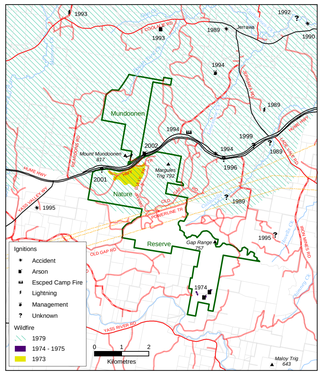
South West Slopes Region
Mundoonen Nature Reserve
Fire Management Strategy 2005

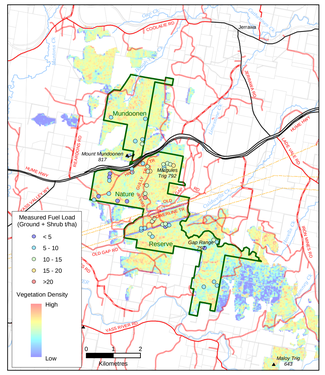
Scale: Works Program mag 1:60,000, Location map 1:800,000, other maps 1:80,000
Version: August 2005, DEC: 2006/41, ISBN: 1 74137 810 9

This Map should be used in conjunction with air photos and ground reconnaissance during incidents and the development of incident action plans.

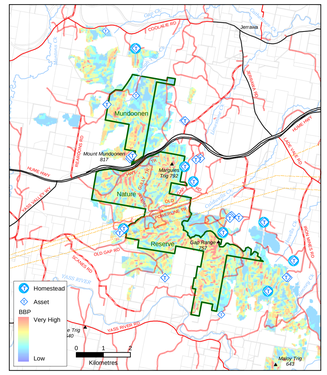
Fire History - Wildfire



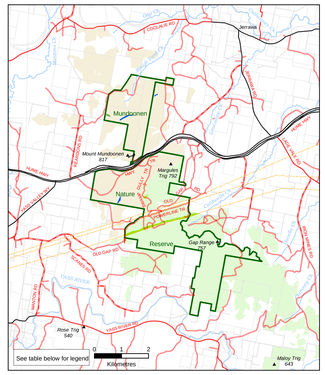
Landscape Fuels



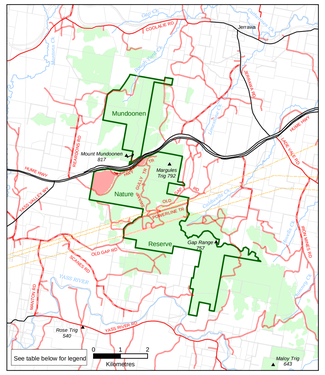
Bushfire Behaviour Potential & Assets at Risk



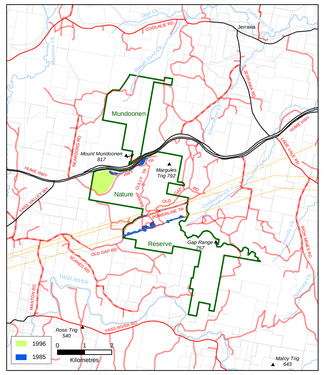
Vegetation Communities



Vegetation Fire Threshold Analysis



Fire History - Prescribed Burns



MEASURED FUEL DATA

Period and samples recorded	Average t/ha	Comments
July-Sept 1998 (45 sites) (44 sites)	9.3 (9.0)*	Surface fuel ranged between 2.8 and 13.1 t/ha and elevated fuels from 0.4 and 9.3 t/ha. Total fuels ranged between 3.3 and 21.7 t/ha.
March 1999 (12 sites) (11 sites)*	12.5 (11.9)*	Surface fuel ranged between 5.2 and 17.6 t/ha and elevated fuels from 0.5 and 9.3 t/ha. Total fuels ranged between 5.9 and 18.4 t/ha.
May 2002 (n=114)	N/a	Surface fuels ranged between 4.7 and 15.5 t/ha with average of 10.7t/ha. Elevated fuels were not measured.

Figures marked with *: Average excluding one site in veg type 2 (<1% of reserve, unrepresentative of fuels across the reserve landscape).

ANALYSIS OF LANDSCAPE FUELS

Fuel loadings in the reserve are variable, both across the landscape, and in response to climatic influences. The above map displays measured fuel loads combined with vegetation density, to indicate fuel level variability across the reserve.

