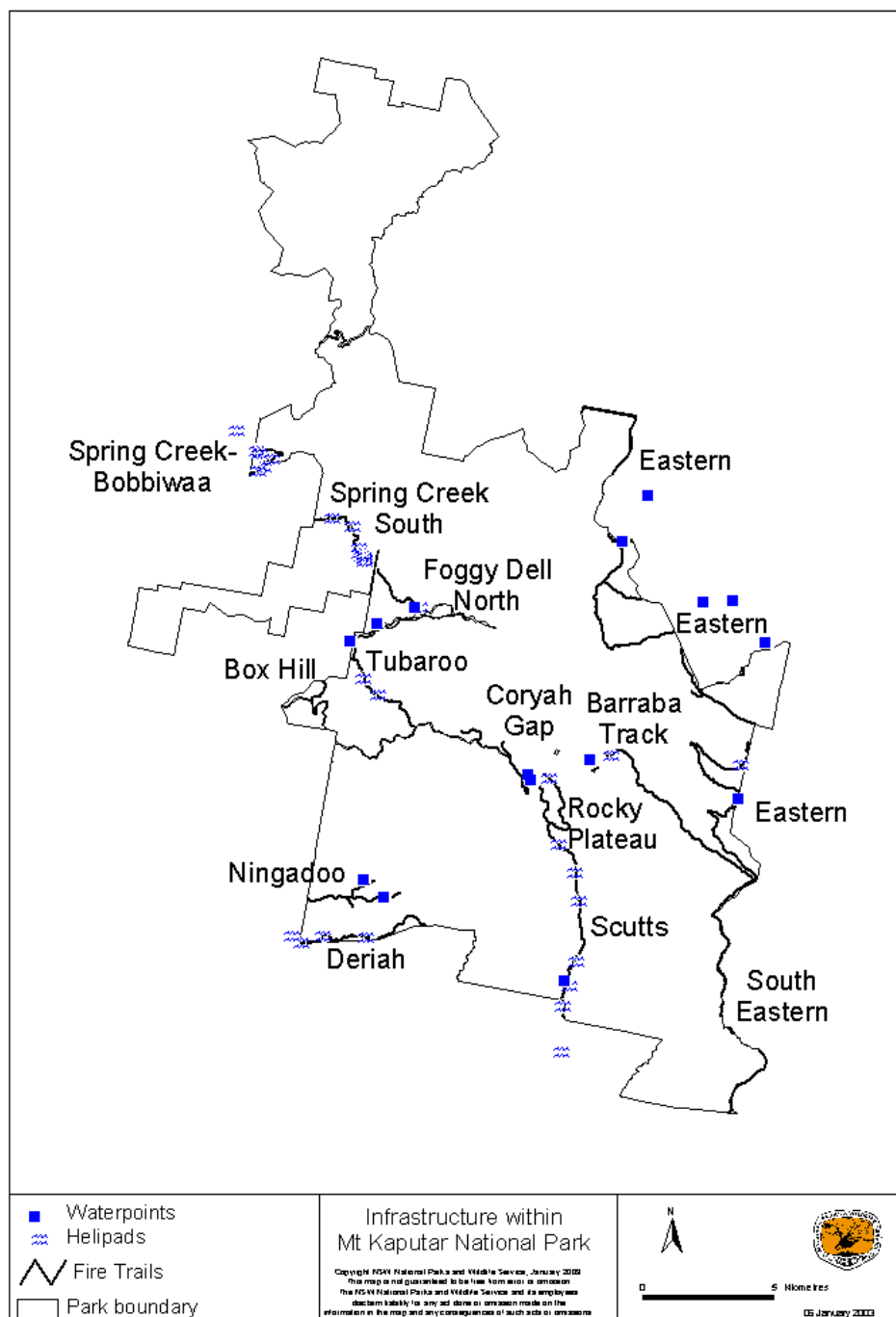


Figure 5.1 Location of fire trails, dams and waterpoints.

5.2 Fire management utilities

Fire management utilities includes infrastructure that assists in the detection and control of wildfires, and assists in fire management operations. This includes detection sites, dams and maintained water points, and helipads which are shown on Figure 5.1.

Table 5.3: Water points

Location	Grid Reference	Type	Helicopter access?
Ningadoo Management Trail	191415 199409	dam (medium) dam (medium)	yes yes
Eastern Fire Trail	331453 338513 325528 314527 282548 291566	dam dam dam dam dam	no no no no no
Scutts Trail	269381	dam (medium)	yes
Foggy Dell North Fire Trail	205519	dam (large)	yes
Bark Hut North Fire Trail	251458	dam (small)	no
Tubaroo Fire Trail	181505	dam (large)	yes
Bark Hut	252456	water tank & o/h hose	N/A
Foggy Dell depot	191512	water tank & o/h hose	N/A
Dawsons Spring camping area	274465	water tank & o/h hose	N/A

The Horton River is the only permanently flowing stream that can be relied upon to provide water for fire operations. A number of watercourses carry water after heavy rainfall in the summer months.

Narrabri Area also has an 11,000 litre portable dam (buoy wall) which can be located in numerous locations along fire trails for vehicle access, and also at identified helipads (Table 5.4) for helicopter operations.

Table 5.4: Helipads

Location	Easting	Northing	Class	Latitude	Longitude
Barraba Track	228000	6646700	1	30°16'50.926" S	150°10'20.642" E
Scutts Trail	226200	6643200	2	30°18'43.031" S	150°9'10.065" E
Scutts Trail	226900	6642200	2	30°19'16.047" S	150°9'35.306" E
Scutts Trail	227100	6641100	2	30°19'16.209" S	150°9'42.786" E
Scutts Trail	227100	6638800	2	30°21'6.528" S	150°9'39.601" E
Scutts Trail	226900	6637900	2	30°21'35.568" S	150°9'31.274" E
Scutts Trail	226700	6637100	2	30°22'1.362" S	150°9'23.040" E
Scutts Trail	226700	6635400	2	30°22'56.521" S	150°9'21.442" E
South-eastern Fire Trail	adjacent pasture		1		
Eastern Fire Trail	232900	6646600	2	30°16'58.095" S	150°13'23.746" E
Eastern Fire Trail	adjacent pasture		1		
Spring Ck-Bobbiwaa Fire Trail	213200	6658200	3	30°10'25.544" S	150°1'18.636" E
Spring Ck-Bobbiwaa Fire Trail	214000	6657500	3	30°10'52.177" S	150°1'47.729" E
Spring Ck-Bobbiwaa Fire Trail	214100	6657400	3	30°10'52.262" S	150°1'51.463" E
Spring Ck-Bobbiwaa Fire Trail	214600	6657200	3	30°10'59.173" S	150°2'9.941" E
Spring Ck-Bobbiwaa Fire Trail	214300	6656900	3	30°11'8.653" S	150°1'58.445" E
Spring Ck-Bobbiwaa Fire Trail	214100	6656700	3	30°11'14.972" S	150°1'50.782" E
Spring Ck Fire Trail	217000	6655100	3	30°12'9.325" S	150°3'37.543" E
Spring Ck Fire Trail	217800	6654800	2	30°12'19.728" S	150°4'7.137" E
Spring Ck Fire Trail	218100	6654000	3	30°12'45.935" S	150°4'17.574" E
Spring Ck Fire Trail	218300	6653600	3	30°12'59.080" S	150°4'24.661" E
Spring Ck Fire Trail	218100	6653800	3	30°12'52.424" S	150°4'17.381" E
Spring Ck Fire Trail	218200	6653700	3	30°12'55.752" S	150°4'21.021" E
Spring Ck Fire Trail	218300	6653700	3	30°12'55.835" S	150°4'24.757" E
Spring Ck Fire Trail	218300	6653500	3	30°13'2.324" S	150°4'24.565" E
Foggy Dell Nth Fire Trail	220500	6651900	1	30°13'56.067" S	150°5'45.228" E
Tubbaroo Fire Trail	218500	6649100	3	30°15'25.248" S	150°4'27.806" E
Tubbaroo Fire Trail	219100	6648500	3	30°15'45.216" S	150°4'49.654" E
Deriah Fire Trail	216300	6639200	2	30°20'44.597" S	150°2'55.961" E
Deriah Fire Trail	216700	6639000	2	30°20'51.423" S	150°3'10.729" E
Deriah Fire Trail	217500	6639300	2	30°20'42.364" S	150°3'40.946" E
Deriah Fire Trail	219100	6639300	1	30°20'43.707" S	150°4'40.797" E
Rocky Plateau Fire Trail	225700	6645700	1	30°17'21.506" S	150°8'53.716" E
Ningadoo Fire Trail	wide clearings		1		

