

**JINGELIC, BOGANDYERA AND CLARKES HILL  
NATURE RESERVES**

**PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service**

**Part of the Department of Environment and Conservation (NSW)**

**July 2006**

**This plan of management was adopted by the Minister for the Environment on 24<sup>th</sup> July 2006.**

## **Acknowledgments**

This plan of management is based on a draft plan prepared by staff of the Upper Murray Area of NPWS.

For additional information or enquiries on these nature reserves, contact the Service's Upper Murray Area Office at Scott St, Khancoban or by phone on 02 6076 9373.

© **Department of Environment and Conservation (NSW) 2006**: Use permitted with appropriate acknowledgment

**ISBN 1 74122 097 1**

## FOREWORD

Jingellic, Bogandyera and Clarkes Hill Nature Reserves are located on the south eastern highlands of NSW between the towns of Jingellic, Tumberumba and the locality of Tooma.

The reserves protect an area of previously poorly conserved south eastern highlands eucalypt forests. Recent studies have indicated a diverse range of communities including some threatened and regionally uncommon plant and animal species.

Bogandyera Nature Reserve, which is dissected by Mannus Creek, conserves a regionally rare example of relatively intact riparian vegetation. Mannus Creek consists of a visually spectacular and unique water sculpted metamorphic rock river bed containing a number of rock pools and waterfalls. Three sites along Mannus Creek within Bogandyera Nature Reserve have been used intermittently for low key recreation including camping and fishing.

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

A draft plan of management for Jingellic, Bogandyera and Clarkes Hill Nature Reserves was placed on public exhibition from 3 September until 20 December 2004. The exhibition of the draft plan of management attracted 12 submissions that raised 9 issues. All submissions received were carefully considered before adopting this plan.

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

**Bob Debus**  
**Minister for the Environment**

# CONTENTS

	<b>page</b>
1. INTRODUCTION	1
1.1 Location, Gazettal and Regional Setting	1
1.2 Landscape	2
2. MANAGEMENT CONTEXT	3
2.1 Legislative and Policy Framework	3
2.2 Management Directions	4
3. CONSERVATION OF NATURAL AND CULTURAL HERITAGE	5
3.1 Geology, Landform and Soils	5
3.2 Native Plants	6
3.3 Native Fauna	10
3.4 Aboriginal Heritage	13
3.5 Historic Heritage	14
4. RESERVE PROTECTION	15
4.1 Soil Erosion	15
4.2 Water Quality and Catchment Management	16
4.3 Introduced Species	17
4.4 Fire Management	20
5. VISITOR OPPORTUNITIES AND EDUCATION	25
5.1 Information Provision	25
5.2 Recreation Opportunities	25
5.3 Other Uses	27
6. RESEARCH AND MONITORING	29
7. MANAGEMENT OPERATIONS	31
8. PLAN IMPLEMENTATION	33
REFERENCES	38
MAPS	End pages

## 1. INTRODUCTION

### 1.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Jingellic, Bogandyera and Clarkes Hill Nature Reserves (referred to as the reserves in this plan of management) are located on the south eastern highlands of NSW between the towns of Jingellic, Tumbarumba and the locality of Tooma (see summary map, centre pages). The reserves were gazetted as nature reserves on 30<sup>th</sup> March 2001 under the *National Parks Estate (Southern Region Reservations) Act 2000* as part of the Southern Region Forest Agreement. The reserves are all within the Tumbarumba Shire local government area.

Jingellic Nature Reserve (NR) is located about 27 kilometres south-west of Tumbarumba and has an area of 2,137 hectares. This reserve was previously the Holman State Forest managed by NSW State Forests until 1972 and then became vacant Crown land. Jingellic (gingellick) is an Aboriginal word, the meaning of which is no longer clear although there is a reference to the word meaning “bald hill” or “slate country” (Rooks, 1998).

Bogandyera NR is located 5-20 kilometres south of Tumbarumba. The reserve has an area of 8752 hectares. Bogandyera NR is comprised of lands that were previously the Ournie State Forest, part of Mannus State Forest and various portions of vacant Crown land. Bogandyera is historically referred to as a local Aboriginal clan name. The origin and meaning of this word is not clear however the part “bogan” may be a reference to the bogong moth. The word “Bogandyera” has also been referred to as “Bogandika”, which was apparently shortened to provide the name of the prominent peak within Bogandyera NR known as Mt Ikes (Rooks, 1998).

Clarkes Hill NR is located 15 kilometres south-east of Tumbarumba. This reserve has an area of 2139 hectares. It was previously Clarkes Hill State Forest and is dissected by the Tooma Rd. Clarkes Hill” is named after the Rev. W.B. Clarke, a geologist who carried out the first geological exploration of the Snowy Mountains in 1851-1852. It was from Clarkes Hill that Hume and Hovell first saw and recorded the Snowy Mountains (Rooks, pers. comm.).

The reserves generally consist of linear and dissected blocks with long boundaries. Jingellic NR has an area of 2137 hectares and a boundary of 41 kilometres, (area to boundary ratio of 52:1). Bogandyera NR has an area of 8752 hectares and a boundary of 173 kilometres (area to boundary ratio of 50:1). Clarkes Hill NR has an area of 2139 hectares and a boundary of 41 kilometres (area to boundary ratio of 52:1). The irregular shape and moderately high area to boundary ratios have significant implications for long term conservation of biodiversity within the reserves and management of boundaries. There are approximately 70 neighbours immediately adjoining the reserves.

The Upper Murray area supports mainly grazing and cropping enterprises, and forestry operations. There are hardwood and softwood forestry operations in the region with some pine plantations immediately adjacent to the reserves. The district is also a popular tourist and holiday area, attracting visitors mainly during the summer, particularly to the Murray River and Kosciuszko National Park.

## 1.2 LANDSCAPE

Natural and cultural heritage and on-going use are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices. The activities of modern day Australians continue to influence bushland through recreational use, cultural practices, and the presence of introduced plants and animals.

The reserves protect an area of previously poorly conserved south eastern highlands forests consisting predominantly of narrow leaved peppermint (*Eucalyptus robertsonii*), broad leaved peppermint (*E. dives*), red stringybark (*E. macrorhyncha*), silver bundy (*E. nortonii*) and apple box (*E. bridgesiana*). Recent studies have indicated a diverse range of communities including some threatened and regionally uncommon plant and animal species.

Bogandyera NR, which is dissected by Mannus Creek, conserves a regionally rare example of relatively intact riparian vegetation. Mannus Creek consists of a visually spectacular and unique water sculpted metamorphic rock river bed containing a number of rock pools and waterfalls. Three sites along Mannus Creek within Bogandyera NR have been used intermittently for low key recreation including camping and fishing.

The geology, landform, climate and plant and animal communities of the area, plus its location, have determined how it has been used by humans. Parts of the reserves and surrounding landscape would have been used by Aboriginal people for resources and camping. It is likely that Aboriginal interaction with this environment included burning practices that would have contributed to the biodiversity at the time of European colonisation. Changes in burning practices in the area since colonisation are likely to have contributed to changes in biodiversity, however, such changes are very difficult to measure.

Post Aboriginal use of this landscape has included conservation, recreation, extraction of timber resources, particularly of red stringybark for fence posts and firewood harvesting, mining, grazing and clearing for agriculture. Current land use adjacent to the reserves consists primarily of scattered blocks of retained native vegetation in varying degrees of condition, cleared agricultural land and some pine plantations. The close proximity of pine plantations adjacent to the reserves has implications for fire and pest species management in the reserves.

Both Aboriginal and non-Aboriginal people place cultural values on natural areas, including aesthetic, social, spiritual, recreational and other values. Cultural 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 and document usefulness natural and cultural heritage, non-human threats and on-going use are dealt with individually, but their inter-relationships are recognised.

## 2. MANAGEMENT CONTEXT

### 2.1 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*, the *Threatened Species Conservation Act 1995* and the policies of the NPWS. The policies arise from the legislative background, the corporate goals of the Service and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic site conservation, recreation, commercial use, research and communication. Other legislation, international agreements and charters may also apply to management of the area.

Nature reserves are reserved under the National Parks and Wildlife 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 principle, to provide for visitor use.