Sites with higher aerial fuel loadings are located in the central parts of the reserve and are dominated by thickets of *Daviesia leptophylla*. These thickets appear to be the result of germination stimulated by runs of high fire intensity that resulted from the SW change in the 1979 wildfire. In contrast, sites located in the long-unburnt areas to the south had aerial fuels of less than 2t/ha. However, it should be noted that much of the *Daviesia leptophylla* has senesced in the 2002-4 drought period and thus aerial fuel loadings in the central part of the reserve are generally declining. While no formal fuel sampling has been undertaken in the northern part of the reserve, fuels appear to be similar to those in the central section, having also been affected by the 1979 fire.

Across the reserve, surface fuel loads tend to be higher on north-westerly aspects, possibly due to bark accumulation from scribbly gum. However, application of the Overall Fuel Hazard Guide (NRE 1998) indicates that southerly aspects of the reserve may have a high to very high overall fire hazard, compared with a moderate hazard on north-westerly aspects. This reflected the higher proportion of stringybarks on sheltered slopes which, particularly under extreme conditions, contribute more to ember attack than smooth-barked trees.

Loadings vary seasonally, with lowest levels to date being recorded in the late winter/early spring after a moist decomposition phase. The highest figures were recorded in autumn 1999 after accumulation through leaf drop under drought conditions and low decomposition rates.

The above data indicates that across the reserve landscape, fuel loads generally conform with levels prescribed for strategic management zones (8-15t/ha for 60-80% of zone), and thus afford a comparatively low level of threat to adjoining landholders. These fuel loadings are, however, sufficient to carry a wildfire onto surrounding pastures. The draft bushfire risk management planning package (RFS , July 1998) identified that both the forest and pasture found in this area could have a high fire behaviour potential under worse case conditions.

Data based on 45 fuel sites within the Park (n >200). This data is used to determine the relationship of fuel sites with NDVI (Vegetation Index) from LANDSAT imagery to calculate vegetation density across the reserve.

BUSHFIRE BEHAVIOUR POTENTIAL CLASSES

Vegetation Fuel Hazard Rating

Rating	Vegetation Type	% of Reserve
Low	Cleared land – heavily grazed by macropods	<1%
Medium	Regrowth wattle (black wattle). Powerline easement vegetation (red-anther wallaby grass, dogwood).	<1%
High	Red stringybark - scribbly gum low open forest (1a and 1b) Argyle apple – apple box – yellow box grassy creek open forest (2) Brittle gum open forest (3) Yellow box – Blakelys red gum woodland (4)	99%

Topographic Hazard

Aspect Behaviour Rating – reflecting likely fire wind direction		Slope Behaviour Rating		
Rating	Aspect (°)	Rating	Slope (°)	% of Reserve
Low	All aspects on land <5 ° slopes & 350 - 190°	Very Low	<5 °	17%
Medium	190 - 220 °, 310 - 350 °	Low	5 - 10 °	33%
High	220 - 310 °	Medium	10 - 20 °	43%
		High	>20 °	7%

Note: Bushfire Behaviour Potential was modelled using the above vegetation, aspect and slope ratings. BFBP outside reserve is only mapped for timbered lands.

VEGETATION COMMUNITIES

VegGroup	Vegetation Description	% of reserve
1a	Scribbly gum- red stringybark low open forest. *Daviesia leptophylla* dominated understorey.	47%
1b	Scribbly gum- red stringybark low open forest. Red-anther wallaby grass - snow grass dominated understorey.	52%
2	Argyle apple – yellow box – apple box grassy creek open forest Most of these areas have been previously grazed and cleared.	<1%
3	Brittle gum open forest.	<1%
4	Yellow box – Blakelys red gum woodland.	<1%
A	Regrowth wattle (black wattle). Small dense patches occur is some of the disturbed creeks.	<1%
P	Powerline easement vegetation (Red-anther wallaby grass - snow grass).	1%
C	Cleared land.	<1%

VEGETATION FIRE THRESHOLD CLASSES

Overburnt	Fire thresholds have been exceeded. *Protect from fire as far as possible.*
Vulnerable	The area will be Overburnt if it burns this year. *Protect from fire as far as possible.*
Recently Burnt	Time since fire is less than the optimum interval, but before that it was within threshold. *Avoid fires if possible.*
Within Threshold	Fire history is within the threshold for vegetation in this area. *A burn is neither required nor should one necessarily be avoided.*
Almost Underburnt	The area is close to its threshold and may become underburnt with the absence of fire. *A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Underburnt	Fire frequency is below fire thresholds in the area. *A prescribed burn may be advantageous. Consider allowing unplanned fires to burn.*
Unknown	Insufficient data to determine fire threshold.

