NSW GOVERNMENT
Environment, Climate Change & Water
National Parks & Wildlife Service

Manobalai Nature Reserve

Plan of Management

MANOBALAI NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

Part of the Department of Environment, Climate Change and Water

May 2010

This plan of management was adopted by the Minister for Climate Change and the Environment on 18th May 2010.

Acknowledgments

This plan of management is based on a draft plan prepared by staff of the Central Coast Hunter Range Region of NPWS.

Photograph of spotted gums in Manobalai Nature Reserve by Elizabeth Magarey, NPWS.

Inquiries about this reserve or this plan of management of should be directed to NPWS Hunter Range Area Office at 2156 Putty Road, Bulga NSW 2330 or by telephone on 6574 550.

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FOREWORD

Manobalai Nature Reserve is located 20 kilometres west of Muswellbrook and approximately 200 kilometres north-west of Sydney. The reserve is 3,758 hectares in size and directly adjoins a large area of Crown land to the south. The nature reserve and Crown land form part of an important vegetation corridor, with Goulburn River National Park to the south-west and Wollemi National Park to the south.

Manobalai Nature Reserve represents a distinct transition between bioregions, lying at the junction of the central western slopes, central tablelands, central coast and north coast botanical divisions. The reserve conserves 13 vegetation communities and is home to a diversity of native animals including 12 species listed as threatened under the *Threatened Species Conservation Act 1995*, two of which are also listed under the *Environment Protection and Biodiversity Conservation Act 1999*. The hills of Manobalai are also considered of Aboriginal spiritual significance.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how an area will be managed in the years ahead.

A draft plan of management for Manobalai Nature Reserve was placed on public exhibition from 10th October 2008 until 16th February 2009. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve the State Plan priority to "Protect our native vegetation, biodiversity, land, rivers and coastal waterways", including further research into the unique assemblages of vegetation and plant and animal species within the reserve and the management of introduced species in accordance with the Regional Pest Management Strategy.

This plan of management establishes the scheme of operations for Manobalai Nature Reserve. In accordance with Section 73B of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

Frank Sartor MP
Minister for Climate Change and the Environment

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1. MANOBALAI NATURE RESERVE

1.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Manobalai Nature Reserve is located near the small township of Sandy Hollow, approximately 30 kilometres west of Muswellbrook and approximately 200 kilometres north-west of Sydney. The reserve is 3,758 hectares in size and directly adjoins a large area of Crown land to the south. To the north, east and west, the reserve is surrounded by partially cleared private and Crown lands.

In 1967 2,914 hectares of Crown land was gazetted as Manobalai Nature Reserve for the purpose of protection, promotion and study of fauna. Additions to the reserve were made in 1969 and 1974.

The reserve represents a distinct transition between bioregions, lying at the junction of the central western slopes, central tablelands, central coast and north coast botanical divisions. The unique location of the reserve contributes to the diverse vegetation patterns and an overlap of species typical of both coastal and western slopes habitats. As a result, the reserve and the adjacent Crown land contain a vast array of flora and fauna diversity concentrated in a small area.

The reserve and the adjacent Crown land comprise a total of around 7,800 hectares of contiguous native vegetation, and form part of an important vegetation corridor, with Goulburn River National Park to the south-west and Wollemi National Park to the south.

The main landuse pattern in the surrounding area is agriculture, primarily cattle and sheep farming, as well as grape vines for wine production and olive farms. Mining is prevalent in the Upper Hunter region, although current mining operations have no direct impact on the reserve.

The Wonnarua Aboriginal peoples are the original inhabitants of the area. The Wanaruah Local Aboriginal Land Council represents Aboriginal interests in the area today.

The reserve is located within Muswellbrook Shire Council, and the Hunter-Central Rivers Catchment Management Authority area.

1.2 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies arise from the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) may require the assessment and mitigation of the environmental impacts of works proposed in this plan. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also applies in relation to actions that may impact on threatened ecological communities listed under that Act.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within Manobalai Nature Reserve except in accordance with the plan. This plan will also apply to any future additions to Manobalai Nature Reserve. Where management strategies or works are proposed for the nature reserve or any additions that are not consistent with the plan, an amendment to the plan will be required.