#### **Regional Forest Agreements**

Regional Forest Agreements are one of the principle means of implementing the National Forest Policy Statement of 1992. Under this Statement, Commonwealth, State and Territory governments agreed to work towards a shared vision for Australia's forests. This aimed to maintain native forest estate, manage it in an ecologically sustainable manner and develop sustainable forest-based industries. The Statement provided for joint comprehensive assessments of the natural, cultural, economic and social values of forests. These assessments formed the basis for negotiation of Regional Forest Agreements that provide, amongst other things, for Ecologically Sustainable Forest Management (see section 6).

The Southern Region Forest Agreement of 2001 covers the region for the period 2001 to 2021. The process leading up to the RFA provided for major additions to the reserve system, including establishment of Jingellic, Clarkes Hill and Bogandyera Nature Reserves.

## 2.2 MANAGEMENT DIRECTIONS

The reserves will be primarily managed to conserve their natural and cultural heritage while providing opportunities for low key educational use. Strategies and programs to protect, and where necessary restore, the natural and cultural values will include:

- protection from human disturbance of rare forest ecosystems, significant areas of old growth, and the habitat of threatened species;
- conservation, in conjunction with the community, of significant cultural values and sites;
- application of fire regimes designed to maintain ecosystems while mitigating against damage from wildfire;
- control of introduced plant and animal species;
- rehabilitation of areas previously subject to various impacts such as eroding trails and drainage lines;
- implementation of the principles of ecologically sustainable forest management (see section 7) including codes of practice, research and monitoring; and
- management of public use in an ecologically sustainable manner.

Provision for public use needs to be made in a regional context and jointly with other public land managers. Conservation will have priority over public use and only those areas that can sustain low key use will be promoted through provision of access.

Public vehicle access will be maintained to the bottom falls on Mannus Creek and opportunities will continue to be provided for foot access to more remote areas.

The reserves will be managed within a bioregional landscape framework. Conservation of the native plant and animal communities of the region cannot be achieved solely on national park and nature reserve lands. This is particularly so given the linear configuration of the reserves and their moderately high area to boundary ratios.

Management programs, where appropriate, will be undertaken in cooperation with State Forests of NSW, Parks Victoria, Tumbarumba Shire Council, Hume Rural Lands Protection Board, and neighbouring private landowners. Management programs shall be implemented jointly with other agencies and landholders to achieve cost efficiencies and more effective results of management programs across the landscape.

The viability of the integrity of the reserves will depend on retention and sympathetic management of significant natural vegetation on adjacent lands. Opportunities will be provided including assistance to neighbours to establish voluntary conservation agreements and wildlife refuges on adjacent high conservation value areas where a neighbour seeks such assistance, and additions to the reserve system as funding and resources permit.

Close liaison will be maintained with adjacent land managers and neighbours. The community will be kept informed about major management programs and will be consulted and involved in appropriate programs. A mechanism will be developed for consultation and, where appropriate, cooperative management, with the Aboriginal community.



### 3. CONSERVATION OF NATURAL AND CULTURAL HERITAGE

#### 3.1 GEOLOGY, LANDFORM, AND SOILS

Jingellic NR lies within the Kiandra beds of the Tumut Ponds group of geological formations. Rock types include quartzite, slate, phyllite, greywacke, hornfels and schist. Soils range from sandy yellow earths on mid-slopes below 500m elevation to sandy granitic soils above 500m elevation. The reserve has a predominantly west and north aspect with slopes between 10° and 30°. Elevation ranges between 300 metres to 820 metres.

Bogandyera NR lies within two main geological structures. The Mt Garland ridge and parts of the Ournie ridge lie within the Kiandra beds of the Tumut Ponds group of geological formations. Rock types include quartzite, slate, phyllite, greywacke, hornfels and schist. Soils range from sandy yellow earths on mid slopes below 500m elevation to sandy granitic soils above 500m elevation. Mt Ikes and the south-west fall of the Ournie ridge lie within the Maragle batholith. Rock types in this area comprise a complex and varied mixture of granites, and gneissic and granitic granodiorite associated with generally sandy granitic soils. The reserve is characterised by the lay of the dominant ridge lines tending north south in the case of Mt Garland Ridge, south east to north west in the case of the Ournie ridge and the isolated mount of Mt Ikes in the central north area of the reserve. The Mannus Creek bed in the Bogandyera NR provides a spectacular exposed metamorphic rock bed including a number of waterfalls and deep rock pools. The Ournie ridge has a level plateau on the north east side and slopes steeply to the south west with slopes of up to 50° in places. Mt Ikes and the Mt Garland ridge have slopes up to 45° with an average slope of about 30°. The reserve exhibits the full range of aspects with the Ournie Ridge having a predominantly south-west aspect, and Mt. Garland ridge having predominantly east and west aspects. Elevation ranges between 290 metres to 1030 metres.

Clarkes Hill NR is located on the Maragle batholith. Rock types comprise a complex and varied mixture of granites, and gneissic and granitic granodiorite. Soils are predominantly sandy granitic soils. The reserve has a predominantly south and south east aspect with slopes between 10° and 30°. Elevation ranges between 480 metres to 920 metres.

#### Major Catchments

The majority of Jingellic NR drains to the west in to the catchment of Horse Creek and thence directly into the Murray River. Most of Bogandyera NR is in the catchment of the Mannus Creek, which joins with Tumbarumba Creek to flow into the Tooma River and eventually into the Murray River. A large portion of the Ournie ridge drains directly south-west via East Ournie Creek and various minor drainage lines into the Murray River. All of Clarkes Hill NR drains into Maragle Creek, which flows through parts of the reserve, thence into Tumbarumba Creek and eventually into the Murray River. Some neighbours rely on creek water for their water supplies.

### 3.2 NATIVE PLANTS

The reserves conserve a diversity of vegetation communities across a range of age classes, including old growth forests. Prior to gazettal a Comprehensive Regional Assessment (CRA) identified a range of vegetation alliances that were then classified as Forest Ecosystems. Targets were then set during the CRA process to ensure that adequate representation of each ecosystem was conserved. Forest ecosystems provide an indication of the type of vegetation in an area only and, although not a reliable description of the actual vegetation associations present, are useful in determining the comparative significance of vegetation in the reserves. Forest ecosystems observed in the reserves include:

No.	Description (forest ecosystem)	Location	Area (ha)
38	Tableland Dry Heath Shrub/Herb/Grass Woodland - <i>Calytrix tetragona</i> / <i>E. goniocalyx</i>	Bogandyera NR	4
71	Western Tableland Dry Shrub Forest - <i>E. macrorhyncha</i> / <i>Leptospermum brevipes</i>	Jingellic NR	5
82	Western Montane Acacia Fern/Herb Forest - <i>E. viminalis</i> / <i>E. robertsonii</i> / <i>Cassinia aculeata</i> / <i>Pteridium esculentum</i>	Bogandyera NR Clarkes Hill NR	7
93	Western Tablelands Herb/Grass Dry Forest - <i>E. robertsonii</i> / <i>Microlaena stipoides</i>	Bogandyera NR Clarkes Hill NR	2787
94	South-west Slopes Acacia Dry Herb/Grass Forest - <i>E. bridgesiana</i> / <i>E. macrorhyncha</i> / <i>Acacia dealbata</i> / <i>Microlaena stipoides</i>	Jingellic NR Bogandyera NR Clarkes Hill NR	3060
108	Western Tablelands Dry Herb/Grass Forest - <i>E. macrorhyncha</i> / <i>E. dives</i> / <i>Hibbertia obtusifolia</i> / <i>Poa sieberiana</i>	Jingellic NR Bogandyera NR	3530
119	Western Tablelands Dry Shrub/Grass Forest - <i>E. macrorhyncha</i> / <i>E. polyanthemos</i> / <i>Hibbertia obtusifolia</i> / <i>Gonocarpus tetragynus</i>	Jingellic NR	16
121	Western Slopes Grass/Herb Dry Forest - <i>E. macrorhyncha</i> / <i>E. goniocalyx</i> / <i>Gonocarpus tetragynus</i> / <i>Poa sieberiana</i>	Jingellic NR Bogandyera NR Clarkes Hill NR	3396
	Cleared or unclassified		158
		<b>TOTAL</b>	<b>12962</b>

Of these forest ecosystems, both 94 and 119 are still under target in the Southern RFA area and are therefore under represented within the conservation reserve system. Of the overall distribution and conservation status of these forest ecosystems in the Southern Region, the reserves make significant contributions to the conservation targets set for forest ecosystems 71, 93, 94, and 119.