NB. Fire thresholds are defined for vegetation communities to conserve biodiversity

VEGETATION MANAGEMENT THRESHOLDS

Analysis of the fire responses (recorded in the NPWS fire response database) of key plant species in the reserve suggests that reserve vegetation may suffer species decline if;

- **repeated successive fires occur less than 25 years apart, or more than 150 years apart.**

However, allowing for the operation of drought as a trigger for both germination and resprouting in the reserve, this upper limit may not apply. These thresholds provide a broad framework for assessing the biodiversity status of the reserve, as mapped above. The following guidelines provide additional detail.

VEGETATION MANAGEMENT CONSIDERATIONS

The reserve is dominated by scribbly gum- red stringybark open forest, with an understorey dominated by red-anther wallaby grass or the shrub *Daviesia leptophylla* depending on the fire history. Very small patches of other vegetation communities occur, usually on deeper soils, and it is assumed their fire history and fire requirements are similar to the main vegetation community.

51 % of plant species in the reserve regenerate primarily through resprouting (from buds in the stem, trunk or roots), often combined with some seedling germination. Eight percent of plant species in the reserve are obligate seeders, which die after complete leaf scorch but regenerate from seed. It is likely that most other plants in the reserve regenerate primarily through resprouting. These characteristics affect how the plants in the reserve respond to the different elements of a fire regime, as outlined below.

Response to aspect of fire regime	Impact
Repeated short interval fires • reduce the number of seeding species by killing the plants before seed set occurs. • deplete the energy in the buds of resprouting plants, leading to plant death.	Depending on the length of the interval, repeated fires might lead firstly to the loss of long-lived shrubs, short-lived shrubs and finally perennial grasses.
Long fire intervals • fail to provide fire as a trigger to stimulate resprouting, or germination of species • adult plants may then senesce and die of old age • however, germination and resprouting may be triggered by drought, frost and animal disturbance.	Long fire intervals may reduce biodiversity unless other triggers initiate germination and resprouting. In Mundoonen germination of fire sensitive species such as Hakea decurrens was observed following the drought breaking rain of autumn 1998, suggesting this is a key trigger. Doherty (1997) observed no difference in overall floristic or structural diversity between recently burnt and long unburnt sections of the reserve.
Moderate to high intensity fire • causes significant damage to resprouting plants, enabling the germination and establishment of seedlings.	Moderate to high intensity fire may cause domination by seeder species. The high density of *Daviesia leptophylla* in many areas burnt in 1979 appears to be a response to high intensity fire.
Low intensity fire • causes little damage to resprouting species that then out-compete germinating seedlings for water and nutrients.	Low intensity fire may cause domination by resprouting species. Thus, *Daviesia leptophylla* has resprouted after the 1996 prescribed burn over the old 1979 fire area.
Spring fire • may reduce germination due to moisture stress • may be followed by death of seedlings in the hot, dry summers experienced in the area.	Spring burning may lead to a dominance of resprouting species
Autumn fire • moisture levels may be sufficient to enable successful resprouting and germination of plants. • Seedlings may be killed by subsequent frosts	Autumn prescribed burning may maintain a mix of seeder and resprouting species, depending on frost severity.
Drought • In this area may prevent germination of plants until over 50 mm of rain falls after a fire. • Recovery of resprouting plants will also be slowed.	Fire applied in a drought cycle may lead to local extinctions of seeders. Slower rates of germination and resprouting will also contribute to erosion and nutrient losses.
A small fire • may lead to selective overgrazing of plants by herbivores.	A small fire may lead to the local extinction of palatable species.

BIODIVERSITY MANAGEMENT GUIDELINES

Guideline 1: Consecutive fires should be a minimum of 25 years apart in any area

Justification	• A minimum 25 year interval will ensure post-fire maturity and reproduction of most perennial components and obligate seed regenerators. *Dillwynia* species found in the reserve need between five to eight years to grow to adult size and a further period in which to establish a soil seed bank (Doherty 1998). An allowance is made for the slowing of development of plants under drought conditions, common in the area (see weather). • Ensure post-fire maturity and reproduction of many fauna species.
Fire History Evaluation	• *Approximately* 8% of the reserve has had 2 or more consecutive fires within 25 years.

Guideline 2: A range of post- fire ages younger and older than approximately 40 years should be present in the reserve.

Justification	• Ensures a range of age classes for a diversity of flora and fauna species.
Fire History Evaluation	• 40% unburnt for more than 40 years, 52% unburnt for between 25 & 40 years, 8% burnt less than 25 years ago.

Guideline 3: At least 50% of the reserve should be unburnt for more than 40 years.