1.3 MANAGEMENT PURPOSES AND PRINCIPLES

Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

Under the Act, nature reserves are managed to:

- conserve biodiversity, maintain ecosystem functions, and protect geological and geomorphological features and natural phenomena;
- conserve places, objects, features and landscapes of cultural value;
- promote public appreciation, enjoyment and understanding of the reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

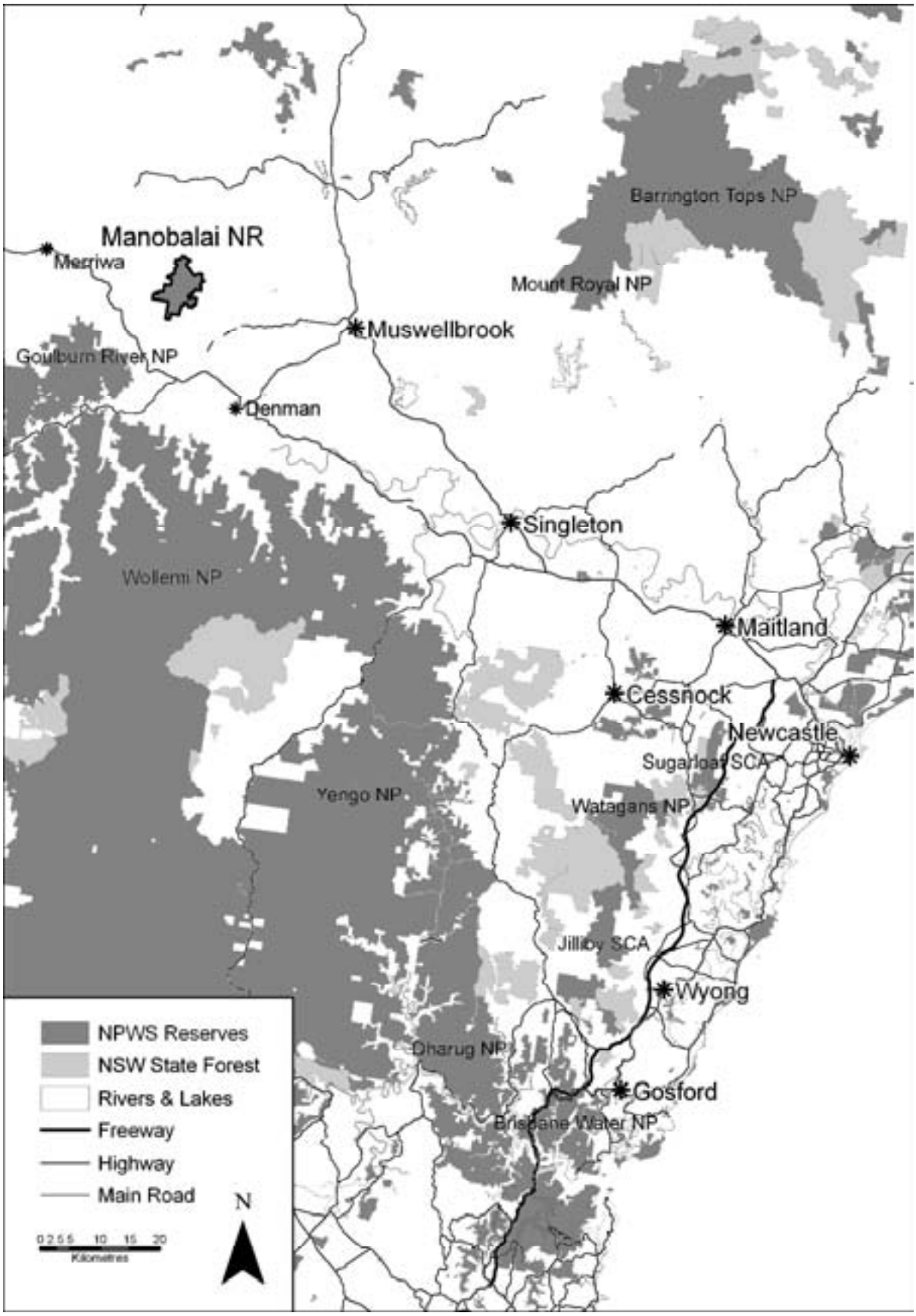
Nature reserves differ from national parks in that they do not have as a management principle to provide for visitor use.