- 1 No exposed soil or sand, ground cover short, flat landing surface at least 20x20m, good obstacle free access with gradient less than 40 degrees, No work required to be fully serviceable.
- 2 Minimal exposed soil or sand, ground cover < 1m, Minimal ground slope < 8 degrees, landing surface at least 20x20m, good obstacle free access. Minimal work required to be fully serviceable.
- 3 More than 20% exposed ground, ground cover patchy, possible slope, access requires work, available emergencies
- 4 Potential helipad, but not currently functional for any helicopter use.

6.

WORKS SCHEDULE

6.1 Biodiversity works schedule

6.1.1 Fire management research

A number of biodiversity / fire ecology research and monitoring projects have been identified for the life of this Plan, which will provide valuable information for more effective ongoing Park management. These are listed in Table 6.1.

Table 6.1: Research and monitoring projects

Fire Response Surveys

Area of Survey	Description of works	Completion
Jokers Spring HAMZ	<ul style="list-style-type: none"> Establish vegetation monitoring sites following 2001-02 prescribed burns. Undertake post-fire surveys.	<ul style="list-style-type: none"> March 2003 ongoing
Pound Mountain HAMZ	<ul style="list-style-type: none"> Establish vegetation monitoring sites following prescribed burns. Undertake post-fire surveys.	<ul style="list-style-type: none"> September 2003 ongoing
Sub-alpine community	Undertake a prescribed burn in portion of specified community and (post burn) undertake bi-annual species composition and structure surveys to determine response.	Burn: Surveys: ongoing
Dry Heathland community	As above	Burn: Surveys: ongoing
Dry rainforest	Undertake post-fire surveys.	If opportunity due to wildfire

Fire Ecology Literature Reviews

Area of Survey	Description of works	Completion
Riparian communities	Undertake literature review of fire ecology in specified community and consider further detailed assessment following completion of vegetation surveys.	2003
Dry Rainforest	As above	2003

Threatened Species Survey

Area of Survey	Description of works	Completion
Fauna	Surveys in known localities of threatened species assessing population size and significant changes to habitat.	Ongoing
Flora	As above	Ongoing

An annual research report will be prepared, and submitted to Bush Fire Management Committees and NPWS Regional Manager.

6.1.2 Fire mapping and database management

Records of all known wildfires in and adjacent to the current Park area are maintained in the Narrabri Area Office. These records are maintained as paper documents and maps, and computer databases and digitised maps. All known fire boundaries have been recorded in a geographic information system. This will be updated following any fires.

Databases are kept detailing all strategic works including fire trail maintenance and asset protection works including prescribed burns and radiation zone slashing.

6.1.3 Monitoring fuel

The monitoring of fuel levels and fire effects is conducted to ensure that the objectives for

asset protection and heritage management are achieved.

Permanent monitoring sites will be established in asset protection, strategic management and cultural heritage management zones to determine fuel loadings and hazard reduction priorities. Temporary monitoring sites may be established in areas where wildfires have occurred, and the fire effects recorded.

6.1.4 Monitoring fire regimes and changes to biodiversity

Permanent vegetation monitoring quadrats are being established on a progressive basis to gather baseline data on the vegetative composition of the Park. These sites will then be used to monitor vegetation responses and changes in biodiversity in differing fire regimes.

Fuel accumulation, flora and fauna monitoring, will be undertaken at 6 months, 1 year, then annually up to 5 years after fire, then at five-yearly intervals. Timing may be amended slightly to take advantage of spring flowering.

6.2 Operations Works Schedule

6.2.1 Prescribed burning

Table 6.2 specifies the program for prescribed burning for asset protection, strategic fire management and heritage management.

This schedule can only provide an indication of the priority and the areas planned to be burned for the period 2003 to 2007. The ability of the Service and assisting organisations to implement each planned burn will be affected by seasonal conditions and wildfires. Reviews of Environmental Factors will be completed for each proposed activity.

Burn Unit Name	Zone # (ref app 2)	Objective	~ size (ha/km)	Scheduled completion	Last fire
Sub-alpine	HAMZ 14	Undertake prescribed burn to assess species response on Mount Mitchell/Camels Hump.	open ended	2003	1985-86
Middle Creek	SFMZ 11	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	3.5		no records of fire
Rusden	SFMZ 10	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	3		1985-86
Darthula	SFMZ 1	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	4.5 (+)		1985-86
Horton Valley	HAMZ 13	Introduce fire into an community nearing maximum threshold and afford protection for neighbouring property.	1000	2004	22 ha 1984/85; most 1974/75
Sawn Rocks	APZ 4	Asset protection works.	+		1995/96; 1992/93
Dry heathland	*	Undertake prescribed burn to assess species response.	+		

Table 6.2: Proposed prescribed burning activity (2003-2007)

Coryah	SFMZ 5	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	1.6		1985/86	
Cow Creek	HAMZ 21	Introduce fire into a community nearing maximum threshold and afford protection for neighbouring property.	1300		no records of fire	Amore Hill
Spring Creek	SFMZ 12	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	3.8		1974/75	SFMZ 2
Amore Hill	SFMZ 2	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	4.3		1974/75	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.
Scutts West	HAMZ 20	Introduce fire into a community nearing maximum threshold and with low fire frequency.	+	2005	1985/86	Eulah
Grattai East	HAMZ 2	Introduce fire into a community nearing maximum threshold.	+		1984/85	HAMZ 19
Killarney Gap (north)	HAMZ 6	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	3.0		1971/72	Doyles Peak
Kaputar	SFMZ 7	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	0.8		1974/75	HAMZ 8
Tubaroo	SFMZ 4	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	5.0		1974/75	Introduce fire nearing maximum threshold and afford protection for neighbouring property.
Yulludunida	HAMZ 14	Introduce fire into a community nearing maximum threshold and provide buffer from neighbouring property.	+	2006	1985/86	Hollowforth
Bullawa	HAMZ 12	Introduce fire into a community nearing maximum threshold and provide buffer from neighbouring property.	+		1974/75	SFMZ 3
Scutts	SFMZ 6	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	1.5		1974/75	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.
Killarney Gap (south)	HAMZ 7	Burning to compliment trail, boundary clearing or fuel reduced area to provide strategic control and containment advantage.	3.0		1971/72	Waa Gorge

Total area of HAMZ/SFMZ will not be burnt in a single prescribed burn.
 * HAMZ for dry heathland burn yet to be determined.
 + Further planning required to ascertain more accurate size of probable burn area.