Justification	• Dominance of understorey by *Daviesia leptophylla* should decline after this time interval. • Long period since fire enables development of a diversity of vegetation and habitat types for fauna. Recovery of vegetation is very slow in the reserve due to the poor, shallow soils and harsh climate. • In sub alpine areas 10-12 years post-fire is needed to restore nitrogen to pre-fire levels, and phosphorus replacement may take 20 years (Raison, Khanna and Woods 1985). Doherty (1997) considers that given the lower nutrient status of soils in the reserve, burns at less than 30 year intervals may prove detrimental to the long-term maintenance of these vegetation types. • presence of significant areas of long unburnt provides opportunities for research directed at assessing impacts of longer fire intervals.
Fire History Evaluation	• 40% unburnt for more than 40 years.

KEY BIODIVERSITY MANAGEMENT PROVISIONS

The various responses of reserve fauna to fire suggest that, for biodiversity management;

- Except for strategic purposes, fire should not be introduced to the area affected by the 1979 wildfire until it has recovered its full carrying capacity for koalas (HMZ 2).
- Until that time, fire should be excluded from the southern section of the reserve, which provides core koala habitat (HMZ 1).
- Any burning required for strategic purposes should not be applied between early spring and mid summer due to impacts on various threatened bird species.
- Strategic burns should be restricted in area and only low in intensity (to reduce impacts on koalas and powerful owl) and at a low enough to maintain understorey habitat components for a range of threatened fauna.
- Wildfires should be kept as small as possible to reduce impacts on koalas and their habitat.
- Wildfires should be managed to reduce fire intensity where possible to limit both direct and indirect impacts on koalas.
- Research plot burns should be undertaken in the 1979 fire area to determine if application of repeated, low intensity burns will improve habitat quality for koalas (by reducing density of saplings, allowing development of fewer trees) without significantly harming other biodiversity values.

In addition, for management of vegetation;

- Fire should be excluded from the areas burnt repeatedly or recently (HMZ 1).
- Monitoring of floristic and structural diversity should be conducted in the 1996, 1984, 1979 and pre 1924 age classes to monitor any changes in floristic diversity and habitat quality occurring with time since fire.
- Fire should only be applied in response to a demonstrated loss of biodiversity.

CULTURAL HERITAGE

Key Management Guidelines

- Identified sites will be protected.
- DEC Databases for cultural heritage will be accessed during incidents, and in planning for prescribed burning or other works to ensure new records are considered. Aboriginal site information from AHIMS is sensitive and subject to a Memorandum of Understanding. Site data must be used appropriately.
- For prescribed burning programs, protection measures will be addressed in the Review of Environmental Factors and burning program guidelines.
- Where possible, trained officers will provide advice on site protection methods.
- Fire management activities will comply with all conservation management plans.

Aboriginal Heritage	There are no known Aboriginal cultural sites within the reserve (as at February 2005). Site types recorded within Yass and Gunning shires that also may occur within the reserve include scarred trees, shelters with artifactsoils, open campsites and quarry sites.
Historic Heritage	There are two European cultural sites recorded within the reserve. • Old Gap Road was built in the early 1830s but was soon superseded by the Hume Highway alignment. This site is of local historical significance (Pearson, 1976). The road was formed by cutting or blasting a bench in the side of a steep gully and piling up the rubble as an embankment on the downhill side. A conservation assessment by Pearson (1976) does not prohibit any necessary maintenance of this route. • A number of charcoal pits dating from the second world war which were used to convert logs to charcoal for producer gas during the period of severe petrol rationing. It is not anticipated that fire will damage either the charcoal pits or the structure of Old Gap Road. Monitoring for erosion and implementation of erosion control measures may be required after an intense wildfire.