1.4 MANAGEMENT DIRECTIONS

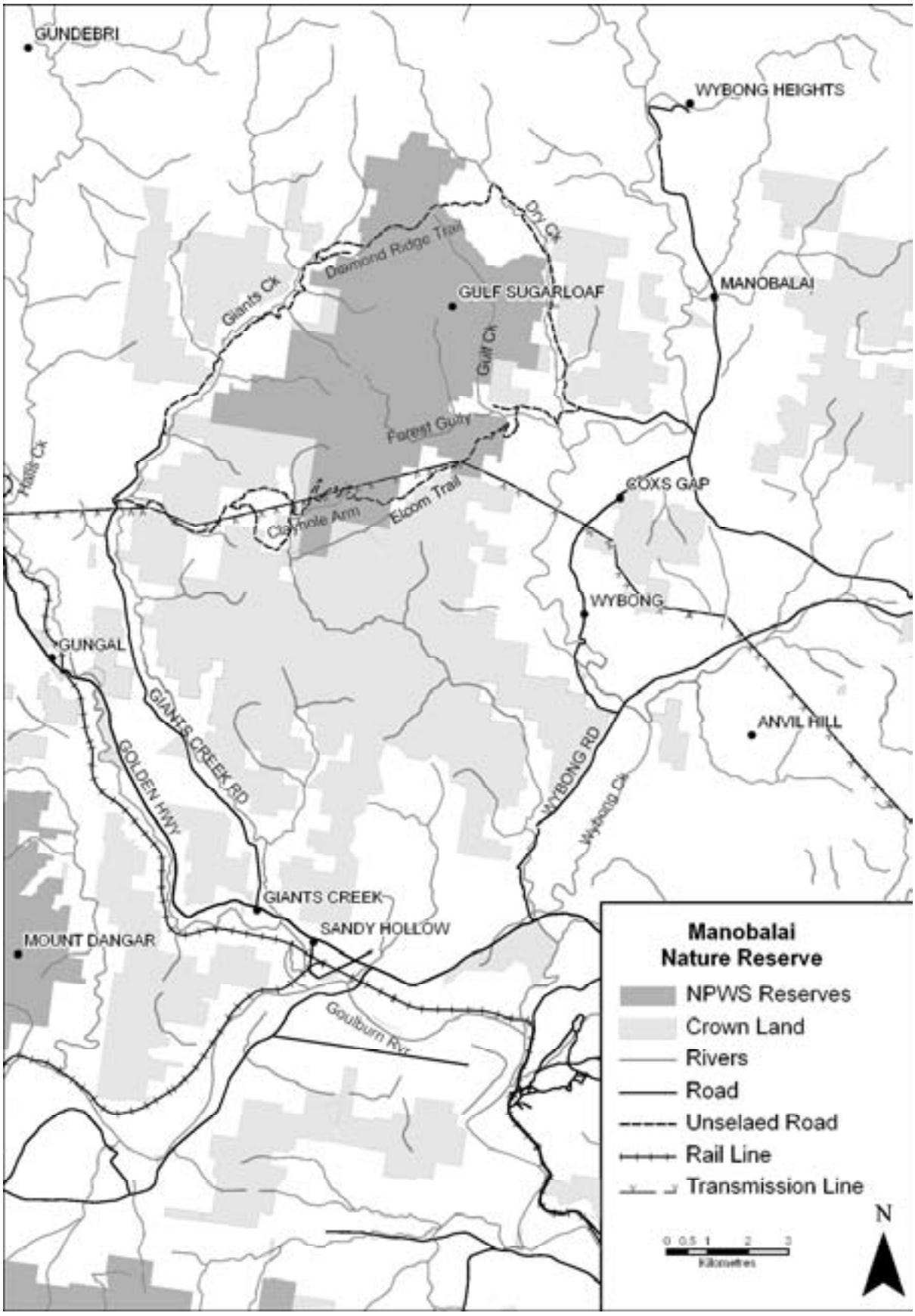
In addition to the above principles, Manobalai Nature Reserve will be managed to:

- Protect and conserve the unique flora and fauna species, populations, ecological communities and their habitat, which have resulted from convergence of ecological influences.
- Identify Aboriginal and historical heritage sites in the reserve and ensure these sites are protected.
- Reduce known threats and assist the recovery of natural ecosystems and established ecological processes.

RESERVE LOCATION



RESERVE MAP


GUNDEBRI
WYBONG HEIGHTS
Diamond Ridge Trail
Dry Ck
Giants Ck
GULF SUGARLOAF
MANOBALAI
Gulf Ck
Forest Gully
Halls Ck
COXS GAP
Clayhole Arm
Elcom Trail
WYBONG
GUNGAL
GIANTS CREEK RD
GOLDEN HWY
ANVIL HILL
WYBONG RD
Wybong Ck
GIANTS CREEK
SANDY HOLLOW
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2. RESERVE VALUES

The location, landforms and plant and animal communities of an area have determined how it has been used and valued. Both Aboriginal and non-Aboriginal people place values on natural areas, including aesthetic, social, spiritual and recreational values. These values may be attached to the landscape as a whole or to individual components, for example to plant and animal species used by Aboriginal people. This plan of management aims to conserve both natural and cultural values. For reasons of clarity, natural heritage, cultural heritage, threats and on-going use are dealt with individually, but their inter-relationships are recognised.

2.1 LANDSCAPE

Manobalai Nature Reserve is situated along the Great Dividing Range, which is at its lowest altitude within the Hunter Valley compared to the rest of the divide. This has allowed for a greater interchange of ecological systems characteristic of both the western slopes and coastal divisions.

The reserve is located on a highly dissected sandstone plateau and is characterised by magnificent sandstone peaks and mesas and deep gorges. A spectacular sandstone peak known to locals as ‘Giants Leap’ is situated within the Crown land.

The climatic patterns across the reserve are directly related to topography. Generally, the reserve does not exceed an elevation of 500 metres above sea level. The annual rainfall ranges from 615 to 710 millimetres per year, with highest rainfall on upper slopes and peaks.