The CRA also identified old growth ecosystems (refer page 8) and found the reserves make a significant contribution to achieving regional targets for all of these old growth forest ecosystems.

No.	Description (old growth forest ecosystem)	Location	Area (ha)
93	OG Western Tablelands Herb/Grass Dry Forest - <i>E. robertsonii/Microlaena stipoides</i>	Bogandyera NR	755
94	OG South-west Slopes Acacia Dry Herb/Grass Forest - <i>E. bridgesiana/E. macrorhyncha/Acacia dealbata/Microlaena stipoides</i>	Jingellic NR Bogandyera NR	975
108	OG Western Tablelands Dry Herb/Grass Forest - <i>E. macrorhyncha/E. dives/Hibbertia obtusifolia/Poa sieberiana</i>	Jingellic NR Bogandyera NR	1546
119	OG Western Tablelands Dry Shrub/Grass Forest - <i>E. macrorhyncha/E. polyanthemos/Hibbertia obtusifolia/Gonocarpus tetragynus</i>	Jingellic NR	16
121	OG Western Slopes Grass/Herb Dry Forest - <i>E. macrorhyncha/E. goniocalyx/Gonocarpus tetragynus/Poa sieberiana</i>	Jingellic NR Bogandyera NR Clarkes Hill NR	1667

Generally the vegetation structure in all of the reserves is most commonly open forest with a sparse to moderately dense shrub layer and grassy/herbaceous understorey. The canopy species structure varies from areas of old growth trees to areas of dense even-aged stands of regrowth ranging in age from five to fifty years. The regrowth stages are most likely to be the result principally of changed fire regimes.

Red stringybark (*Eucalyptus macrorhyncha*) is clearly the dominant overstorey species in most areas and occurs at most elevations and aspects. Red stringybark is most dominant on north to west slopes, but is also co-dominant when associated with narrow-leaved peppermint (*E. robertsonii*) on some south and south-west aspects and brittle gum (*E. mannifera*) on more sheltered easterly slopes. Silver bundy (*E. nortonii*) is also relatively abundant and occurs from lower to upper slopes mainly on north to west slopes. At times silver bundy appears co-dominant with red stringybark in locations where, commonly, broad-leaved peppermint (*E. dives*) is also co-dominant or sub-dominant. Whilst broad leaved peppermint is still present in some locations, usually on more southerly aspects, it is often a minor component of the association. Long-leaved box (*E. goniocalyx*) and red box (*E. polyanthemos*) occur in the Jingellic NR. Other relatively common tree species in the reserves include mountain swamp gum (*E. camphora*), brittle gum (*E. mannifera*), Blakely's red gum (*E. blakelyi*), and black sallee (*E. stellulata*).

Isolated stands of eurabbie (*E. bicostata*) occur on the south-west aspect of the Ournie ridge. This association has a floristically distinct understorey.

Density of the shrub layer throughout the reserves is related to aspect, soil type and moisture availability. Shrub density generally increases on deeper soils and areas with higher moisture availability such as riparian zones. Species diversity in the shrub layer generally increases with decreased soil depth and increased incidence of rocks in the soil layers. Riparian zones along Mannus Creek have a dense tea tree (*Leptospermum* sp) shrub layer. Understorey species diversity (ie shrub/herbaceous layer) is comparatively low in Clarkes Hill NR as a result of recent intensive grazing by goats. Small areas of heath vegetation occur in a few locations within the reserves generally associated with skeletal soils, however, these areas have yet to be

surveyed. Bogandyera NR contains some areas dominated by black cypress pine (*Callitris endlicheri*) with very sparse shrub/herb understorey.

There are at least 350 plant species recorded to date occurring in the reserves. The highest plant diversity is to be found in herbaceous and grass layer of the vegetation. Little is currently known of the distribution and composition of the flora generally and further detailed surveying is required to complete an accurate documentation of species, including rare and threatened species, found in the reserves.

To date no threatened plant species as listed in the *Threatened Species Conservation Act 1995* (TSC Act) have been found in the reserves. This result is more a reflection of the lack of survey effort than a statement on the presence or absence of threatened species. Surveys in 2002 have found an unusual *Grevillea* species that may be a hybrid or cross between *Grevillea rosmarinifolia* and *G. lanigera*. This plant species may, following further study, be of regional significance.

A component of the CRA process was to develop predictive models for the presence of habitat for a range of some threatened species. Threatened plant species that are known to occur within a 50 kilometre radius of the reserves, and may occur in the reserves, are listed below:

Species Name	Probability of occurrence in reserves	Conservation status (TSC Act)
<i>Acacia phasmoides</i>	High – recorded within 25 kilometres	V
<i>Caladenia concolor</i>	Medium – similar habitat but localised occurrence	E
<i>Caladenia rosella</i>	Medium – similar habitat but localised occurrence	E
<i>Calotis glandulosa</i>	Low – generally occurs to the north of Upper Murray Area	V
<i>Euphrasia collina</i> ssp <i>muelleri</i>	Low – previous local records including from Tumbarumba late 19 <sup>th</sup> Cent.	E
<i>Euphrasia scabra</i>	Low – previously recorded from Tumbarumba	E
<i>Grevillea jephcottii</i>	High – occurs in <i>Callitris</i> pine habitat	
<i>Pilularia novae-hollandiae</i>	Low – recorded in moist areas in the greater region	E
<i>Senecio garlandii</i>	Low – recorded in region	V
<i>Swainsona recta</i>	Low	E
<i>Swainsona sericea</i>	Low	V

Under the provisions of the TSC Act, recovery plans may be prepared for listed species. Some of the species listed above either have recovery plans adopted, in draft or in preparation. As the recovery plans are adopted, the recommendations of the plans as they relate to species found in the reserves, will be implemented. Further research into the ecology of threatened species that may occur in the reserves followed by targeted surveys and monitoring may be required.

Disturbance in the reserves has consisted principally of opportunistic logging, firewood collection, occasional grazing, fire, mining and impacts of pest animals such as rabbits, goats and pigs. Clarkes Hill NR was heavily grazed by goats for a number of years prior to gazettal as a nature reserve. Some areas are still actively used for firewood and timber collection and rubbish dumping. A recent acquisition within Clarkes Hill NR (the property Teebles) shall require significant revegetation to re-establish native ecosystems. Small areas (<2.0 ha) within Bogandyera and Clarkes Hill Nature Reserves were cleared, possibly for stock camps.

The reserves form a major vegetation and fauna habitat corridor linking Kosciuszko National Park in the east with Woomargama National Park to the west. The corridor is identified in the Riverina Highlands Vegetation Management Plan as being a major biolink. The linkage is discontinuous, being separated by leased Crown land and some privately owned blocks, much of which is cleared or in poor condition. Although much of the adjacent land use is cleared agricultural land, there are some areas of remnant native vegetation immediately adjacent to the reserves. The Service will seek to have adjacent vegetation retained and enhanced through such means as voluntary conservation agreements, landcare and environmental planning controls.

### **Desired Outcomes**

- The full range of native plant species found in the park is conserved.
- Vegetation structural diversity and habitat values are conserved, and where necessary restored.
- Significant and restricted communities are conserved.
- The habitat and populations of all significant plant species are protected.
- Park neighbours support conservation of remaining areas of privately owned native vegetation near the park.

### **Strategies**

- Allow natural regeneration of past disturbed areas.
- Actively revegetate previously cleared areas within Clarkes Hill NR (excluding the Snowy Hydro communications tower site but including the property Teebles) using locally sourced plant material.
- Implement recovery plans, where appropriate, for threatened species identified occurring within the reserves.
- Undertake vegetation surveys, in particular to cover poorly researched areas and check for additional significant species.
- Introduce a program to monitor the status of the significant communities and identified threatened plant species and to evaluate the success of management programs.
- Introduce a long term program to monitor selected vegetation survey plots for response to fire, weed control and other disturbance factors.
- Liaise with neighbours, Landcare, vegetation management committees and land use authorities to encourage retention, conservation and if possible expansion, of areas of native vegetation close to the reserves.

### 3.3 NATIVE FAUNA

Few surveys for animals have been carried out in the reserves, however, fifteen sites were surveyed in April 2002 using standard CRA methods.