6.2.2 Fire radiation zones

Fire radiation zones, primarily located around Asset Protection Zones (utilities and infrastructure) and Special Area Management Zones (cultural sites) will be periodically assessed and maintained according to the individual requirements of each site and the nature of the threat to that site from fire.

Such works will require the removal of a litter

and shrub layer to a specified distance from the site in question. In most cases, the manual removal of material utilising chainsaws, brushcutters and rakehoes will be the preferred method, however the application of herbicides may be beneficial in some cases.

6.2.3 Summit area radiation zone

Develop and implement an Asset Protection Plan for the Mount Kaputar / Mount Dowe summit area that minimises impact on the sub-alpine vegetation, while providing asset protection. A Review of Environmental Factors will be completed for the Asset Protection Plan.

6.2.4 Management of Asset Protection Zones and Special Area Management Zones

Table 6.3 outlines specific management action to be taken for the protection of various assets.

Table 6.3: Management of APZ and SAMZs.

APZ Name	Maintenance requirement	Maintenance cycle
The Governor (towers)	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs prescribed burn 	<ul style="list-style-type: none"> annual 3-yearly if fuel loads exceed 8 t/ha
Scutts Hut	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs prescribed burn 	<ul style="list-style-type: none"> annual 3-yearly if fuel loads exceed 8 t/ha
Sawn Rocks	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs prescribed burn 	<ul style="list-style-type: none"> annual 3-yearly if fuel loads exceed 8 t/ha
Bark Hut	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs prescribed burn 	<ul style="list-style-type: none"> annual 3-yearly if fuel loads exceed 8 t/ha
SAMZ Name	Maintenance requirement	Maintenance cycle
Scutts Hut	<ul style="list-style-type: none"> monitor fuel loads slash prescribed burn 	<ul style="list-style-type: none"> annual annual if fuel loads in slopes surrounding cleared area exceed 8 t/ha
Koala Hut	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs prescribed burn 	<ul style="list-style-type: none"> annual 3-yearly if fuel loads exceed 8 t/ha
Chinese fence	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs and litter to 5m 	<ul style="list-style-type: none"> annual selected sections annually to complete cycle over 3 years
Ningadoo woolshed	<ul style="list-style-type: none"> monitor fuel loads slash 	<ul style="list-style-type: none"> annual subject to fuel load and season
Euglah Springs surveyor's tree	<ul style="list-style-type: none"> monitor fuel loads mechanical removal of shrubs 	<ul style="list-style-type: none"> annual 3-yearly

6.3 Infrastructure Works Schedule

6.3.1 Fire management access and utilities

Fire trails and utilities are assessed annually, prior to the commencement of the fire season (October 1). Detailed descriptions of each trail and annual assessments are maintained in the *Fire Trail Register*, held in the Area office. Subsequently, recommendations are made for the maintenance of trails, water points and helipads, based on:

- specific requirements;
- failures and maintenance requirements;
- advances in technology;
- budget allocations; and
- other Area priorities.

A specific project will be to mark the locations of containment lines used in the 1986 fires near Curramanga and Stony Gully Creeks with blue reflectors to speed up the process of developing containment lines in an emergency.

Install a large water tank and pump fed from Horton River to provide a water supply for initial response.

Investigate developing a Memorandum of Understanding with neighbours regarding construction and use of dams on property in strategic locations neighbouring the Park.

Permanent waterholes on creeks will be evaluated for access for fire-fighting vehicles, portable pumps and helicopters, including downstream from Waa Gorge, Curramanga Creek and Horton River.

Identify which of the Ningadoo dams to maintain.

6.3.2 Fire management facilities

Currently, the Narrabri Area holds and maintains a satisfactory level of equipment in order to undertake Class 1 and 2 wildfire response and carry out prescribed burning. Further items needed at short notice can be supplied from NPWS out of area support, other local fire agencies or by contracted services. A register of out of area equipment availability is maintained by NPWS ParkOps, and contract equipment by the Area Office.

Area equipment is inventoried annually, prior to the fire season and documented in the *Equipment Strategy*, held in the Area Office. Subsequently, recommendations are made for the acquisition of new equipment, based on:

- specific requirements;
- failures and maintenance requirements;
- advances in technology;
- budget allocations; and
- other Area priorities.

6.3.3 Summary of Works to be undertaken annually.

Task	Description	Completion
Fuel monitoring	Monitor fuel accumulation and record on GIS	July 31 December 31
Priority list for prescribed burns	Priority list of all prescribed burns, priorities, objectives, justifications, areas, vegetation communities etc. submitted to Area Manager.	Spring: July 31 Autumn: Dec 31
Review Equipment Strategy	Undertake full inventory of fire fighting equipment, and identify repairs and new purchases required.	August 30
Review and update Incident procedures and contact lists	Update booklet detailing incident procedures and contact lists.	August 30
Fire Trail Assessment	Thorough assessment of all fire trails, helipads and water points.	September 30
Review fire trail strategy	Update trail descriptions and detail priority list of fire trail maintenance.	September 30
Prescribed burning	As per Plan, nominations, REFs and weather conditions, undertake prescribed burning as required.	Per weather conditions
Fire trail maintenance	Ensure effective spending of Area fire trail budget in maintaining access of priority trails.	Preferably pre-season
Review lists of contractors	Check all details of potential contractors for earth moving and aerial work.	September 30
Review training needs	Assess Area requirements for training, particularly remote area fire techniques.	September 30
Pre-season fire refresher training	Refresher training for staff, equipment check and maintenance.	September 30
Bushfire Field Day	Cross-agency field day	Spring

7. PLAN ADMINISTRATION

7.1 Management of works

The works programmed for the next five years will be identified in as broad objectives in Operations Plans prepared by the Cunningham Zone (Barraba, Bingara), Moree Plains and Narrabri Bush Fire Management Committees.

An annual report on the works will be submitted to Cunningham Zone (Barraba, Bingara), Moree Plains and Narrabri Bush Fire Management Committees, and NPWS Regional Manager.

7.2 Environmental assessment of scheduled works

Reviews of Environmental Factors (REF) will be prepared as required by Part 5 of the *Environmental Planning and Assessment Act 1979*. Where an REF indicates that a significant impact is likely, an Environmental Impact Statement (EIS) will be prepared.

REFs will be prepared by Narrabri Area staff, and assessed by the Northern Plains Regional Manager, or Western Directorate Conservation Programs and Planning Division where impacts on threatened species or cultural heritage are likely.

7.3 Plan review

To ensure that regular reviews are undertaken, the Mount Kaputar National Park Fire Management Plan has an operational span of 5 years. The Plan will be reviewed at the end of the period in the light of increased knowledge of fire management and any changes to the Park's management priorities.

The works component of the Plan will be reviewed annually.

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APPENDIX 1

Definitions and principles

Most definitions described below come from the Australian Fire Authorities Council (AFAC) Glossary of Rural Fire Terminology (March 1996).