The reserve lies just within the upper limits of the Sydney Basin Bioregion. Just to the north of the reserve begins the Brigalow Belt South Bioregion.

Creeks on the eastern side of the reserve flow into Dry Creek, part of Wybong Creek sub-catchment. Creeks on the western side of the reserve drain to Giants Creek, within Halls Creek sub-catchment. Both Wybong and Halls Creek drain into the Hunter River via the Goulburn River.

2.2 GEOLOGY AND SOILS

The predominant geology of the area is Triassic Narrabeen sedimentaries, mostly containing sandstone and conglomerate components. There are also small areas of Tertiary Basalt.

The main soil types include yellow podzolic soils and shallow loamy soils. These occur along the crests and upper slopes. Sandy yellow and brown soils are predominantly found along the lower slopes. Organic sands and muds are found in lagoons and swamps (Bilton 1990). The valley floors to the east, west and south are comprised of recently formed alluvial soils which is made up of eroded sandstone material, richer clays and silts derived from the basalt substrates (DEC 2005).

2.3 NATIVE PLANTS

The sandstone plateaus of the reserve support a combination of grassy dry sclerophyll forests and open woodland. The more sheltered slopes and gullies support taller woodlands with a more diverse and abundant shrub and ground layer, and a small amount of dry rainforest. There are also small pockets of alluvial woodland along the low lying river systems.

The reserve lies at the intersection of several botanical divisions. The topography of the Upper Hunter Valley at this point allows the central western slopes to meet the north coast, without tablelands in between. This location provides for a unique mix of species. It is not uncommon to find species such as Spotted Gums (*Corymbia maculata*), typical of coastal vegetation assemblages, closely associated with Brown Bloodwood (*Corymbia trachyphoia* subsp *amphistomatica*) which is typical of western slope vegetation (Bilton 1990).

Vegetation survey and mapping of the Crown land was conducted in 1997 (Bell 1997). Subsequent sampling and mapping was undertaken in the reserve in 1999 (Peake 1999), describing a few additional vegetation types not found in the Crown land.

A total of 13 vegetation communities have been identified in the reserve (Peak 1999, using the vegetation communities described by Bell 1997 for the Crown land where relevant). These are listed below in order of dominance:

- Narrabeen Sheltered Dry Forest (occurs throughout the reserve);
- Spotted Gum Open Forest Complex on Sandstone (dominant throughout northern section);
- Narrabeen Exposed Woodland (dominant in central to south western section of the reserve);
- Box Woodland on Basalt (occurs only in two areas in the south-east of the reserve);
- Red Gum Swamp Open Forest on Alluvium (occurs at two sites only in the area, at Clayhole Arm in the reserve and Upper Pheenys Creek in the Crown land);
- Ironbark Woodland on Alluvium (occurs in one small area south west of the reserve and continues into the Crown land);
- Disturbed Pasture with Native Olive on Basalt (occurs solely in the upper Healey Arm and Forest Gully catchments);
- Dry Rainforest on Alluvium (occurs at one site in the south of the reserve)
- Spotted Gum Open Grassy Woodland on Sandstone (occurs in a small area in the northeast of the reserve);
- Alluvium Angophora Woodland (occurs in a small area on the south eastern boundary of the reserve);
- Spotted Gum Open Forest on Basalt (occurs in one area on Gulf Sugarloaf);
- Native Olive Vine Thicket (one small patch occurs in the centre of the reserve);
- Allocasuarina Scrub Complex on Sandstone (requires verification, likely to occur in the southern half of the reserve).

Two vegetation types found within the Crown land have not been found within the reserve. These are:

- Narrabeen Acacia Woodland; and
- Narrabeen Rocky Heath.

One of the most significant vegetation communities in the reserve is the Spotted Gum Open Forest Complex on Sandstone. This association of spotted gum, ironbark and grey gum is at its north-west limit within NSW. Spotted gum forest is usually associated with the more fertile coastal regions on shale soils. Within the reserve it occurs on the less fertile silaceous soils of the Manobalai Plateau. On a local level this community can also be found in the Wybong district east of the reserve. It is moderately well represented, however much of this vegetation occurs outside conservation areas.

Red Gum Swamp Open Forest on Alluvium and Box Woodland on Basalt both have high conservation significance. Their distribution is limited within the reserve, and they are poorly represented on a local and regional level (Peake 1999).

Spotted Gum Open Forest on Basalt occurs only at one site in the reserve, covering an area of approximately 5 hectares at Gulf Sugarloaf. Regionally this community is poorly conserved, and its known distribution outside the reserve is limited to isolated patches in Goulburn River National Park and to the north-west of Manobalai Nature Reserve (Peake 1999).

Box Woodland on Basalt is consistent with the White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC) listed under the TSC Act and with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community listed under the EPBC Act. Peake (personal communication) also considers that Red Gum Swamp Open Forest on Alluvium and Spotted Gum Open Forest on Basalt warrant consideration for listing as EECs under the TSC Act due to their highly restricted distribution.