FIRE HISTORY

Wildfire	Prior to 1979, a number of small wildfires were ignited off the highway, with an interval of between five and ten years between fires. Fires were normally extinguished during the evening of ignition and were of a small size. Risk of such ignitions has reduced with the construction of the new freeway with deep cuttings through the range. One small fire (75 ha) started on the Hume Highway in 1973 (cause unknown). In late 1974, another fire (8 ha) occurred at several points along a trail in the southern section of the reserve (suspected arson). The most notable fire to burn through the reserve occurred in 1979. The fire started 9 km WNW of the reserve, during severe fire weather conditions. The fire, under a strong NW influence, pushed through the northern section of the reserve until a wind change to the SW swung the fire to the NE. The southern fire flanks were controlled off dozer lines and the powerline easements during milder night conditions. The main fire front continued several kilometres to the NE before being brought under control. Excluding the three wildfires mentioned above, much of the reserve has not burnt since an unknown date prior to 1924 (Gruber, pers.comm). Historic fire patterns in the reserve are not strongly correlated to seasonal conditions, but are driven primarily by human caused ignition events close to or in the reserve.
Prescribed burns	Prescribed burns have been implemented along the southern side of the highway (1985, 1996) and along the powerline easements (1985) with the objective of enhancing the fire available provided by the road and power easements. A total of approximately 146 ha (10% of the reserve) was burnt in these prescribed burns.
Ignitions	Wildfire records include the three fires recorded on the reserve by the NPWS since 1970 and 21 other fires recorded in the vicinity by the BFMCs in the period 1989-90 to 2003-04. Seven were caused by accident or negligence, four by illegal burns, two by lightning and one by arson, the remaining are of unknown cause.
Fire Frequency	584 ha (40%) has been unburnt since before 1924, while 770 ha (52%) has been burnt once, 112 ha (8%) has burnt twice and 3 ha (0.2%) has been affected by three recorded fire events since pre 1924. Frequency may be slightly higher than this along the Hume Highway. However, for the bulk of the reserve the fire frequency is very low with 92% experiencing an interval of more than 55 years between fires.

ANALYSIS OF BUSHFIRE BEHAVIOUR POTENTIAL

Bushfire behaviour at any spot on the landscape reflects

- site attributes such as vegetation type, slope, aspect (can affect fuel levels, structure and moisture content); and
- fire weather attributes such as temperature, relative humidity, wind direction and wind speed. While these characteristics are difficult to predict, analysis of local weather data shows that bad fire weather days are generally associated with winds from the north- west to south- west. These winds have thus been incorporated into the fire behaviour potential model.

The vegetation in the reserve is of one type, modified by past clearing and fire events, and by influences of aspect on the species mix at any location. While these interactions are too subtle for use in fire behaviour potential modelling, it should be noted that areas exposed to the 1979 wildfire have a higher density of eucalyptus saplings, and often more *Daviesia leptophylla* than long unburnt areas. These factors combine to increase the link between ground and canopy fuels, thus potentially increasing fire behaviour. In addition, steeper south to south-easterly slopes, which are sheltered from sun between autumn and spring, support a higher density of stringybarks than the drier north-westerly slopes. This may increase the fire behaviour on these slopes due to the contribution of bark fuels from these trees.

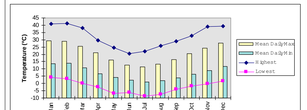
Due to the relatively gentle slopes in the reserve, it is expected that all aspects will dry at a similar rate through summer with the sun directly overhead (or slightly to the south at dawn and dusk), particularly with the common very low relative humidity. In this respect, drying of southerly aspects is hastened by drying south-easterly to westerly winds early in the summer. Thus, in late spring to early summer north – north-westerly slopes will generally be drier than south – south-easterly slopes, and may experience higher fire behaviour. However, by mid to late summer it is expected that very little moisture gradient will exist across the various aspects of the reserve by mid-afternoon, and the highest fire behaviour potential will occur on steeper slopes in the path of the wind direction, regardless of aspect.

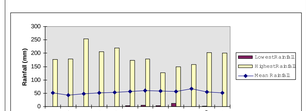
Fire behaviour potential was not mapped for the surrounding grasslands, however fire behaviour in these areas will be affected by variables such as the degree of curing, bulk of grass etc, and may potentially exceed that within the forested areas . The draft bushfire risk management planning package (NSW Bush Fire Coordinating Committee, July 1998) identified that for slopes of 11-17°, tablelands dry sclerophyll forest could generate 5.1 kW/m of heat, while improved pasture could generate 11.7 kW/m. This suggests that under worse case conditions, with a FDI of 80+, both forest and pasture in this area could have a high fire behaviour potential.

WEATHER

Mundoonen Nature Reserve experiences a temperate climate characterised by warm to hot summers and cool winters. In summer, hot days are followed by noticeably cooler nights with a mean daily temperature range at Yass from 13.7 °C to 29.3 °C in January. Winter mean daily temperatures range from 1 °C to 11.5 °C in July.

The mean annual rainfall for Yass is 649.5 mm. Rainfall is very variable, and generally lower than average, this being offset by isolated heavy rain events. Droughts are common, with 59 periods recorded between 1898 and 1996 when rainfall was very much below average (two or more consecutive months with mean rainfall of less than 40 mm). These periods occur at any time of the year. Rainfall is lowest in late summer and early autumn. Summer rain falls on relatively few days, with less than 6 rain days per month.