Aerial Detection	Reconnaissance and reporting of fires from aircraft.
Aspect	The direction towards which a slope faces, eg north-east. Slopes on a west to north-westerly aspect are the most hazardous during fire fighting operations.
Assets at Risk	The natural resources or improvements that may be jeopardised if a fire occurs. Examples include: threatened species habitat, rainforests, forestry coupes, human built structures or infrastructures, park information signs, transmission poles, water catchment quality etc. and may also include scenic values.
Backburning	A fire started intentionally along the inner edge of a fireline to consume the fuel in the path of a wildfire.
Buffer	A strip or block of land on which the fuels are reduced to provide protection to surrounding lands.
Burning Program	A series of prescribed burns scheduled for a designated area over a nominated period of time.
Bush Fire Management Unit (FMU)	Management areas of a variable size that define containment blocks in the event of a wildfire. Alternatively they have also been designated as areas of specific ecosystem types defined by management authorities in order to monitor the long term effects of fire upon those areas.
Bush Fire Management Zone (BFMZ)	Management areas (usually sub-sets of fire management units) where a specified fire management operational objective, strategy and performance indicator has been developed to mitigate against the threat of a wildfire.
<i>special note about the above: an FMU is usually a monitoring and containment block whilst a BFMZ is a sub-unit of an FMU where fire managers undertake activities such as prescribed burning, in order to achieve a set outcome (such as provide protection or slow the advance of a wildfire) for a whole FMU or suite of FMUs.</i>	
Byram-Keetch Drought Index (BKDI)	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation, and expressed as a scale from 0 - 200 points. When 100 points has been reached in an area, that area is said to be in drought.
Coarse Fuels	Dead woody material, greater than 25mm in diameter, in contact with the soil surface (fallen trees and branches).
Controlled Burning	<i>see Prescribed Burning.</i>
Crown Fire	A fire burning in the crowns of trees and usually supported by fire in ground fuels. It is a fast travelling fire that usually consumes all available fuels in its path.
Drought Index	A numerical value, such as the Byram-Keetch Drought Index, reflecting the dryness of soils, deep forest litter, logs and living vegetation.
Ecosystem	The interacting system of a biological community, both plant and animal, and its non living surroundings
Edge Burning	A term used to describe perimeter burning of an area in mild conditions prior to large scale prescribed burning. This practice is used to strengthen buffers and to reduce mop-up operations.
Elevated Fuels	The standing and supporting combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, bark and creepers.

Fine Fuels	Grass, leaves, bark and twigs less than 6mm in diameter.
Fire	The chemical reaction between fuel, oxygen and heat. Heat is necessary to start the reaction and once ignited, fire produces its own heat and becomes self-supporting. Removal of any one of the three elements of fuel, oxygen and heat will extinguish a fire.
Fire Behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography. Changes in any of these variables with result in a change in the fires behaviour.
Fire Break	Any natural or constructed discontinuity in a fuel bed used to segregate, stop and control the spread of a wildfire, or to provide a fireline from which to suppress a fire.
Fire Extent	<p>The area burnt by a wildfire, measured in hectares. Within that area there will be "islands" of unburnt vegetation (these islands are generally included in the total fire extent).</p> <p><i>NB: it is preferable that the fire affects only part of a vegetation community at any one time so that nearby areas of more mature plants may provide a seed source for recolonisation and animals will have suitable unburnt habitat in order to seek shelter and forage.</i></p>
Fire Front	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.
Fire Intensity	The rate of energy released per unit length of fire front. This is usually expressed as kilowatts per metre (kW/m).
Fire Management	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives.
Fire Perimeter	The entire outer boundary of a fire area.
Fire Regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning (season in this context refers to the time of the year in which the fire occurred). It may also include proposals for the use of fire in a given area.
Fire Season	<p>The period(s) of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control. In New South Wales the core fire season is from 1st October to the 31st March of the following year.</p> <p><i>At the regional scale, the season may be introduced or extended by one month dependant upon the prevailing weather conditions, drought indices and number of wildfires that may already be burning within that area.</i></p>

Fire Storm	Violent convection caused by a large continuous area of intense fire; often characterised by destructively violent surface indrafts, a towering convection column, long distance spotting, and sometimes by tornado-like whirlwinds.
Flame Height	The vertical distance between the tip of the flame and ground level, excluding higher flame flashes. Expressed in vertical metres.
Fuel	Any material such as grass, bark, leaf litter and living vegetation which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare of dry weight. <i>Available fuel</i> is the amount of fuel that will actually burn in a fire and varies according to moisture content, fuel size and arrangement, fire duration and intensity. <i>Total fuel</i> is the quantity of fuel which will burn under the driest seasonal conditions with the highest intensity fire.
Fuel Arrangement	A general term referring to the horizontal and vertical arrangement of fuel in a given area.
Fuel Bed	The arrangement and vertical profile of all readily combustible materials lying on the ground.
Fuel Load	The oven dry weight of fuel per unit area. Commonly expressed as tonnes per hectare.
Fuel Management	Modification of fuels by prescribed burning, manual removal, slashing, grazing, or other means. The objective is to reduce the fuel thereby reducing the risk posed by a wildfire.
Fuel Type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause predictable rate of spread or difficulty of suppression under specified weather conditions.
Habitat	A physical portion of the environment that is inhabited by an organism or population of organisms. A habitat is characterised by a relative uniformity of the physical environment and fairly close interaction of all the biological species involved. <i>Organisms within the a given habitat will express a level of co-dependancy upon one-another. The loss of the physical characteristics of a given habitat can have sever and long term detrimental effects upon the organisms living in that habitat.</i>
Hazard Reduction	<i>see Fuel Management</i>
Island	An unburnt area within a fire perimeter. Numerous islands, contribute to a mosaic of unburnt areas, and are critical for species survival and recruitment after a wildfire event.
NPWS	The National Parks and Wildlife Service of New South Wales.
NSWFB	The New South Wales Fire Brigades.
Prescribed Burning	The controlled application of fire under specified environmental and weather conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives.
RFS	The Rural Fire Service.
Rate of Spread	The forward progress per unit time of the head of the fire or another specified part of the fire perimeter.
Service, the	The National Parks and Wildlife Service of New South Wales.
SF	State Forests of New South Wales.
Scorch Height	The height above ground level up to where foliage has been browned by a fire. This height is roughly four times the actual flame height of the fire.
Slip-on Unit	A fire fighting unit that can be placed on to the back of a four wheel drive vehicle to convert it to a fire tanker. <i>Depending upon the water carrying capacity of the unit, a four wheel drive tray top vehicle could be converted to Category 2,7 or 9 fire tankers in a very short space of time.</i>

Spot Fire	Isolated fires started ahead of the main fire by sparks, embers or other ignited material, sometimes to a distance of several kilometres.
Striker	A small four wheel drive fire tanker capable of carrying from 400 to 600 litres of water for fire fighting purposes. Also known as a Category 9 Fire Tanker.
Structural Fire	A fire burning part, or all of any building, shelter, or other human made construction.
Tanker	A mobile firefighting vehicle equipped with a water tank, pump, and the necessary equipment for spraying water and/or foam. <i>Under NSW Dept. of Rural Fire Service guidelines, bushfire fighting tankers have been designated into nine 'Categories' delineating water carrying capacity and whether the unit is two or four wheel drive capable.</i>
Topography	The surface features of a particular area or region, ie the lay of the land, and includes mountains, rivers etc.
Unplanned Fire	<i>see Wildfire</i>
Urban/Rural Interface	The line, area, or zone where structures and other human development adjoin or overlaps with undeveloped bushland. Also known as the urban/bush interface, urban interface or just the interface.
Wildfire	An unplanned fire. A generic term which includes grass fires, forest fires and scrub fires.