A total of 352 vascular plants (of which 18 are introduced species) have been identified in the reserve (Peake 1999).

Pomaderris queenslandica, listed as endangered on the TSC Act, has been recorded within the reserve, which is towards the southern extent of its range. The Rare or Threatened Australian Plant (ROTAP) species *Gonocarpus longifolius* has also been recorded in the reserve.

A few threatened flora species have been recorded on the Crown land: *Commersonia rosea* (endangered), *Lasiopetalum longistamineum* (vulnerable), and *Rulingia procumbens* (vulnerable). These species have not been recorded within the reserve.

Native Grape (*Cayratia clematidea*), a relatively common vine in rainforest habitats, was identified as having an extended range into the central western slopes. This species is associated with the Spotted Gum Open Forest Woodland on Basalt (Peake 1999).

2.4 NATIVE ANIMALS

A fauna survey was conducted in the reserve and adjacent Crown lands in 2004/2005 (DEC 2005), building on prior records (NPWS 1997; Stauber & Thumm 2000). A total of 166 native vertebrate species have been recorded in the reserve and 201 species recorded in the Crown lands. This included 120 diurnal birds species, eight nocturnal birds, five arboreal mammals, 11 ground dwelling mammals, 16 bats, 30 reptiles and 14 frogs across both areas (DEC 2005).

The fauna composition and diversity in both the reserve and Crown land is significant, influenced by the high diversity of plant species and vegetation communities present. Species typical of both the central western slopes and north coast are abundant, and many species are at the limit of their known range.

As the reserve has been relatively unaffected by clearing, logging and fire, it provides valuable sheltering habitat within the region. The reserve supports a large number of species that are reliant on tree hollows for shelter, roosting, nesting or breeding.

There are 12 animal species listed as threatened under the TSC Act (two of which are also listed under the EPBC Act) recorded in the reserve. The Crown land supports 17 threatened species, seven of which have not been recorded in the nature reserve (Table 1). There is also one species, the Rainbow Bee-eater *(Merops ornatus*), listed under the international migratory bird protection agreement with China (CAMBA).

The Crown land supports a greater diversity of birds, and more threatened bird species than the nature reserve. The threatened birds found within the reserve generally prefer the open woodlands of the creek flats and lower escarpment slopes. The Glossy Black-cockatoo feeds on forest oak, found in more sheltered slope and gully sites. The habitat within the area is of relatively low quality for owl species, and these are found at low densities. The area also supports many bird species that are in decline nationally or within the Sydney Basin Bioregion (DEC 2005).

Both the reserve and adjacent Crown land contain suitable habitat for the Regent Honeyeater and Swift Parrot (*Lathamus discolor*), which are both listed as endangered. Although not recorded in the reserve or Crown land, the Manobalai area contains important foraging habitat for these species with abundant winter flowering Spotted Gums. The Hooded Robin (*Melanodryas culcullata*) has been identified on private land within one kilometre of the Crown land. Although not listed as threatened, there has been a serious decline of this species as a result of widespread removal of habitat. This species has been observed to be a winter visitor in the central eastern parts of NSW. It is therefore recommended that targeted surveys be undertaken during the winter months to establish whether this species uses the alluvial woodland (DEC 2005).

A total of 14 microbat species were identified in the reserve, including six listed as vulnerable. Tree-roosting species are the most abundant, using tree hollows and bark for shelter. The high species diversity is reflective of the wide range of microhabitats suitable for bats across the reserve and Crown lands (DEC 2005).

Table 1 Threatened fauna species recorded within Manobalai Nature Reserve and surrounding lands

Scientific Name	Common Name	TSC Act	EPBC Act	Nature Reserve	Crown Land	Within 5kms
Birds						
Callocephalon fimbriatum	Gang-gang Cockatoo	V			Y	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Y	Y	Y
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		Y	Y	Y
Grantiella picta	Painted Honeyeater	V			Y	
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V			Y	
Neophema pulchella	Turquoise Parrot	V			Y	Y
Ninox connivens	Barking Owl	V		Y	Y	Y
Ninox strenua	Powerful Owl	V		Y	Y	
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V			Y	Y
Pyrrholaemus sagittatus	Speckled Warbler	V		Y	Y	Y
Tyto novaehollandiae	Masked Owl	V		Y	Y	Y
Xanthomyza phrygia	Regent Honeyeater	E	E			Y
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Y	Y	
Dasyurus maculatus	Spotted-tailed Quoll	V	E			Y
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V		Y	Y	
Mormopterus norfolkensis	Eastern Freetail-bat	V		Y		
Nyctophilus timoriensis	Greater Long-eared Bat	V	V	Y	Y	
Petaurus norfolcensis	Squirrel Glider	V			Y	
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V			Y
Phascolarctos cinereus	Koala	V			Y	Y
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Y		
Vespadelus troughtoni	Eastern Cave Bat	V		Y	Y	

E = endangered; V = vulnerable; Y = species recorded

There have been no confirmed Brush-tailed Rock-wallaby sightings in either the reserve or adjacent Crown land, however the reserve contains suitable habitat for this species and targeted surveys are required.