Across the southern tablelands, days of higher fire behaviour potential are characterised by high temperatures and very low humidities with strong winds backing from the north-west to west, often followed by a "cool change" with WSW or south-westerly winds. This pattern is associated with the passage of cyclonic weather patterns, which are usually repeated every five to seven days. However in the event of "blocking highs", when the passage is delayed, exceptionally severe fire weather can be expected when the pattern returns to normal.

At Yass, the mean relative humidity in December ranges from 56% at 9 am to 36% at 3 pm. Cloud cover is consistently less than 4.0 oktas between December and April. Strong winds are not common in the area, peaking with a mean of 1.2 days of strong wind in November and falling back to 0.2 days in January and February.

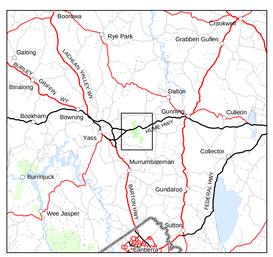
On average, less than six days per annum occur where temperatures exceed 25 °C, relative humidity is less than 40% and winds exceed 20 km/h at 3 pm. Less than three days each year experience these warm, dry conditions with a wind speed greater than 30 km/h. Hot, dry, windy days are rare, with less than one day per year experiencing conditions where temperature exceeds 35 °C, relative humidity is below 40% and wind speeds exceed 30 km/h at 3 pm.

RESOURCE INFORMATION

Mundoonen Nature Reserve comprises 1485 ha of the timbered Mundoonen Range in the Southern Tablelands of NSW (gazetted 27th February 1970). The reserve is approximately 70 km north of Canberra, straddling the Hume Highway between Gunning and Yass.
The reserve occupies the uppermost parts of several sub-catchments which drain westwards to the Yass River and thence the Murrumbidgee River or eastwards to the Lachlan River. The boundary between the Yass Valley and Upper Lachlan Councils follows the crest of the range through the reserve. The reserve falls in the areas serviced by the Manton, Jerrawa and Oolong volunteer rural fire brigades.

Department of Environment and Conservation	Queanbeyan Area, South West Slopes Region, Parks and Wildlife Division	**Government Areas**	Hume Federal Electorate. Burrinjuck State Electorate. Yass Valley & Upper Lachlan Local Government Areas
Rural Fire Service	Southern Tablelands Zone Bush Fire Management Committee	**Other Organisations**	Onerwal Local Aboriginal Land Council Lachlan & Murrumbidgee Catchment Management Boards

Location



RISK ASSESSMENT – LIFE & PROPERTY

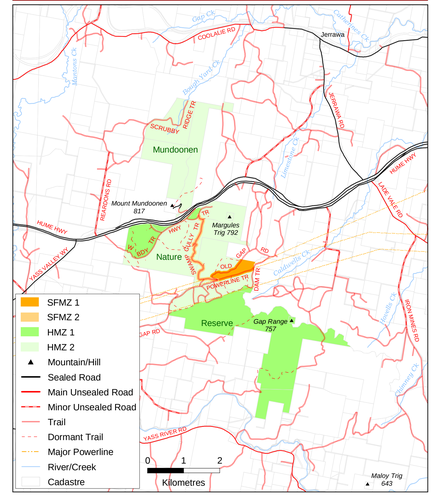
Asset	Vulnerability	Risk Mitigation
Mt Mundoonen communications towers	• Sited on cleared pads (15 m around assets) in low open forest, approximately 200 m from reserve boundary. • Vulnerable to fire from private property to the north-west and west pushed up the hill. • Lower risk from fire coming from the reserve under the influence of north-easterly to south-easterly winds.	• Participate in any fire management proposals regarding asset protection of towers. However, RFS and communications agencies have primary responsibility for determining asset protection. • Contain all unplanned fire events as soon as possible by rapidly responding to reported ignitions.
Private property east of the Reserve	• A number of houses are located to the east of the reserve, generally sited in cleared agricultural land at some distance from the reserve boundary. • However, one property to the east of Mt Margules has been constructed within 100 m of the reserve and thus is vulnerable to fire leaving the reserve. • The property to the east of Gap Range Trig is sited within 300 m of timber on private property. It is primarily at risk from fire passing through this timber to its north-west, but also is vulnerable to fires leaving the reserve under a south-easterly to south-westerly influence. • Fire under these winds will also potentially impact on the other properties north of the powerlines.	• Maintain access trails within the reserve, particularly Swamp Gully Trail and Old Gap Road (see Bushfire Management Zones map and Works Programme). • Enhance the strategic zone along Swamp Gully Trail to assist in control of fires (as above). • Contain all unplanned fire events as soon as possible by rapidly responding to reported ignitions. • Participate in DBFC risk management planning process and implementation. • Cooperate with the RFS and landholders to develop a perimeter trail along the timberline on the east of the reserve.
Private Property to west of reserve	• Properties to the west of the reserve are generally less vulnerable as fire moving under milder conditions and down slope. • Property on Old Gap Road at the reserve entrance is vulnerable to fire from the north-west.	• Participate in DBFC risk management planning process and implementation.