APPENDIX 2 Fire Zone Specifications

Zone	Sub-Zone (if applicable)	Suppression Objective	Prevention & Mitigation Objectives	Strategies (Methods)	Width
Asset Protection	at present no sub-zones	to protect residential areas, utilities, camping areas, day use areas, urban interface, cultural heritage assets, etc.	to instigate, where appropriate, community education and community fireguard programmes	fuel managed by slashing, selective shrub clearing, burning, construction of radiation barriers or trail construction	as per NSW Rural Fire Service (2001)
Strategic Fire Management	Strategic Wildfire Control	<ul style="list-style-type: none"> to assist in the strategic control and containment of wildfires. to reduce wildfire intensity and spotting intensity 	promotion of the NPWS fire management and fuel management activities	<ul style="list-style-type: none"> burning suppress or contain fires inconsistent with the fire prescription fuel managed by slashing, selective shrub clearing, construction of radiation barriers or trail construction 	100-3000 metres
Heritage Area Fire Management (Land Management)	Special Area Management	to prevent permanent damage or destruction of natural or heritage items, areas, values or assets by an inappropriate fire regime	promotion of awareness of the special values requiring protection in these areas	<ul style="list-style-type: none"> burning suppress or contain fires inconsistent with the fire prescription (may include mechanical methods for heritage sites) 	appropriate for the protection of the heritage item
	Heritage Area Management	to apply fire prescriptions consistent with broad area objectives or relevant statutes	promotion of awareness of the special values requiring protection in these areas	<ul style="list-style-type: none"> burning suppress or contain fires inconsistent with the fire prescription 	variable
Fire Exclusion	at present no sub-zones	to rapidly suppress all fires that occur within this zone for the duration of the zones existence	promotion of awareness of the values threatened by any potential fire that will occur within the lifetime of this zone's existence	<ul style="list-style-type: none"> rapid suppression of all fires 	variable

APPENDIX 3 FIRE MANAGEMENT ZONE PROFILES

ASSET PROTECTION ZONES (Visitor nodes and utilities)

APZ No.	Name	Behaviour potential	Freq.	Last fires	Vegetation community	GR
1	Dawsons	Low – Med	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest and woodland	227
2	Bark Hut	Low – Med	Three	1985-86, 1974-75, 1951-52	Moist tall open forest	225
3	Green Camp	Med – High	Two	1985-86, 1974-75	Dry open forest and woodlands	219
4	Sawn Rocks	Med – High	One	1971-72	Dry open forest and woodlands	216
5	Corrunbra Borawah	Low - Med	Three	1974, 1957, 1951	Dry open forest and woodlands	225
6	Waa Gorge	Med – High	Three	1984-85, 1957-58, 1937-38	Dry open forest and woodlands	220
7	Info. Bay	High	One	1985-86	Dry open forest and woodlands	216
8	Mt Dowe	Med – High	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest and woodland	227
9	Governor (towers)	Low - Med	Three	1974-75, 1957-58, 1951-52	Dry open forest and woodlands	226

* Threatened flora

- 1 *Boronia rubiginosa*
- 2 *Cadellia pentastylis*
- 3 *Discaria pubescens*
- 4 *Diuris aequalis*
- 5 *Eucalyptus nandewarica*
- 6 *Eucalyptus rubida* ssp. *barbidgerorum*
- 7 *Euphrasia orthocheila*
- 8 *Gonocarpus longifolius*
- 9 *Haloragis exalata* ssp. *exalata*
- 10 *Macrozamia stenomera*
- 11 *Muehlenbeckia costata*
- 12 *Phebalium viridiflorum*
- 13 *Prostanthera cruciflora*
- 14 *Pterostylis longicurva*

Threatened fauna

- 1 *Calyptorhynchus banksii*
- 2 *Certionyx variegatus*
- 3 *Chalinolobus dwyeri*
- 4 *Climacteris picumnus*
- 5 *Dasyurus maculatus*
- 6 *Grantiella picta*
- 7 *Lathamus discolor*
- 8 *Litoria booroolongensis*
- 9 *Lophoictinia isura*
- 10 *Macrotis lagotis*
- 11 *Melanodryas cucullata*
- 12 *Melithreptus gularis*
- 13 *Miniopterus australis*
- 14 *Miniopterus schreibersii*
- 15 *Neophema pulchella*
- 16 *Petaurus australis*
- 17 *Petaurus norfolcensis*
- 18 *Petrogale penicillata*
- 19 *Phascogale cinereus*
- 20 *Pomatostomus temporalis*
- 21 *Pyrrholaemus sagittatus*
- 22 *Saccolaimus flaviventris*
- 23 *Stagonopleura guttata*
- 24 *Underwoodisaurus sphyrurus*

For Visitor Facilities (APZ nos. 1-7):

Suggested Fire Management Objectives

- To protect Park visitors and visitor facilities (cabins, shelters, toilets, tables recycling stations, etc.) at listed visitor nodes.
- To reduce hazard in the vicinity of visitor nodes sufficient to establish a safe area/refuge, if required.

Suggested Fire Management Strategies

- Maintain radiation zones around structures, camp-grounds and facilities by manual and/or mechanical removal of shrubs, litter and other flammable debris.
- Ensure adequate infrastructure (extinguishers, water availability, fire unit response ability) and access for effective fire fighting.
- Undertake annual maintenance of buildings to reduce potential ignition from embers.
- Hazard reduce fuels in the broader vicinity.

Suggested Fire Suppression Strategies

- Priority response
- Immediately account for and establish safe area / refuge or evacuate visitors.
- Close all walking tracks and roads to public access in the vicinity.
- Priority suppression to those fires / areas of fire threatening structures.
- Preference given to minimum impact techniques.
- Use of foam and wetting agents permitted with approval of OIC.
- Earth moving machinery used only with appropriate consideration to visual impacts and approval of OIC.

Following containment:

- Black-out to minimum 100 metre of perimeter of visitor precinct.
- Maintain active patrol until fire can be declared 100% safe.

For Utilities (APZ nos. 8&9): [As per Visitor Facilities (APZ nos. 1-7), where applicable, and:]

Suggested Fire Management Objectives

To provide protection for utility infrastructure at Mount Dowe and The Governor.

Suggested Fire Management Strategies

Liaise with managing authority on appropriate management of radiation zones.

Suggested Fire Suppression Strategies

Notify managing authority ASAP when wildfire in general locality of zone.

SPECIAL AREA MANAGEMENT ZONES (Cultural sites)

Grid references are maintained on a database at the Area Office.