The April 2002 survey recorded 95 species of native vertebrates comprising 53 bird, 24 mammal, 13 reptile and 5 amphibian species. Most of the species recorded are normally associated with the forests of the south west slopes but there are also a number of inland species. No information is available on the diversity or distribution of invertebrates within the reserves.

Native animals commonly seen within the reserves include eastern grey kangaroo (*Macropus giganteus*), red-necked wallaby (*M. rufogriseus*), swamp wallaby (*Wallabia bicolor*) and common wombat (*Vombatus ursinus*), all of which can be seen throughout the reserves grazing in open forests and along creeks. The more common arboreal mammals observed, albeit generally in very low abundance, include sugar glider (*Petaurus breviceps*), common brushtail possum (*Trichosurus vulpecula*), common ringtail possum (*Pseudocheirus peregrinus*), and greater glider (*Petauroides volans*). The most common ground dwelling mammal is the agile antechinus (*Antechinus agilis*), although records also exist for the dusky antechinus (*Antechinus swainsonii*) and the bush rat (*Rattus fuscipes*).

Common bird species seen throughout the reserves include the crimson rosella (*Platycercus elegans*), sulphur crested cockatoo (*Cacatua galerita*), grey fantail (*Rhipidura fuliginosa*), red wattlebird (*Anthochaera carunculata*), yellow-faced honeyeater (*Lichenostomus chrysops*), spotted pardalote (*Pardalotus punctatus*), rufous whistler (*Pachycephala rufiventris*) and emu (*Dromaius novaehollandiae*). Species such as the eastern whipbird (*Psophodes olivaceus*), striated thornbill (*Acanthiza lineata*) and red-browed treecreeper (*Climacteris erythroptera*) have been observed in the more mesic forests of western Bogandyera and Clarkes Hill Nature Reserves. A single record exists for a masked owl (*Tyto novaehollandiae*) at Clarkes Hill.

Raptors that have been recorded in the reserves include the peregrine falcon (*Falco peregrinus*), wedge tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), and nankeen kestrel (*Falco cenchroides*).

The reserves support a diverse range of reptile species, with skinks being observed in all locations. The most common species observed are the garden skink (*Lampropholis guichenoti*), copper-tailed skink (*Ctenotus taeniolatus*), southern water skink (*Eulamprus heatwolei*), and the three-toed skink (*Hemiergis decresiensis*). Gecko's and snakes have not been commonly recorded, although brown snakes (*Pseudonaja textilis*) and red bellied black snakes (*Pseudechis porphyriacus*) have been observed on a number of occasions. Records of the blotched blue tongue (*Tiliqua nigrolutea*) and black rock skink (*Egernia saxatilis*) are significant as rare observations in the area.

Amphibian species known to occur in the reserves include Lesueur's tree frogs *Litoria lesueuri*, spotted grass frog (*Limnodynastes tasmaniensis*), Bibron's toadlet

(*Pseudophryne bibronii*), Sloane's toadlet (*Crinia sloanei*), and common eastern froglet (*Crinia signifera*). It is likely that further surveying will detect significantly greater diversity of amphibian species in the reserves. There is a high probability of locating the booroolong frog (*Litoria booroolongensis*) in the Ournie block of the Bogandyera NR as it has been observed within 1 kilometre of this area and suitable habitat exists within the reserve.

Bat species recorded in the reserves include Gould's wattle bat (*Chalinolobus gouldii*), chocolate wattle bat (*Chalinolobus morio*), lesser long-eared bat (*Nyctophilus geoffroyi*), Gould's long-eared bat (*Nyctophilus gouldii*), little forest bat (*Vespadelus vulturnus*), large forest bat (*V. darlingtoni*), King River forest bat (*V. regulus*) and the white-striped mastiff bat (*Tadarida australis*).

### Threatened Species

Four threatened animal species were recorded during surveys in 2002. These were the yellow-bellied glider, tiger quoll, false pipistrelle and masked owl. The western record for the yellow-bellied glider was of an incision tree and no live animals were recorded, however there is an active feed tree in Clarkes Hill NR. This species had previously not been detected on the south-west slopes of NSW. Recent targeted surveys in Mannus Creek for the endangered Booroolong frog found at least 30 individuals along this creek system.

The threatened species for whom habitat is predicted to occur within the reserves (CRA data) is shown below:

Scientific Name	Common Name	Conservation Status
<i>Lathamus discolor</i>	Swift Parrot	E
<i>Litoria booroolongensis</i>	Booroolong Frog	E
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E
<i>Climacteris picumnus</i>	Brown Treecreeper	V
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V
<i>Grantiella picta</i>	Painted Honeyeater	V
<i>Lophoictinia isura</i>	Square-tailed Kite	V
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subsp.)	V
<i>Neophema pulchella</i>	Turquoise parrot	V
<i>Ninox strenua</i>	Powerful Owl	V
<i>Petroica rodinogaster</i>	Pink robin	V
<i>Phascolarctos cinereus</i>	Koala	V

The following additional threatened species have been recorded within a 50 kilometre radius of the reserves. The list has been edited to show only those species for whom habitat is possibly present in the reserves and the reserves are reasonably within their distributional range.

Scientific Name	Common Name	Conservation Status
<i>Burhinus grallarius</i>	Bush Stone-curlew	E
<i>Litoria raniformis</i>	Southern Bell Frog	E
<i>Litoria spenceri</i>	Spotted Frog	E
<i>Pseudomys fumeus</i>	Smoky Mouse	E
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V
<i>Melanodryas cucullata</i>	Hooded Robin	V
<i>Miniopterus schreibersii</i>	Common Bentwing-bat	V
<i>Ninox connivens</i>	Barking Owl	V
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat	V
<i>Pachycephala inornata</i>	Gilbert's Whistler	V
<i>Pachycephala olivacea</i>	Olive Whistler	V
<i>Petaurus australis</i>	Yellow-bellied Glider	V
<i>Petaurus norfolcensis</i>	Squirrel Glider	V
<i>Polytelis swainsonii</i>	Superb Parrot	V
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subsp.)	V
<i>Pyrrholaemus saggitata</i>	Speckled Warbler	V
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V
<i>Stagonopleura guttata</i>	Diamond Firetail	V
<i>Suta flagellum</i>	Little Whip Snake	V
<i>Tyto novaehollandiae</i>	Masked Owl	V

A great deal of further research is required to determine the presence or absence within the reserves of the species listed above.

### Desired Outcomes

- Fauna species found within the reserves are surveyed, monitored and documented.
- The full range of native animal species found in the reserves is conserved.
- The habitat and populations of all threatened fauna species and biogeographically significant species are protected and maintained, and where necessary enhanced.

### Strategies

- Protect the habitats of threatened and biogeographically significant fauna species from visitor impacts, the effects of introduced species and inappropriate fire regimes.
- Undertake fauna surveys, in particular to survey poorly researched areas and to record the distribution of threatened and significant fauna species.
- Implement recovery plans when prepared.
- Introduce a long term program to monitor the status of the significant threatened fauna species and to evaluate the success of management programs.
- Introduce a long term program to monitor selected fauna survey plots for fauna response to fire, weed control and other disturbance factors.



### **3.4 ABORIGINAL HERITAGE**

The history of the Aboriginal people of the Upper Murray area is poorly documented and often contradictory. The reserves fall within the area occupied by the Djilamathong language group (according to Tindale 1974) or the Wolgal or Wolgalal (according to Mitchell T. 1981). Mitchell indicates that the Djilimathong (or Gillamatong) ranged over the area without any specific territorial area.

Recently completed preliminary cultural heritage surveys in Clarkes Hill and Bogandyera Nature Reserves located 42 previously unrecorded Aboriginal sites. These sites consisted of isolated artefacts, scarred trees and potential archaeological deposits. A range of sites have also been recorded in the surrounding region.

The strong attachment of Aboriginal people to the land is acknowledged. They have cultural links with the whole landscape and specific locations. Individual places of significance may include living places, art sites, ceremonial sites, spiritual places and contact sites. Aboriginal sites and places are also important to non-Aboriginal people as they provide information about the past lifestyles of all humans.

While the Service presently has legal responsibility for the protection of Aboriginal sites and places it acknowledges the right of Aboriginal people to make decisions about their own heritage. It is therefore policy that Aboriginal communities be consulted and involved in the management of Aboriginal sites, places and related issues and the promotion and presentation of Aboriginal culture and history. The reserves fall within three Aboriginal Land Council (LALC) areas. Jingellic NR falls partly within the Albury LALC area and partly within the Brungle Tumut LALC area. Bogandyera NR falls almost wholly within the Brungle Tumut LALC and Clarkes Hill NR falls entirely within the Wagonga LALC. There are also likely to be other Aboriginal community organisations and individuals with an interest in use and management of the reserves.