FAUNA MANAGEMENT CONSIDERATIONS

Species	TSC Act Schedule	Management Considerations
Koala ®	Vulnerable	A low- density breeding population survives in the reserve. The koala's ability to recover from catastrophic events is very slow. Allen (1999) found that koala numbers in the reserve had not yet recovered from the 1979 fire and identified that fire affected areas still had a reduced carrying capacity for koalas. Areas unburnt since pre 1924 are the most important for this population in the reserve. Fires that result in crown scorch will harm koalas by injuring or killing individuals, by reducing food supplies and increasing opportunities for predation. Large, non- patchy fires will hinder recolonisation, particularly in such a fragmented landscape.
Powerful owl ®	Vulnerable	In the fragmented habitat of the area, use the reserve as only part of range. In this area, feed primarily on ringtail possums and small gliders, thus high intensity or frequent low intensity fires that impact adversely on prey numbers may directly impact on powerful owls utilising the reserve. Nest in large, old eucalypts so high intensity fires that destroy such trees are detrimental. Nest late autumn - mid winter and disturbance at this time may affect breeding success.
Brown treecreeper	Vulnerable	Lives in woodland and dry open forest. 80% of diet consists of ants, so widespread, frequent fires are detrimental. Nest in hollows and tree stumps so fires removing these are detrimental.
Hooded robin	Vulnerable	Inhabit open woodland. Rely on fallen timber to support perch and pounce feeding behaviour, so frequent fires removing logs are detrimental. Breed July – November in nests between 1-5 m above ground. Thus winter-spring prescribed burns are detrimental.
Speckled warbler	Vulnerable	Inhabit open woodland with grassy ground layer. Nest on ground between August and January so vulnerable to spring-early summer fire.
Diamond firetail	Vulnerable	Inhabit open woodland and forest. Nest and roost in shrubs and canopy from August-January so vulnerable to fire in this period.
Small mammals		Numbers generally take a few years to recover after fire. Extended if more than 80% of the habitat of small mammals such as antechinus and bush rat is burnt.
Ground-nesting birds		The spotted quail-thrush, painted button-quail and the stubble quail may also be particularly vulnerable to the direct impacts of wildfires in spring and early summer, as well as to the loss of litter layer and food resources.
Reptiles		Many reptiles need enough time between fire to allow a build-up of litter, shelter, basking sites such as logs, and an adequate food supply of litter invertebrates.
Invertebrates		Frequent fire will reduce the numbers of invertebrates dependent on a stable litter layer, though a number of species such as some spiders prefer more frequent fire. Frequently burnt areas have fewer ant species with specific habitat and feeding requirements, and more generalist ant species.
Other		Long fire intervals may result in shrub senescence, impacting on species that utilise shrubs for feeding and nesting. However, hollow logs, litter and variable shrub patches develop in long unburnt areas, which can be occupied by a diverse range of fauna.

® indicates species recorded in reserve. **TSC Act** = Threatened Species Conservation Act

WORKS PROGRAMME



BUSH FIRE MANAGEMENT ZONES - DEFINITIONS

Asset Protection Zone (APZ)	Stringent fuel management standards are applied in areas immediately adjoining assets, to protect life and property.
Strategic Fire Management Zone (SFMZ)	Fuel levels controlled to reduce fire intensity, rate of spread & spotting distance. May be strategically placed areas in areas of high ignition potential, to consolidate asset management zones, to break up areas of higher bushfire behaviour potential or limit the spread of fires off reserve. Recommended fuel levels (BFCC) are between 8-15 t/ha for 60-80% of zone (except near a watercourse or in rainforest).
Heritage Management Zone (HMZ)	Defines management strategies for the protection of areas with important natural or cultural values. Focus on conserving biodiversity.