SAMZ No.	Name	Behaviour potential	Frequency	Last fires	Vegetation com
20-12	Shelter with deposit	Low-Med	Two	1985-86, 1974-75	Shrublands
20-13	Shelter with deposit	Low-Med	Two	1985-86, 1974-75	Shrublands
20-14	Scarred tree	Low-Med	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest
20-15	Scarred tree	Low-Med	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest
20-20	Open camp site	Med-High	Three	1984-85, 1957-58, 1937-38	Sub-alpine forest
20-21	Shelter with deposit	Med-High	One	1971-72	Dry open forests
20-22	Shelter with deposit	Med-High	One	1971-72	Dry open forests
20-25	Open camp site	Med-High	Three	1995-96, 1992-93, 1971-72	Dry open forests
20-26	Shelter with deposit	Low-Med	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest
38-01	Scutts Hut and associated	Med	One	1974-75	Dry open forests
38-02	Scutts Trail	Var.	Two	1985-86, 1974-75	Open forests and
38-03	Koala Hut	Med	One	1985-86	Open forests and
38-04	Chinese Fence	Med	Two	1974-75, 1951-52	Open forests and
38-05	Stony Gully Troughs	High	Three	1984-85, 1957-58, 1937-38	Acacia shrubland
38-06	Stony Gully Tributary Troughs	High	Three	1984-85, 1957-58, 1937-38	Dry open forests
38-08	Bundaleer Homestead	Med-High	Four	1985-86, 1974-75, 1957-58, 1951-52	Dry open forests
38-09	Ningadoo Woolshed	Grass	None	-	Grass
38-10	Hartley Ck Mine Shaft	High	Four	1985-86, 1974-75, 1957-58, 1951-52	Dry open forests
38-11	Bark Hut logging area	Low-Med	Twice	1974, 1951	Moist Tall Open
38-12	Green Camp troughs	High	None	-	Dry open forests
38-14	Euglah Springs Surveyor's tree	Med	Two	1974-75, 1951-52	Open forests and
16	Ningadhun Engravings	Med-High	Once	1974	Dry open forests
17	Tubaroo trough	Grass	None	-	Grass
19	Foggy Dell Woolshed	Grass	None	-	Grass
20	Mt Grattai Trig Station	Med-High	Three	1984-85, 1957-58, 1937-38	Acacia shrubland
21	Mt Kaputar Trig Station	Low-Med	Three	1974-75, 1957-58, 1951-52	Sub-alpine forest
22	Mt Ningadhun Trig Station	Med-High	Two	1985-86, 1974-75	Dry open forests
23	Yulladunida Trig Station	Low-Med	Three	1985-86, 1974-75, 1957-58	Shrublands
24	Mt Borawah Trig Station	Low-Med	Three	1974, 1957, 1951	Open forests and
25	Camel Hump Trig Station	Low-Med	Two	1985-86, 1974-75	Shrublands
26	Mt Waa Trig Station		Two	1957-58, 1937-38	Shrublands

Suggested Fire Management Objectives

- To prevent permanent damage or destruction of cultural heritage items by an inappropriate fire regime.
- To prevent permanent damage or destruction of cultural heritage items by inappropriate use of fire related equipment and machinery.

Suggested Fire Management Strategies

- Maintain radiation zones around cultural heritage sites by manual and/or mechanical removal of shrubs, litter and other flammable debris.
- Undertake annual maintenance of buildings to reduce potential ignition from embers.
- Hazard reduce fuels in the broader vicinity.
- Maintain master map and register to locate sites and prevent their destruction during suppression works.
- Management of heritage items may be subject to an independent management or conservation plan.

Suggested Fire Suppression Strategies

- Exclude fire operations likely to negatively impact upon site.
- Brief personnel involved in control line construction on the location of sites, as

- appropriate, and nominated control line route to avoid site/s.
- Give preference to minimum impact suppression techniques.
- Use of fire fighting chemicals only where no resultant damage to site.
- Earth moving machinery used only with appropriate consideration to broader HAMZ specifications and specifically with regard to preservation of cultural site.
- Appropriate rehabilitation works will be undertaken post-fire.

STRATEGIC FIRE MANAGEMENT ZONES (Strategic wildfire control)

SFMZ No.	Name	length (km.)	Behaviour potential	Frequency	Last fires	Vegetation com
1	Darthula	1.5	Low-Med	None	-	Open forests and
2	Amore Hill	1.8	Med-High	Three	1974, 1957, 1951	Open forests and
3	Hollowforth	4.5	Med-High	Four	1996, 1974, 1957, 1951	Open forests and
4	Tubaroo	5.0	Med-High	Two	1974, 1957	Dry open forests
5	Coryah	1.6	Low-Med	Two	1974, 1951	Open forests and
6	Scutts	5.3	Low-Med	Two	1974, 1951	Open forests and
7	Kaputar	0.8	Low-Med	Three	1974, 1957, 1951	Sub-alpine forests
8	Wongala	3.5	Low-Med	One	1974	Open forests and
9	Deriah	3.3	Med-High	None	-	Dry open forests
10	Rusden	3.8	Med-High	None	-	Dry open forests
11	Middle Ck.	2.0	Med-High	None	-	Dry open forests
12	Spring Ck.	3.8	Med-High	Two	1974, 1957	Dry open forests

Suggested Fire Management Objectives

- To reduce wildfire intensity and spotting distance.
- To facilitate protection and conservation in other zones.
- To manage fuels for the strategic containment of wildfires.
- To reduce the risk of ignition and/or spread in identified high ignition localities.

Suggested Fire Management Strategies

- Burn off existing roads or boundary clearings (to 100-3000 metres) where a combination of trail, clearing and hazard reduction can significantly increase efforts to contain wildfire before entering/exiting Park, or continuing to affect significant portion of the Park.
- Maintain trails and boundary clearings to standards suitable for use as burning control lines and access.
- If possible (and not in conflict with suppression objectives) it is desirable to meet minimum thresholds of suggested fire regimes to maintain biodiversity.

Suggested Fire Suppression Strategies

- Knowledge of the age and potential effectiveness (given wildfire conditions) of SFMZs may assist the fire manager in planning the containment of wildfires.

Summary Table of HERITAGE AREA MANAGEMENT ZONES

HAMZ No.	Name
1	Mt Waa
2	Grattai East
3	Gins
4	Grattai West
5	Mt Lawler
6	Killarney
7	Spring Creek
8	Doyles Peak
9	Number 76
10	Pound Mountain
11	Foggy Dell
12	Bullawa
13	Horton
14	Yulludunida
15	Euglah Rock
16	Mount Dowe
17	Jokers Spring
18	Ningadoo
19	Eulah
20	Scutts West
21	Horsearm

Suggested Fire Management Objectives

- To manage bushfires to meet the conservation needs of species that may be at risk of long-term damage as a result of inappropriate fire management.

Suggested Fire Management Strategies

- Implement prescribed burning based on an assessment of fire risk and fire frequency.
- Suppress fires inconsistent with the suggested fire prescription.
- Promote awareness of special values requiring protection in the park.
- Species recovery plans have not yet been developed for threatened species.
- Fire management strategies will be in accordance with any relevant fire management plans.

Suggested Fire Suppression Strategies

- Suppress all unplanned fires ignited by human causes.
- For natural ignitions, assess fuel levels, fire history, drought conditions and short term forecast for likelihood of fire extinguishing rain; if HIGH probability – develop and implement suppression strategy; if LOW probability – develop and implement suppression strategy; if MEDIUM probability – develop and implement suppression strategy.
- Where time since fire is below the lower threshold, minimise suppression.
- Where time since fire is approaching or exceeding upper threshold, develop and implement suppression strategy.
- Brief relevant personnel on the location of known threatened species.
- Minimise use of earth moving machinery and fire fighting equipment in the park.

conditions in Table 4.4.