There is interest in the local Aboriginal community in undertaking cultural and teaching activities in the reserves. Cultural activities are appropriate as long as they comply with the policies of this plan of management and have minimal environmental impact. The Service supports this in principle and will work with the community to establish agreements for such access.

#### **Desired Outcomes**

- Sufficient information on location and condition of sites of Aboriginal significance is available to ensure that management activities do not impact on the sites.
- Aboriginal sites and places are protected from damage by human activities.
- Aboriginal people are involved in the management and interpretation of Aboriginal cultural values in the reserves.

## Strategies

- Manage Aboriginal heritage in consultation with the Albury, Brungle Tumut, and Wagonga Local Aboriginal Land Council and other relevant Aboriginal community organisations and individuals.
- Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact on Aboriginal sites and places.
- Do not publicise the location of Aboriginal sites and places except where the agreement of relevant Aboriginal community organisations has been obtained.
- Develop appropriate site management strategies where required and manage cultural sites places and features in accordance with the Regional Cultural Heritage Management Strategy.

### 3.5 HISTORIC HERITAGE

The route taken by the early explorers Hume and Hovell in 1828-1829 passes through the northern end of Bogandyera NR. The Hume and Hovell track, which is managed by the Department of Lands, follows the route taken by these early explorers.

The reserves have been used since the late 1800's for the purposes of mining, localised timber getting and occasional grazing. These activities, combined with the impacts of changed fire regimes and introduction of alien plant and animal species, have resulted in landscape scale disturbance and modification of the vegetation and faunal communities. As a result of the changes to fire regimes, many of the areas within the reserves are regenerating landscapes.

Physical evidence of past use of the reserves remains in the form of mine shafts, a stone hearth and associated earthworks in Jingellic NR; a corrugated iron shepherds hut in Bogandyera NR; and an old stone chimney and saw pits in Clarkes Hill NR. Historic places identified in the reserves will be recorded and assessed for their significance.

#### Desired Outcomes

- Historic features are appropriately documented, conserved and managed.
- Heritage features and places eg. Mine shafts do not present a risk to public.

#### Strategies

- Progressively identify, record and assess the significance of historic places and features.
- Develop management strategies and manage historic places and features identified as being of high significance to protect their cultural and heritage values.
- Prepare and implement a conservation management plan for historic places identified as being of high significance.
- Carry out a risk assessment of heritage places that have the potential to present a risk to the public.

## 4. RESERVE PROTECTION

### 4.1 SOIL EROSION

Areas within Bogandyera NR and Clarkes Hill NR have sandy granite-derived soils that are highly susceptible to erosion when disturbed. This presents challenges for trail maintenance. Soils within the Jingellic NR are generally rocky and stable. Trails were constructed in the reserves during the 1980's-1990's principally to assist with bushfire protection.

Jingellic NR has a large number of trails in close proximity and it is proposed to close and rehabilitate two trails (as shown on the attached map) to minimise erosion and maintenance requirements, and to maximise the conservation values of the reserve.

An old cattle track in Clarkes Hill NR adjacent to the Tooma Rd is in a very unstable and eroding condition. Negotiations with Tumbarumba Shire Council and Hume Rural Lands Protection Board have resulted in an agreed proposal to eventually close and rehabilitate this old trail.

A short section of the park road to Mannus Falls is in a continually eroding condition and is potentially dangerous in wet conditions. This trail is also proposed to be available for general public vehicular access. A short section will be investigated for the potential to be re-routed to a shallower grade and the former section closed and rehabilitated.

The Pine Water Hole trail in Bogandyera NR is an informal dead end route to Mannus Creek that has never been formally constructed. This trail will be maintained to a minimum standard to provide access for reserve management and research only.

Two bridges on Sapling Yards creek in Bogandyera NR were constructed in the 1980's by the then State Forests of NSW. The bridges consist of the base frame from a railway carriage, and log head walls on the banks of the creek. One of these bridges washed out in a flood in the late 1990's and was replaced with a rock crossing in 2001. The second bridge has erosion occurring around the head walls and is possibly in an unsafe condition.

All trail closures and access decisions are subject to the provisions of the *National Parks Estate (Southern Regions Reservation) Act 2000*, which outlines a process for the determination by December 2005 of trail use including closures.

Large erosion gullies occur in a number of locations within Clarkes Hill NR and are thought to be the result of a combination of events, such as drought and rabbit plague followed by bushfire and flooding rains, in the 1930s. Many of these erosion gullies appear to have stabilised to some degree, however, some are still active. The extent and location of these eroding areas require mapping and erosion mitigation works.

All works carried out on these soils will be subject to application of standard trail maintenance procedures which include soil erosion mitigation guidelines.

## Desired Outcomes

- Human induced soil erosion in the park is minimised.
- Currently eroding gullies are stabilised.
- Management trails network is appropriate to carry out management activities while maximising the conservation values of the reserves.
- Trails and tracks are constructed to standards sufficient to prevent erosion.

## Strategies

- Identify, map and assess all active erosion gullies.
- Design and undertake all works in a manner that minimises soil erosion.
- Undertake rehabilitation works on eroded gullies in the Clarkes Hill NR area.
- Investigate the potential for re-routing the road to Mannus Falls where possible to reduce the grade of the trail and hence the erosion potential, and rehabilitate the closed section.
- The old bridge on Sapling Yards Creek will be investigated for its structural integrity, and shall be removed if deemed unsafe and replaced with an appropriate crossing.
- Close and rehabilitate those trails identified as not being required (subject to process required by the *National Parks Estate (Southern Regions Reservation) Act 2000*).
- Monitor areas of erosion and treat where necessary.

## 4.2 WATER QUALITY AND CATCHMENT MANAGEMENT

The reserves are all within the Murray River catchment that commences and extends well beyond the reserve boundaries. The reserves fall within the Jingellic, Ournie, Mannus, Tumbarumba, and Maragle subcatchments although there are no subcatchments that are completely within the reserve boundaries. As such there is little opportunity for direct control of water quality in the streams of the reserves. Current water quality in the streams of the reserves is largely unknown. Some streams appear clear at most times, however, some streams appear to carry relatively high sediment loads during periods of higher rainfall. Carp are known to occur in Mannus Creek as far upstream as the Mannus Falls. Above Mannus Falls platypus have been observed in the last three years indicating a reasonable level of water quality in the upper part of the Mannus Creek.

The *Catchment Management Act 1989* provides a framework for achieving cleaner water, less soil erosion, improved vegetation cover, the maintenance of ecological processes and a balanced and healthier environment. It also provides a focus to balance conservation needs and development pressures and encourages a more aware and involved community. An important means of achieving these aims is the formation and support of catchment management boards at a local level. The reserves are within the area of the Upper Murray Catchment Authority.

## Desired Outcomes

- The reserves' catchment values and the water quality and health of streams are maintained.

### Strategies

- Design and undertake all works in a manner that minimises water pollution.
- Liaise with local government and other authorities as needed to maintain the water quality of the reserves' catchments.
- NPWS will continue to participate in and support the Upper Murray Catchment Authority.

### 4.3 INTRODUCED SPECIES

An introduced species is defined in this plan as any plant or animal species not native to the reserves. Introduced species within the reserves and on adjoining land are of concern because they have the potential to have detrimental effects on 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.

### Weeds

Introduced plant species are common and widespread with 53 introduced plant species recorded to date in the reserves. Most of these species do not have any appreciable environmental impact on the ecological values of the reserves. Priority species for control that are present in the reserves and that are identified in Snowy Mountains Region Pest Management Strategy include willow, St Johns wort, blackberry, Patersons curse and pine wildlings.

#### High priority species

Blackberry (*Rubus ulmifolius*) and its numerous varieties and cultivars occur in all of the reserves. Blackberry has been aerially mapped and is estimated to currently occur in around 720 hectares of the reserves, with the greatest infestations being in Clarkes Hill NR. An ongoing blackberry control program is and will continue to be implemented in the reserves. The focus of the control will continue to be on isolated populations, boundaries where neighbours are actively engaged in control on their lands, the upper parts of catchments, and the more accessible areas. NPWS will continue to implement blackberry control in cooperation, and in a coordinated manner with other agencies and neighbours.