The Spotted-tailed Quoll was reported in the reserve many years ago but there are no official records. In the 1930s Koalas were also commonly seen in the north-eastern section of the reserve (W. Bray, personal communication).

2.5 ABORIGINAL HERITAGE

Aboriginal communities have an association and connection to the land. The land and water biodiversity values within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Aboriginal heritage and nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

The Wonnarua Aboriginal people are most closely associated with the area; however the Kamilaroi may have extended this far south (Brayshaw 1986). The Wonnarua and the Wiradjuri Aboriginal tribes believed that the hills of Manobalai contained the spirit of the great creator Baiame (Bilton 1990).

There are no Aboriginal sites or artefacts recorded in the reserve, however two sites have been recorded in the adjacent Crown land.

2.6 HISTORIC HERITAGE

From the 1820s large tracts of land were cleared within the Hunter Valley region for agricultural purposes, primarily cattle and sheep grazing. From the 1860s the expanding coal trade and provision of railways lead to the expansion of the region, with new urban centres and agricultural crops. Wide areas of forest were cleared, and a range of exotic plants and animals were introduced (Bilton 1990).

However, due to the ruggedness, inaccessibility, low soil fertility and dry climate throughout much of Manobalai Nature Reserve, the area remained relatively undisturbed. Sheep and cattle grazing occurred in the valley systems surrounding the reserve. Dairy farming became an extensive and well known industry in the Giants Creek Valley.

From the 1870s the Bray family owned land bordering the reserve to the north-east, and used trails through the area that is now reserve, including the Diamond Ridge trail, to transport stock. There are reports that in the 1930s a bullock team regularly removed timber, probably Ironbark or Spotted Gum, from the reserve (which was often referred to as ‘the forest’) (H. Bray personal communication). A few tree stumps bearing scars from felling, on the north-east boundary of the reserve, are evidence of this.

2.7 PUBLIC AND OTHER USES

There is no public access to Manobalai Nature Reserve, and no facilities within the reserve for recreation.

The primary purposes of nature reserves are the conservation of biodiversity, ecosystems and cultural values, and environmental research, monitoring and education. Ample recreation opportunities are provided in the nearby Wollemi, Yengo, Goulburn River, and Barrington National Parks. Bird watching and similar groups occasionally use the reserve with the permission of the NPWS and the neighbouring private landowners whose land they must cross to access the reserve.

The Elcom and Diamond trails traverse the northern and southern sections of the reserve respectively. These are classified and maintained as secondary fire trails and used for management purposes.

There is one private property to the southeast of the reserve that has no other practical means of access other than through the reserve via the Elcom trail. An access agreement licence will be established in accordance with NPWS policy.

Transgrid transmission lines run through the southern section of the reserve. The Elcom trail provides access for maintenance of the lines.

3. THREATS TO RESERVE VALUES

3.1 SOIL EROSION

There is evidence of soil erosion in two areas within the reserve: on the Elcom trail's western entry to the reserve; and below the northern end of the Diamond Ridge trail. The cause of erosion is unclear, it may be a natural occurrence or possibly the result of past usage patterns.

The Wybong Catchment program through Hunter-Central Rivers CMA is developing a partnership project to address soil management, salination and riparian management within the area. Recent programs include stabilisation work on the Crown land, at Giants Creek and Dry Creek Road.

3.2 INTRODUCED PLANTS AND ANIMALS

An introduced species is defined in this plan as any plant or animal species not native to the region. Introduced species within Manobalai Nature Reserve and on adjoining land are of concern because they have the potential to detrimentally affect ecological values, and can spread to and from neighbouring land. In addition, the *Noxious Weeds Act 1993* places an obligation upon public authorities to control noxious weeds on land that they occupy to the extent necessary to prevent such weeds spreading to adjoining lands.

Eighteen introduced plant species have been identified in the reserve (Peake 1999). Two introduced species are listed under the *Noxious Weeds Act 1993*, i.e. Tiger Pear (*Opuntia aurantiaca*) and Prickly Pear (*Opuntia stricta* var *stricta*). Both species are predominant along the periphery of the reserve with scattered to patchy infestations, but do not occur within the core of reserve.

The remaining weeds mostly comprise thistles, grasses, and herbaceous plants. Vegetation surveys identified the occurrence of these species as low and having a minimal impact on the reserve.