MT WAA HERITAGE AREA MANAGEMENT ZONE**HAMZ-1**

Characteristics of Zone								
size in hectares *				% within Park			number of dwellings	
174				100			0	
bushfire behaviour potential (% area)				higher ** 25%		medium 25%	lower 50%	negligible -
% of zone burned at various frequencies		unburned	once	2 times 37%	3 times 63%	4 times	5 times	>5 times
year of last three fires and % zone burned			1984-85 (63%)		1957 (100%)		1937 (100%)	
Number of hectares and fire regime of each vegetation community present								
Structural Vegetation class		regime ***		ha.*	Structural Vegetation class		regime	ha.
Moist Forest		b		14	Heath		d	71
Dry Forest		c		89				
Threatened species		endangered plants 12				endangered fauna		

* hectares may not always tally due to rounding.

** the descriptors 'higher', 'medium', 'lower', 'negligible' bushfire behaviour potential are relative indicators of fire intensity and therefore suppression within a HAMZ.

*** regime refers to Table 2.1.

GRATTAI EAST HERITAGE AREA MANAGEMENT ZONE**HAMZ-2**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
2136			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 50 %	lower 0 %	negligible -	
% of zone burned at various frequencies	unburned 1 %	once 7 %	2 times 12 %	3 times 79 %	4 times 0.4 %	5 times -	>5 times -	
year of last three fires and % zone burned		1988-89 (0.07%)			1984-85 (82%)		1982-83 (0.4%)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		165	Heath		d		15
Dry Forest	c		1942					
Threatened species	endangered plants 13				endangered fauna			

GINs MOUNTAIN HERITAGE AREA MANAGEMENT ZONE**HAMZ-3**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
893			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 25 %	lower 25 %	negligible -	
% of zone burned at various frequencies	unburned -	once -	2 times -	3 times 45 %	4 times 55 %	5 times -	>5 times -	
year of last three fires and % zone burned		1984-85 (100 %)			1971 (55 %)		1957 (100 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		101	Heath		d		94
Dry Forest	c		691					
Threatened species	endangered plants				endangered fauna			

GRATTAI WEST HERITAGE AREA MANAGEMENT ZONE**HAMZ-4**

Characteristics of Zone										
size in hectares				% within Park			number of dwellings			
607				100			0			
bushfire behaviour potential (% area)				higher 75 %		medium 25 %		lower -		negligible -
% of zone burned at various frequencies		unburned -	once -	2 times		3 times 26 %	4 times 74 %		5 times -	>5 times -
year of last three fires and % zone burned			1984-85 (87 %)			1971 (87 %)			1957 (100 %)	
number of hectares and fire regime of each vegetation community present										
Structural Vegetation class		regime		ha.	Structural Vegetation class		regime		ha.	
Moist Forest		b		79	Heath		d		8	
Dry Forest		c		586						
Threatened species		endangered plants				endangered fauna				

MT. LAWLER HERITAGE AREA MANAGEMENT ZONE**HAMZ-5**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
343			100			0		
bushfire behaviour potential (% area)			higher 25 %		medium 50 %	lower 25 %		negligible -
% of zone burned at various frequencies	unburned -	once 2 %	2 times 10 %	3 times 82 %	4 times 5 %	5 times -	>5 times -	
year of last three fires and % zone burned		1984-85 (60%)			1971 (34%)		1957 (98 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime	ha.	Structural Vegetation class		regime	ha.		
Moist Forest	b	14	Heath		d	153		
Dry Forest	c	166						
Threatened species	endangered plants			endangered fauna				

KILLARNEY GAP HERITAGE AREA MANAGEMENT ZONE**HAMZ-6**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
349			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 50 %	lower -	negligible -	
% of zone burned at various frequencies	unburned -	once 1 %	2 times 69 %	3 times 8 %	4 times 23 %	5 times -	>5 times -	
year of last three fires and % zone burned		1984 (61 %)			1971 (100 %)		1957 (92 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime	ha.	Structural Vegetation class	regime	ha.			
Moist Forest	b	12	Dry Forest	c	309			
Cleared	e	23						
Threatened species	endangered plants 12			endangered fauna 12				

SPRING CREEK HERITAGE AREA MANAGEMENT ZONE**HAMZ-7**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
2481			100			0		
bushfire behaviour potential (% area)			higher 70 %		medium 20 %	lower 10 %	negligible -	
% of zone burned at various frequencies	unburned -	once 15 %	2 times 100 %	3 times 85 %	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1995-96 (0.1%)			1992 (1 %)		1985-86 (27 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		60	Heath		d		9
Dry Forest	c		2403					
Threatened species	endangered plants				endangered fauna 11,6			

DOYLES PEAK HERITAGE AREA MANAGEMENT ZONE**HAMZ-8**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
669			100			0		
bushfire behaviour potential (% area)			higher 10 %		medium 80 %	lower 10 %		negligible -
% of zone burned at various frequencies	unburned -	once 2 %	2 times 60 %	3 times 38%	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1985-86 (38 %)			1974 (90 %)		1971 (8 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		308	Heath		d		2
Dry Forest	c		344					
Threatened species	endangered plants				endangered fauna			

NUMBER 76 HERITAGE AREA MANAGEMENT ZONE**HAMZ-9**

Characteristics of Zone							
size in hectares			% within Park			number of dwellings	
1800			100			0	
bushfire behaviour potential (% area)			higher 50 %		medium 50 %	lower -	negligible -
% of zone burned at various frequencies	unburned 63 %	once 1 %	2 times 22 %	3 times 14 %	4 times -	5 times -	>5 times -
year of last three fires and % zone burned		1985-86 (14 %)			1974 (33 %)		1971-72 (3 %)
number of hectares and fire regime of each vegetation community present							
Structural Vegetation class	regime	ha.	Structural Vegetation class		regime	ha.	
Moist Forest	b	83	Heath		d	7	
Dry Forest	c	1664					
Threatened species	endangered plants			endangered fauna 12			

POUND MOUNTAIN HERITAGE AREA MANAGEMENT ZONE HAMZ-10

Characteristics of Zone							
size in hectares			% within Park			number of dwellings	
4498			100			0	
bushfire behaviour potential (% area)			higher 25 %		medium 50 %	lower 25 %	negligible -
% of zone burned at various frequencies	unburned	once	2 times	3 times	4 times	5 times	>5 times
	1 %	3 %	4 %	34 %	24 %	33 %	1 %
year of last three fires and % zone burned		1994-95 (10%)			1993-94 (1 %)		1985-86 (86 %)
number of hectares and fire regime of each vegetation community present							
Structural Vegetation class	regime	ha.	Structural Vegetation class		regime	ha.	
Moist Forest	b	2286	Heath		d	17	
Dry Forest	c	2148					
Threatened species	endangered plants 8			endangered fauna			