St Johns wort (*Hypericum perforatum*) occurs in all of the reserves and in some locations, particularly Clarkes Hill NR, forms the dominant ground cover species. Control is currently being carried out by spraying along tracks and by implementation of biological controls. Further assessment and mapping is required and will be followed by implementation of a more developed integrated control strategy.

Pine wildlings (*Pinus radiata*) have been aerially mapped and occur in the northern end of Bogandyera NR and throughout Clarkes Hill NR. Pine wildlings are currently

being and will continue to be removed from the reserves as a high priority. The high priority is due to the currently low abundance and localised distribution.

#### Medium priority species

Willow (*Salix* sp.) are of restricted distribution along creek lines in Bogandyera and Clarkes Hill Nature Reserves. Willows will be controlled where they threaten high conservation value riparian zones such as occurs in the Mannus and Maragle Creeks.

Patersons curse (*Echium plantagineum*) is known to occur in isolated locations in Jingellic, Bogandyera and Clarkes Hill Nature Reserves, although the overall distribution is currently unknown. Further assessment and mapping is required and will be followed by development and implementation of a control strategy.

An emerging weed in the Bogandyera NR is ox-eye daisy (*Leucanthemum vulgare*). Ox-eye daisy currently occurs in an estimated 1200 hectares and is becoming the dominant ground cover species in much of this reserve, displacing local native groundcover species. Control is very difficult as this species grows in association with many native ground cover species. Further research is needed into distribution and potential control methods, followed by development of a control strategy.

#### **Pest Animals**

Introduced animal species recorded in the reserves include goats (*Capra hircus*), pigs (*Sus scrofa*), fallow deer (*Dama dama*), sambar deer (*Cervus unicolor*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), foxes (*Vulpes vulpes*), dogs (*Canis familiaris*), house mice (*Mus musculus*), and brown rats (*Rattus rattus*),

#### High priority species

Wild dogs have been reported in the reserves and control programs have been undertaken in response to stock loss problems on neighbouring properties. Wild dogs can be divided into three groups - dingoes, hybrids with domestic dogs, and feral dogs. Wild dogs, including dingoes, can cause substantial losses to livestock and there is an expectation by rural communities that the impact of these animals be minimised. Wild dogs, including dingoes, will continue to be controlled on the reserves.

Pigs now only occur in low numbers in the reserves due to control measures that have been undertaken by NPWS since 2001. Pigs still occur in small numbers in Jingellic and Bogandyera Nature Reserves. Pigs will be controlled, particularly where they are impacting on neighbouring properties and crops.

Goats occur in Bogandyera NR. A goat control program has reduced the population to about 20% of original numbers. Goats will continue to be actively controlled with the aim of goats being eliminated entirely from the reserves as this is one of the few species for which such a strategy can realistically be achieved in the area.

Foxes occur throughout the reserves, however the wide spread presence of ground dwelling bird species indicates that the fox is possibly in low abundance. Fox control is and shall continue to be routinely undertaken as a component of the wild dog

control program. NPWS will continue to control foxes cooperatively with neighbours and the Rural Lands Protection Board programs.

#### Medium priority species

Rabbits are distributed in very low populations throughout the reserves and are currently a low priority to control. Further mapping is required and control will be implemented where it can be practically carried out.

Deer populations appear to be increasing in the reserves according to local anecdotal information. The current distribution is unknown and further research is required to determine the species present and their abundance and distribution. A control program will be developed and implemented following the results of further research.

#### Low priority species

Although feral cats occur in the reserves, they are very difficult to control. Cats will be controlled when feasible control options become available.

Domestic stock regularly enter the reserves, usually due to inadequate fences. NPWS has assisted neighbours on a number of occasions with fencing materials under fencing agreements. NPWS will continue to offer assistance, subject to availability of funds, to neighbours to ensure secure fencing is in place along boundaries.

A pest monitoring program was introduced to some sections of the reserves in 2001 to monitor species presence and abundance using sandpads. Monitoring provides useful information on the presence or absence of pest species and can also give an indication of the changes in abundance of pest species over time. Such information is essential to design, adapt and implement more efficient and economical pest management strategies.

### **Desired Outcomes**

- The impact of introduced species on native plants and animals is minimised.
- Goats are eradicated from Bogandyera NR.
- Domestic stock do not enter the reserves.

### **Strategies**

- Control introduced species and eradicate them where practicable in accordance with best management practice.
- Give priority for the control of introduced weed species to:
  - Control of willows on creek lines with high quality remnant vegetation;
  - Control of blackberry on creek lines with high quality remnant vegetation, trails and boundaries;
  - Control of Patersons curse in Clarkes Hill NR;
  - Control of St Johns wort on trails and boundaries;
  - Control ox eye daisy on trails and boundaries;
  - Removal of pine wildlings from all reserves; and
  - Control of all weeds on management trails.
- Give priority for the control of introduced animal species to:

- Control of wild dogs, pigs and foxes in all reserves;
- Control of goats in Bogandyera NR; and
- Control of rabbits where warrens are accessible, or where impacts on neighbouring properties are occurring.
- Assess the abundance and impact of deer in the reserves and implement a control strategy if necessary.
- Avoid unnecessary environmental disturbances. Where disturbance is inevitable or is planned, consider the likely impact of the activity in terms of introduced species and put in place controls or programs to reduce any such impact.
- Seek the cooperation of neighbours in implementing weed and pest animal control programs. Undertake control in cooperation with the Hume Rural Lands Protection Board and Tumbarumba Shire Council.
- Encourage maintenance of effective fencing of boundaries with grazing properties to prevent domestic stock from entering into the park. Provide fencing assistance where possible and appropriate.
- Implement a monitoring program to measure the effectiveness of control programs for pest animal species.

#### **4.4 FIRE MANAGEMENT**

Fire is a natural feature of the environment and is essential to the survival of some plant and animal communities. Inappropriate fire, however, can damage natural and cultural heritage and endanger park visitors and neighbours. Management of bushfire in the reserves is a complex issue. Management must aim to achieve both long-term conservation of native plant and animal communities and ongoing protection of life and property within and adjacent to the park.

##### **Ecological requirements**

Bushfire regimes are a major determinant of the distribution and abundance of plants and animals in the reserves. They also affect nutrient cycles, erosion patterns and hydrological regimes. Ecological research suggests the following requirements for biodiversity conservation:

- variability of fire intervals and area burnt is important to conserve floristic diversity and provide diversity of habitat for animals; fire at too frequent intervals will lead to loss of species;
- most plant species and communities require infrequent fires of moderate to high intensity to achieve regeneration but patchy burns are better for fauna as they retain shelter and food refuges;
- fires during the breeding season are the most damaging to fauna communities because of direct impact on young and increased exposure to predation;
- a fire frequency of between 15 and 60 years is generally appropriate for the reserves vegetation communities; species decline is predicted if successive fires occur less than 15 years apart or there are no fires for more than 60 years. Minimum fire frequency is determined using the National Fire Response Register.



**Fire Behaviour and Vegetation Management Guidelines**  
(from Draft Fire Management Strategy).

<b>Community</b>	<b>Fire Behaviour Characteristics</b>	<b>Vegetation Management Guidelines</b>
Cleared/degraded land	<ul style="list-style-type: none"> <li>➤ Varying grass types give different behaviours</li> <li>➤ Cured grasses dry quickly and will be available before surface fuels</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline is predicted if fires occur more often than every 2 years</li> <li>➤ Grassy understorey and surface fuels established very quickly</li> <li>➤ Soils prone to erosion and weed invasion with frequent fire</li> </ul>
Dry Forest	<ul style="list-style-type: none"> <li>➤ Fires possible at most times of the year depending on altitude</li> <li>➤ Quick rate of spread due to drier fuels</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 22 years apart or further than 50 years apart</li> </ul>
Dry Forest dom. / Moist Forest	<ul style="list-style-type: none"> <li>➤ Usually contains moderate to high fuel levels at most strata</li> <li>➤ Will burn intensely at moderate to high fire danger indices (FDIs)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 15 years apart or further than 60 years apart</li> <li>➤ Frequent burning or opening of the canopy will cause faster drying of fuels and succession by more flammable species</li> </ul>
Moist Forest	<ul style="list-style-type: none"> <li>➤ Usually contains high fuel levels at all strata</li> <li>➤ Will burn intensely at high FDIs</li> <li>➤ Fires are rare but likely to be of high intensity</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 25 years apart or further than 60 years apart</li> <li>➤ Frequent burning or opening of the canopy will cause faster drying of fuels and succession by more flammable species</li> </ul>
Moist Forest Tending to Dry	<ul style="list-style-type: none"> <li>➤ Usually contains moderate to high fuel levels at most strata</li> <li>➤ Will burn intensely at moderate to high FDIs</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 25 years apart or further than 60 years apart</li> <li>➤ Frequent burning or opening of the canopy will cause faster drying of fuels and succession by more flammable species</li> </ul>
Woodlands	<ul style="list-style-type: none"> <li>➤ Fires most likely in summer autumn</li> <li>➤ Quick rate of spread due to drier fuels</li> <li>➤ Lesser risk of crown fires with woodland formation although these will occur in drought conditions given sufficient non-grassy fuels</li> <li>➤ Fire in drought conditions will burn almost-bare grassy fuel areas only in high winds. Rate of spread will be high.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 15 years apart. Decline predicted if fire interval exceeds 50 years.</li> <li>➤ Grassy understorey re-established quickly</li> </ul>