RESERVE BUSH FIRE MANAGEMENT ZONES

Zone	Strategy	Guidelines
SFMZ 1 Swamp Gully Trail	• Enhance trail as fire advantage by removing adjoining shrubbery. • Implement 20-100 m strip burn along eastern side of trail to increase ease of controlling spot fires, if this is demonstrated not to renew *Daviesia leptophylla* (now senescing).	• Chemical control of shrub layer for 3 m each side, removal of canopy for 1m each side of carriageway to Cat 1 tanker height. • Low intensity burn (flame height < 1.5 m, scorch height < 3 m). Small area so can be repeated up to every 7 yrs. Implement after rain in late autumn-winter to ensure prescription and area not exceeded. • Implement if fuel threshold for strategic zone is exceeded.
SFMZ 2 Old Gap Rd to Powerline Trail	• Prescribed burning between Powerline Trail and Old Gap Rd if fuel prescriptions are exceeded, if this is demonstrated not to renew dogwood (now senescing).	• Low intensity burn (flame height < 1.5 m, scorch height < 3 m). Small area so can be repeated up to every 7 yrs. Implement after rain in late autumn-winter to ensure prescription and area not exceeded. • Implement if fuel threshold for strategic zone is exceeded.
HMZ 1 Fire exclusion zone South of powerlines + Areas south of highway	• Exclude fire from zone, where possible. • Minimise size of wildfires in zone. • Reduce intensity of wildfires to prevent crown scorch to protect koalas. • Prescribed burns will only be applied if loss of biodiversity is demonstrated.	• Use strategic fire advantages to prevent wildfire entering zone. • All ignitions will be, conditions permitting, immediately directly attacked to minimise size. If direct suppression is not possible, fires will be contained to the closest possible containment lines. • Attempts will be made to increase burn patchiness by use of incendiaries, water bombing etc. Retardant may reduce palatability of crown for koalas in the short term, but should be utilised if needed to reduce crown scorch potentially killing individuals and removing food for a longer period.
HMZ 2 Remainder of Reserve	• Exclude fire from zone, where possible. • Minimise size and intensity of wildfires to protect koalas.	• Wildfires will be suppressed by effective means. • If possible, intensity of wildfires will be reduced to protect koala habitat.

WORKS PROGRAMME

Activity	Category	Name	Proposed Works	Schedule
Prescribed burning	SFMZ 1 & SFMZ 2	Swamp Gully Old Gap Rd – Powerline Tr	• Implement, if verified that prescribed burn will effectively reduce fuels (see research section).	If fuels > 8-15 t/ha for 60-80% of zone
Reserve trails maintenance	SFMZ 1 & SFMZ 2	Swamp Gully Trail Old Gap Rd Powerline Trail	• Chemical fuel reduction 3 m each side of trail • Clearance of vegetation 1 m each side of trail carriageway to Cat 1 tanker height • Install additional turning or passing bays • Maintain carriageway to RFS secondary trail standard	Ongoing 2005-06 then as required 2005-07 2005-07
	Management trails	Highway Trail West Boundary Trail Scrubby Ridge Trail (part)	• Maintain to RFS secondary trail standard • Install additional turning or passing bays	2005-06 then as required
	Other trail	Powerline Service Trails Dam Trail	• Maintain as required for general management purposes – will potentially need touching up for fire activities.	Routine
Research & Monitoring	Koala habitat	1979 burn area	• Research burns to determine if repeated short interval, low intensity fire can be applied to reduce sapling density and enhance koala habitat without significant deleterious effects on other biodiversity values. • If effective could be applied to small to medium sized sections of reserve to improve koala carrying capacity.	Commence by 2007
	Dogwood & Daviesia regrowth	SFMZs	• Conduct test burn to determine whether PB of low intensity renews dogwood *Cassinia longifolia* or *Daviesia leptophylla*. Monitor response through at least one wet season to verify this.	Commence by 2007
	Fuel monitoring	SFMZs	• Visual assessment of peak loadings • Quantitative assessment pre- and post -burning	Biennially As required
		1924, 1979 & 1996 and any new fire age classes.	• Quantitative assessment of surface and elevated fuels, estimation of overall fuel hazard.	Every 7-10 years and with change
	Vegetation monitoring	Pre 1924, 1979 & 1996 and any new fire age classes.	• Monitor floristic and structural diversity to determine and changes with time since fire. • Review changes in terms of koala habitat quality.	By 2007, then every 7-10 years & with change.
Cooperative fire management	Fire field days	Neighbour and volunteer orientation	• Reserve orientation for new members • Discussion of planning goals, practical issues • Develop in conjunction with district bushfire management committee.	Ongoing
	Perimeter trail system	Eastern perimeter trail	• Develop in conjunction with district bushfire management committee and neighbours	Ongoing