Seven species of introduced mammal are known to occur in the reserve: the Rabbit, House Mouse, Fox, Wild Dog/Dingo, European Cattle, Black Rat and Brown Hare (DEC 2005). Species of most concern for their impact on native fauna in the reserve are Foxes, Wild Dogs and Rabbits. Both the Fox and Rabbit are recognised as key threatening processes under the TSC Act. While Fox records are concentrated on the reserve perimeters and roads, there is evidence of Fox presence throughout the reserve. Rabbits mostly occur on the periphery of the reserve, particularly to the south along Clayhole Arm. Control programs have been implemented for Foxes and Wild Dogs within the reserve.

The degree of Dingo heritage in the Wild Dog population is currently unknown, though it may be high within the core of the reserve (DEC 2005). Wild Dogs, including Dingoes, have been declared as pest animals under the *Rural Lands Protection Act 1998* (RLP Act) throughout NSW and hence the NPWS has a statutory obligation to control Wild Dogs on its estate. Under the RLP Act, however, public lands which are considered to contain high quality Dingo habitat have been listed as Dingo management areas. Although Manobalai Nature Reserve is not listed as a Dingo management area, it will be included in a Wild Dog management plan which will identify methods for the control of Wild Dogs.

3.3 FIRE MANAGEMENT

Fire is a natural feature of many environments and is essential to the survival of some plant communities. Inappropriate fire regimes, however, can lead to loss of particular plant and animal species and communities. Fire can also damage cultural heritage, recreation and management facilities and can threaten visitors and neighbouring land. The lack of fire can also be an issue relating to plant species loss and must also be considered.

The reserve contains important vegetation communities, and threatened and significant fauna which are dependent on these communities for foraging and nesting habitat. The fauna survey (DEC 2005) recommended implementing low intensity fires carried out in a mosaic fashion in the reserve to ensure examples of unburnt vegetation are present, but to avoid burning known habitat areas of the Barking Owl, Koala, Eastern Cave Bat and Brush-tailed Rock-wallaby.

A separate fire management strategy has been prepared for Manobalai Nature Reserve (DEC 2006). The fire management strategy outlines the recent fire history of the park (there have been no recorded wildfires within the reserve since its gazettal in 1967), key assets within and adjoining the park including sites of natural and cultural heritage value, fire management zones, and fire control advantages such as management trails and water supply points.

NPWS maintains cooperative arrangements with surrounding landowners and RFS brigades and is actively involved in the Bush Fire Management Committee for Muswellbrook rural fire district. Cooperative arrangements include approaches to fuel management, support for neighbours fire management efforts and information sharing.

3.4 MINING

Coal mining is prevalent in the Upper Hunter region. The Department of Industry and Investment holds an extensive coal exploration title within the area, including all lands directly surrounding the reserve. To the east of Wybong Creek there are a large number of active mines and mining titles between Muswellbrook and Denman. The nearest of these to the reserve is the proposed open cut mine at Anvil Hill.

While coal exploration and mining activities are precluded from nature reserves, nearby mining activities highlight the importance of retaining intact ecosystems, habitat corridors, and remnant vegetation.

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5. MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
Soil and water conservation There is evidence of soil erosion in two areas in the reserve; in the southwest corner near Elcom trail and northeast end below Diamond Ridge trail Soil erosion is also evident on private land along Giants Creek immediately west of the reserve Water quality may be affected by sedimentation coming out of the reserve as a result of the erosion	Soil erosion is minimised Water quality and health of reserve streams is improved	Obtain a concise report from Soil Conservation regarding erosion at Elcom and Diamond Ridge trails and act upon recommendations Liaise with local authorities and local residents to minimise erosion and maintain and improve water quality in the reserve's catchments	High High
Native plant and animal conservation The reserve is located in an area of ecological convergence and diversity. At least two significant vegetation communities are present: Box Woodland on Basalt and Red Gum Swamp Open Forest Community; however vegetation mapping is based on limited ground truthing. Some vegetation communities and threatened species present within the Crown land or other adjacent lands have not been recorded within the reserve	All native plant and animal species and communities are identified and adequately conserved on a local and regional level	Protect threatened and significant plants and animals, and monitor their recovery after disturbance, e.g. fire, weed control, erosion control Undertake further ground truthing to establish distribution of vegetation communities and update the vegetation maps for the reserve Undertake further targeted surveys for threatened species recorded in adjacent lands, particularly for *Rulinga procumbans*, Brush-tail Rock-wallabies, Spotted-tailed Quolls, and Regent Honeyeaters	High Medium Medium