Community	Fire Behaviour Characteristics	Vegetation Management Guidelines
Woodland Dom, Forest Present	<ul style="list-style-type: none"> <li>➤ Fires most likely in summer autumn</li> <li>➤ Quick rate of spread due to drier fuels</li> <li>➤ Lesser risk of crown fires with woodland formation although these will occur in drought conditions given sufficient non-grassy fuels</li> <li>➤ Fire in drought conditions will burn almost-bare grassy fuel areas only in high winds. Rate of spread will be high.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Species decline predicted if successive fires occur less than 15 years apart. Decline predicted if fire interval exceeds 50 years.</li> <li>➤ Grassy understorey re-established quickly</li> </ul>

Fire can also damage some types of Aboriginal sites and historic places. Features such as scarred trees, old buildings and farming implements can be permanently damaged or lost by wildfire. Other sites can be damaged by use of heavy machinery for fire suppression activities.

### Fire history

The natural fire frequency of the reserves is low, with major wildfires having been recorded in 1939 and 1952. Some sections of the reserves have not burnt since the 1952 fire and would benefit from introduction of fire for promotion of ecological succession in accordance with the prescribed fire regimes above. The development of large area wildfire in the last 20 years has frequently been prevented by rapid response and control by local volunteers and State Forests.

Generally, wildfires arrive from the west and south-west with some anecdotal observations of fires spotting over the Murray River from Victoria into the area of the reserves. Despite the lack of wildfire in some areas, the fuel load remains quite low at around 5-10 tonnes per hectare. Localised higher fuel loads (up to 20 tonnes per hectare) occur in some areas. During dry summer periods fuel loads have been observed to increase significantly, and then diminish again during moist periods following the summer.

Hazard reduction burning has been carried out in parts of the reserves by various agencies over the last twenty years. Various blocks within the Jingellic NR have probably been burnt most frequently, while some areas of Bogandyera and Clarkes Hill NR have not had any burning within them since the 1952 wildfire.

### Strategies and cooperative arrangements

Under the *Rural Fires Act 1997* the Service is a fire authority and is responsible for controlling fires on the reserves and ensuring that they do not cause damage to other land or property. An important part of the Service's fire management is participation in local co-operative fire management arrangements, including implementation of Bush Fire Risk Management Plans developed by District Bush Fire Management

Committees. The Service is a member of the Riverina Highlands Bush Fire Management Committee which has a plan covering the reserves.

Water availability during high fire danger periods and periods of low rainfall is limited. Water points for both vehicles and aircraft are shown on the Fire Management Strategy.

Fire leaving the reserves has the potential to threaten adjacent pine plantations and agricultural land with associated buildings including dwellings. A fire management strategy has been prepared for the reserves. This identifies the bushfire threat, requirements for the conservation of native plants and animals, and community protection measures in areas where it is identified that fire is a threat to property. In particular, fire management guidelines are set out for threatened fauna species recorded or predicted to occur in the reserves. These mainly involve protection of potential nesting sites and keeping fire out of the canopy.

Management will aim to maintain biodiversity by restricting fires to only part of the distribution of a vegetation community at any one time and ensuring that the fire frequency thresholds are not exceeded.

A variety of fire management strategies have been developed including fuel reduction, management trail maintenance, detection and cooperative arrangements. Some, or at times all, of these will be applied where appropriate to best protect life, property and natural and cultural assets. Close to boundary areas, fuel reduction programs and management trail maintenance will be designed and implemented in cooperation with neighbours.

The Service is committed to implementing hazard reduction works where required to mitigate against wildfire escaping from the reserve while also taking account of the ecological values of the reserves. Other methods of fuel management such as slashed breaks, management trails and existing fire breaks, will continue to be maintained where they are identified as being required for asset protection.

Management trails in the reserves will be maintained to a standard to prevent erosion. Trails identified as a priority will be maintained to ensure a safe working zone for fire fighters and for other management purposes.

### **Desired Outcomes**

- Fire regimes are appropriate for long-term conservation of the reserves' plant and animal communities.
- Human caused unplanned bushfires are prevented.
- The potential for spread of bushfires on, from, or into the reserves is minimised.
- Persons and property on, or immediately adjacent to, the reserves are protected from bushfires.
- Aboriginal sites, historic places and culturally significant features are protected from damage by bushfires.

## Strategies

- Use prescribed fire to achieve a variety of fire regimes that maintain fire thresholds for each vegetation community in accordance with the Fire Management Strategy.
- Avoid use of heavy machinery for fire suppression in areas of rare plants, Aboriginal sites and historic places.
- Rehabilitate areas disturbed by fire suppression operations as soon as practical after the fire.
- Encourage research into the ecological effects of fire in the reserves, particularly the fire response of significant plant species.
- Continue to actively participate in the Riverina Highlands Bush Fire Management Committee. Maintain close contact and cooperation with Rural Fire Service fire officers and volunteer fire brigades.
- Where appropriate, carry out fuel management in cooperation with neighbours for mutual protection.
- Retain the option to close the reserves to public use during periods of extreme fire danger.
- Undertake fuel reduction programs, trail maintenance, research and monitoring programs in accordance with the policies outlined above and the Fire Management Strategy.

## 5. VISITOR OPPORTUNITIES AND OTHER USES

### 5.1 INFORMATION PROVISION

Provision of information about the reserves will include providing information about the reserves' cultural and heritage values; information about Service actions and outcomes of management programs; and access to maps of those areas accessible to the public. Information is required to inform potential users of the areas that are accessible to the public, particularly the Hume and Hovell Track.

Information is required by emergency response organisations such as Rural Fire Service Brigades, Police and Ambulance Services.

#### Desired Outcomes

- There is widespread community understanding and appreciation of the reserves' natural and cultural values.
- The reserves are used as an educational resource for local schools and community organisations.
- Emergency response organisations are familiar with the information available for navigation within the reserves.

#### Strategies

- Maps of the reserves showing the trail network will be provided to emergency response organisations.
- A neighbour newsletter will be drafted and sent to neighbours and stakeholders advising of management operations and other related information about the reserves.
- Produce media releases and attend meetings with neighbours and community organisations to promote community understanding of the reserves' values and management strategies.
- Provide directional signposting within the reserves to facilitate navigation, particularly for fire fighters.
- Place orientation signs at relevant locations within Bogandyera NR to advise of the areas that are publicly accessible within the reserve.
- Support and assist educational use of the reserves by schools, community groups and individuals through provision of relevant information.

### 5.2 RECREATION OPPORTUNITIES

The primary purposes of nature reserves are conservation of wildlife and natural environments and to provide opportunities for education and scientific research into these resources. Recreational use is appropriate where it does not conflict with these objectives and promotes understanding and appreciation of the reserve's significance.

The reserves are located between two major regional national parks, Kosciuszko National Park to the east and Woomargama National Park to the west. These national parks provide a wide range of recreational opportunities within easy reach of the community of Tumbarumba shire. Mannus Lake to the north of Bogandyera NR offers water sports and fishing opportunities. There are a wide range of state forest areas such as Bago SF, that also provide recreation opportunities for the community of Tumbarumba including day trips, 4WD tracks, picnic areas, camping and fishing. Tumbarumba Shire Council manages the Paddy River Falls and Paddy's River camping area, and camping and recreational facilities at the start of the Henry Angel Track.