FOGGY DELL HERITAGE AREA MANAGEMENT ZONE**HAMZ-11**

Characteristics of Zone							
size in hectares		% within Park			number of dwellings		
502		100			1		
bushfire behaviour potential (% area)		CLEARED / GRASS					
% of zone burned at various frequencies	unburned	once	2 times	3 times	4 times	5 times	>5 times
	17 %	16 %	42 %	18 %	9 %	-	-
year of last three fires and % zone burned		1996-97 (21 %)		1985-86 (4 %)		1974 (67 %)	
number of hectares and fire regime of each vegetation community present							
Structural Vegetation class	regime	ha.	Structural Vegetation class	regime	ha.		
Moist Forest	b	47	Dry Forest	c	401		
Cleared	e	54					
Threatened species	endangered plants			endangered fauna			
				6			

BULLAWA CREEK HERITAGE AREA MANAGEMENT ZONE**HAMZ-12**

Characteristics of Zone							
size in hectares			% within Park			number of dwellings	
5066			100			0	
bushfire behaviour potential (% area)			higher 80 %	medium 20 %	lower -	negligible -	
% of zone burned at various frequencies	unburned 3 %	once 8 %	2 times 22 %	3 times 25 %	4 times 41 %	5 times 1 %	>5 times -
year of last three fires and % zone burned		1996-97 (2 %)		1985-86 (1 %)		1974 (7 %)	
number of hectares and fire regime of each vegetation community present							
Structural Vegetation class	regime	ha.	Structural Vegetation class	regime	ha.		
Moist Forest	b	1150	Heath	d	16		
Dry Forest	c	3875	Cleared	e	3		
Threatened species	endangered plants 13			endangered fauna 6,12			

HORTON HERITAGE AREA MANAGEMENT ZONE**HAMZ-13**

Characteristics of Zone										
size in hectares				% within Park				number of dwellings		
4625				100				0		
bushfire behaviour potential (% area)				higher 20 %		medium 60 %		lower 20 %		negligible -
% of zone burned at various frequencies		unburned	once	2 times	3 times	4 times	5 times	>5 times		
		11 %	10 %	19 %	41 %	19 %	1 %	-		
year of last three fires and % zone burned			1994-95 (1 %)			1993-94 (1 %)		1985-86 (18 %)		
number of hectares and fire regime of each vegetation community present										
Structural Vegetation class		regime		ha.	Structural Vegetation class		regime		ha.	
Sub-Alpine		a		1144	Heath		d		114	
Moist Forest		b		3143	Cleared		e		2	
Dry Forest		c		166						
Threatened species		endangered plants 3,13				endangered fauna 5,7,12				

YULLUDUNIDA HERITAGE AREA MANAGEMENT ZONE**HAMZ-14**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
1295			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 40 %	lower 10 %	negligible -	
% of zone burned at various frequencies	unburned -	once 1 %	2 times 96 %	3 times 2 %	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1985-86 (97 %)			1982-83 (1 %)		1974 (100 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		720	Heath		d		208
Dry Forest	c		363					
Threatened species	endangered plants 3,5,9,11,12				endangered fauna 6,12			

EUGLAH ROCK HERITAGE AREA MANAGEMENT ZONE**HAMZ-15**

Characteristics of Zone							
size in hectares			% within Park			number of dwellings	
1254			100			0	
bushfire behaviour potential (% area)			higher -		medium 50 %	lower 50 %	negligible -
% of zone burned at various frequencies	unburned -	once 1 %	2 times 74 %	3 times 24	4 times 1	5 times -	>5 times -
year of last three fires and % zone burned		1985-86 (100 %)			1974 (100 %)		1957 (1 %)
number of hectares and fire regime of each vegetation community present							
Structural Vegetation class	regime	ha.	Structural Vegetation class		regime	ha.	
Moist Forest	b	1073	Heath		d	41	
Dry Forest	c	139					
Threatened species	endangered plants 3			endangered fauna 12			

MOUNT DOWE HERITAGE AREA MANAGEMENT ZONE HAMZ - 16

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
540			100			0		
bushfire behaviour potential (% area)			higher -		medium 30 %	lower 70 %		negligible -
% of zone burned at various frequencies	unburned -	once 2 %	2 times 71 %	3 times 27 %	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1974 (100 %)			1957 (27 %)		1951 (98 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class	regime		ha.	
Sub-Alpine	a		226	Heath	d		151	
Moist Forest	b		142	Cleared	e		1	
Dry Forest	c		19					
Threatened species	endangered plants 7,12				endangered fauna 7,11,12			

JOKERS SPRING HERITAGE AREA MANAGEMENT ZONE**HAMZ-17**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
2055			100			0		
bushfire behaviour potential (% area)			higher 10 %		medium 70 %	lower 20 %		negligible -
% of zone burned at various frequencies	unburned 32 %	once 30 %	2 times 37 %	3 times 1 %	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1974 (68 %)			1957 (1 %)		1951 (38 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Sub-Alpine	a		2	Heath		d		121
Moist Forest	b		1799	Cleared		e		16
Dry Forest	c		115					
Threatened species	endangered plants 3				endangered fauna 9,10,12			

NINGADOO HERITAGE AREA MANAGEMENT ZONE**HAMZ-18**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
236			100			0		
bushfire behaviour potential (% area)			Cleared / Grass					
% of zone burned at various frequencies	unburned	once	2 times	3 times	4 times	5 times	>5 times	
	-	99 %	1 %	-	-	-	-	
year of last three fires and % zone burned		1998-99 (1 %)			1985-86 (100%)			
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		8	Heath		d		1
Dry Forest	c		9	Cleared		e		218
Threatened species	endangered plants				endangered fauna			

EULAH HERITAGE AREA MANAGEMENT ZONE**HAMZ-19**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
2508			100			0		
bushfire behaviour potential (% area)			higher 30 %		medium 60 %	lower 10 %	negligible -	
% of zone burned at various frequencies	unburned 3 %	once 44 %	2 times 53 %	3 times -	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1998-99 (1 %)			1985-86 (97 %)		1974 (52 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime	ha.	Structural Vegetation class	regime	ha.			
Moist Forest	b	140	Heath	d	172			
Dry Forest	c	2166	Cleared	e	12			
Threatened species	endangered plants				endangered fauna			

SCUTTS WEST HERITAGE AREA MANAGEMENT ZONE**HAMZ-20**

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
2120			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 40 %	lower 10 %	negligible -	
% of zone burned at various frequencies		unburned 11 %	once 41 %	2 times 48 %	3 times -	4 times -	5 times -	>5 times -
year of last three fires and % zone burned			1985-86 (89 %)			1974 (48 %)		
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class		regime		ha.	Structural Vegetation class		regime	ha.
Moist Forest		b		138	Heath		d	71
Dry Forest		d		71				
Threatened species		endangered plants 3				endangered fauna 11		

HORSEARM CREEK HERITAGE AREA MANAGEMENT ZONE HAMZ-21

Characteristics of Zone								
size in hectares			% within Park			number of dwellings		
4141			100			0		
bushfire behaviour potential (% area)			higher 50 %		medium 50 %		lower -	negligible -
% of zone burned at various frequencies	unburned 89 %	once 11 %	2 times -	3 times -	4 times -	5 times -	>5 times -	
year of last three fires and % zone burned		1993-94 (1 %)			1979-80 (1 %)		1974 (10 %)	
number of hectares and fire regime of each vegetation community present								
Structural Vegetation class	regime		ha.	Structural Vegetation class		regime		ha.
Moist Forest	b		263	Heath		d		1
Dry Forest	c		3836					
Threatened species	endangered plants 3				endangered fauna 11			



**NATIONAL
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