Current Situation	Desired Outcomes	Strategies	Priority
One plant species and 12 fauna species listed as threatened on the TSC Act have been recorded in the reserve. Recovery plans have been prepared for some species while for others actions to promote recovery are included in the Priorities Action Statement	Negative impacts on threatened species are identified and reduced	Implement relevant strategies within the Priorities Action Statement, e.g. Speckled Warbler habitat management	Medium
		Implement relevant strategies in recovery plans, e.g. for Large Forest Owls, Barking Owls, Koalas and Brush-tailed Rock-wallabies	Medium
		Work with neighbours, vegetation management committees and Catchment Management Authorities to encourage conservation of remnant native vegetation in the vicinity of the reserve	High
		Encourage further research into the unique assemblages of vegetation and plant and animal species	Low
		Liaise with the Land and Property Management Authority to ensure conservation of habitat and threatened species on the Crown land	High
Introduced species			
A draft Regional Pest Management Strategy was prepared in 2007	Introduced plants and animals are controlled	Manage introduced species in accordance with the Regional Pest Management Strategy	High
Weed species of concern in the reserve are *Opuntia* species, Prickly Pear and Tiger Pear	The impact of introduced species on native species and neighbouring lands is minimised.	Prepare and implement a Reserve Pest Management Plan	Medium
Pest animal species of greatest concern in the reserve are the Fox, Wild Dog and Rabbit.		Control and where possible eradicate introduced plant and animal species. Priority will be given to Tiger Pear, Prickly Pear, Fox and Wild Dog control	High
		Assist RLPB in preparation and implementation of Wild Dog management plan	High

Current Situation	Desired Outcomes	Strategies	Priority
Wild Dog and Fox baiting are conducted in the reserve both independently and in conjunction with the Livestock, Health and Pest Authority, the Land and Property Management Authority and private landowners Straying cattle have occasionally been detected in the reserve	Pest control programs are undertaken in consultation with neighbours	Work in collaboration with other stakeholders and neighbours in implementing weed and pest animal control programs Introduce a strategic monitoring program to determine effectiveness of pest control programs on pest species abundance and biodiversity response Encourage maintenance of boundary fences to exclude stock Investigate strategies to exclude stock where fencing is difficult	High Medium Low Low
Fire management A Fire Management Strategy was adopted in 2006 The Fire Management Strategy identifies fire management zones, assets at risk, fire control advantages, operational guidelines, and biodiversity guidelines	Life, property and natural and cultural values are protected from bushfire Fire regimes are appropriate for conservation of plant and animal communities	Manage fire in accordance with the Fire Management Strategy Fire management activities should aim for a mosaic of fire regimes, providing for areas of long unburnt vegetation Avoid frequent fire in known habitat of Powerful Owls, Sooty Owls, and Koalas; and avoid felling of hollow-bearing trees Continue to participate in Muswellbrook BFMC. Maintain coordination and cooperation with RSF and neighbours with regard to fuel management and fire suppression Encourage research into the ecological effects of fire in the	High High High High Medium

Current Situation	Desired Outcomes	Strategies	Priority
		reserve	
Cultural heritage There are no recorded Aboriginal sites in the reserve, however the Manobalai hills have spiritual significance for Aboriginal people There are no recorded historical sites in the reserve, although there is some evidence of past timber getting	Aboriginal and historic features and values are identified and protected Aboriginal people are involved in management of the Aboriginal cultural values in the reserve Understanding of the cultural significance of the reserve is improved	Precede all new ground disturbance work by an assessment for cultural features Consult and involve the CCHR Aboriginal Co-management Committee, the Wanaruah Local Aboriginal Land Council and other relevant Aboriginal community organisations in understanding the values of the reserve and in the management of Aboriginal sites, places and values, including interpretation of places or values Encourage further research into the historic heritage values of the reserve Record the tree stumps and leave *in situ.*	High High High High
Education / Neighbour relations There are no visitor facilities within the reserve and none are proposed Access to the reserve requires traversing private property	The local community is aware of the significance of the area and of management programs Visitor use is ecologically sustainable	Liaise with neighbours regarding allowing access across their properties for scientific research and reserve management programs. Formalise access agreements where necessary. Permit limited access to the reserve for scientific, educational and management activities, subject to approval by the Area Manager (including licensing where required) and liaison with neighbours regarding access. Promote visitor use and recreational activities at alternate	High Medium Medium

Current Situation	Desired Outcomes	Strategies	Priority
		locations, e.g. Wollemi NP, Yengo NP, Mount Royal NP.	
Management operations			
Two management trails traverse the reserve: Elcom and Diamond Ridge Fire Trails	Management facilities adequately serve management needs and have acceptable impact	Maintain existing management trails to secondary fire access standard	High
One private property requires access via the Elcom Trail		Formalise a license for access to the inholding along Elcom Trail	High
A Transgrid transmission line runs through the south of the reserve, accessed via the Elcom Trail. Access and maintenance are covered by a Deed of Easement	Existing non-park infrastructure is managed to minimise impacts on natural and cultural values	Access by Transgrid will be permitted via the Elcom Trail	High
		Transgrid inspection and maintenance works will be permitted in accordance with the Deed of Easement	High

High priority activities are those imperative to achievement of the objectives and desired outcomes. They must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.

Medium priority activities are those that are necessary to achieve the objectives and desired outcomes but are not urgent.

Low priority activities are desirable to achieve management objectives and desired outcomes but can wait until resources become available.