The reserves have had a limited history of use for fishing and occasional camping on Mannus Creek, recreational horse riding, day trips and picnics. Such use has been intermittent and opportunistic and has generally involved very low numbers of visitors. The Hume and Hovell Track traverses the northern section of the Mannus block of Bogandyera NR and is occasionally used for bushwalking. There are no recreational facilities in the reserves.

The reserves are principally surrounded by private property and most of the access into the reserves is therefore limited. There are few public roads leading into or through the reserves including the Tooma Rd which dissects Clarkes Hill NR; Sections of Winfields Trail; and sections of the Mt Garland Trail. All trail closures and access decisions are subject to the provisions of the *National Parks Estate (Southern Regions Reservation) Act 2000*, which outlines a process for the determination, by December 2005, of trail use including closures.

Given the historic use patterns, public vehicle access will be permitted to continue to Mannus Falls via the Mt Garland Ridge. Such access will be 4WD dry weather only due to the standard of the roads. No other roads within the reserves will be available for public vehicular access. All management trails will be available for bushwalking.

Horse riding, motor cycling, and large scale or commercial recreation activities will not be permitted in the reserves. The current low level of bicycle riding in the reserves will be permitted to continue.

Firewood collecting is not permitted in the reserves. Campers are required to use fuel stoves for cooking.

### **Desired Outcomes**

- A variety of low key visitor opportunities are available that encourage appreciation of the natural environment.
- Visitor use is compatible with the purposes of nature reserves and is ecologically sustainable.

### **Strategies**

- Use of the reserves for educational purposes, nature observation and scientific inquiry will be promoted.

- Recreational activities other than low impact mountain bike riding, bushwalking, remote camping and public vehicle access to Mannus Falls, will not be permitted in the reserves. No recreational facilities will be provided.
- Allow remote camping throughout the reserves. Campers will be required to remove all rubbish, use fuel stoves only and practise minimum impact camping.
- Allow bushwalking on management tracks throughout the reserves, and the continued use of the Hume and Hovell track.
- Monitor and record numbers and impacts of visitors using the reserves.

### 5.3 OTHER USES

There are nine licensed bee sites in Clarkes Hill NR. The licences for these sites will be permitted to continue as provided for in the NPWS Beekeeping policy.

The Rural Fire Service (RFS) has used the Jingellic NR for driver training for RFS volunteers. This activity is supported by NPWS as it encourages local brigade members familiarity with the reserve. Continued use will be subject to licence conditions and environmental monitoring.

There are a number of communications towers and power lines either within the reserves or to which access is via the reserves management trails. These were constructed prior to gazettal and include a Snowy Hydro Limited communications tower at Clarkes Hill, power lines through Clarkes Hill NR, access to various towers and powerlines on Mt Ikes in Bogandyera NR, and a Telstra Tower immediately adjacent to the Jingellic NR.

Where licences were held for structures or other uses or purposes prior to the reserves gazettal, such licences will be permitted to continue for the purpose for which they were originally granted, subject to NPWS policy and relevant legislation and subject to access and maintenance agreements negotiated with the relevant owners of these structures. As the reserves are remote natural areas with high natural and cultural values, construction of new facilities by other authorities or individuals will only be permitted where expressly provided for by current legislation.

The powerlines supplying Mt Ikes have caused a significant visual impact on the north side of Mt Ikes which is visible from many points north. Opportunities to have these powerlines removed and/or replaced with underground cabling will be investigated.

There is a proposal by State Forests to realign the Mt Garland management trail, in the Mannus section of the Bogandyera NR, through parts of the reserve. This proposal shall be managed with due regard to statutory processes.

A number of situations occur where individuals and authorities have carried out unlicensed development within the area that is now nature reserve. These include clearing for access, planting of pine trees, and possibly some of the powerlines and towers. Negotiations will be held with individuals and authorities to resolve these issues in accordance with the provisions of the *National Parks and Wildlife Act 1974* and the *National Parks Estate (Southern Region Reservations) Act 2000*.

Fences exist along Tooma Road in Clarkes Hill NR and are currently in very poor condition.

A quarry located within the external boundary of Lot 187 in Bogandyera NR is not required for management purposes. A rehabilitation plan will be prepared to address safety and revegetation options for this quarry.

Access by neighbours through reserve management trails occurs in a number of locations. In some circumstances such access is the primary means of access to and from a property. The provisions of the *National Parks Estate (Southern Region Reservations) Act 2000* will be applied to resolve and formalise access issues including the negotiation of access agreements and licences where appropriate.

There is an addition to Clarkes Hill NR (Teebles) which under the acquisition agreement with the previous owner allowed for licensed occupation until October 2004. Following the expiration of this licence, the block shall be revegetated with native species propagated from locally harvested seed.

### **Desired Outcomes**

- Non-park uses have minimal environmental impact.
- Inappropriate uses of the reserves cease occurring or are relocated outside the reserves.

### **Strategies**

- Allow the continued use of Jingellic NR by the RFS for driver training.
- Continue to permit the existing commercial beekeeping operations in accordance with Service policy and licence conditions.
- Keep non-Service utilities such as powerlines and towers under review, with the aim of closure or relocation where feasible.
- Any proposed non-NPWS infrastructure within the reserves will not be permitted unless the development is for purposes consistent with the NPW Act.
- Negotiate with individuals and authorities to have unlicensed developments removed from the reserves, or licensed where consistent with the purpose of the NPW Act and other relevant legislation.
- Investigate the location, ownership and responsibility for maintenance of the fences along Tooma Road in Clarkes Hill NR and elsewhere in the reserves, with a view to removing the fences if they are no longer required.
- Access issues are identified and resolved in accordance with legislative procedures.
- Prepare a rehabilitation plan to address management of the Bogandyera quarry.
- Revegetate new additions to reserves with species propagated from locally harvested seed.



## 6. RESEARCH AND MONITORING

The purpose of scientific study in the reserves is to improve understanding of its natural and cultural heritage and the processes which affect them. Research also establishes the requirements for management of particular species or entities of concern.

Little research has been carried out in the reserves in the past and consequently there is little systematic historical data about fire, pests, and native flora and fauna of the reserves. Limited flora and fauna surveys were carried out during 2002. Research is required to determine the suite of flora and fauna species present in the reserves and their conservation status locally and regionally.

Research is also required into the cultural heritage of the reserves. Although there is some evidence of past occupation, both Aboriginal and European, there is very little documented data available.

Under the Southern Region Forest Agreement (RFA) all forest managers including State Forests of NSW, Department of Lands and the Service must demonstrate ecologically sustainable forest management (ESFM). ESFM aims to maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate, including:

- ecosystem biodiversity, health, vitality, productive capacity and functional processes;
- soil and water productive capacity and functional processes;
- long term social and economic benefit; and
- natural and cultural heritage values.

ESFM is an over-riding management principle and will be applied to all ecosystem types, not just forests. It will be implemented primarily through monitoring to provide feedback on management programs and directions for future adaptive management. Performance indicators of ecologically sustainable forest management have been identified. Monitoring programs will be developed using the indicators to demonstrate the impact of management actions on ecological functions. Remedial management actions will then be undertaken as required.

Bogandyera NR is a nominated reserve for ongoing monitoring of on-reserve management effectiveness under the State of the Parks monitoring program.

Research priorities identified under the RFA will be pursued along with topics identified in this plan of management. Key areas of research and monitoring will be:

- flora and fauna monitoring to examine impacts of management activities;
- distribution and density of weeds and pest animals; and
- cultural heritage.

The results of research and monitoring will be used to guide management programs.

Research by other organisations and students may provide valuable information for management. A prospectus will be prepared to encourage involvement of other organisations in priority research areas.

### **Desired Outcomes**

- Research is undertaken that enhances the information base and assists management of the reserves.
- Research causes minimal environmental damage.
- Monitoring programs are in place to detect any changes in the status of the reserves' resources, particularly threatened species.

### **Strategies**

- Implement monitoring programs as required for reporting for Bogandyera NR for the State of the Parks monitoring program.
- Use the principles of Ecologically Sustainable Forest Management to guide management operations. Work with other authorities and stakeholders in implementing ESFM principles across the landscape.
- Develop appropriate protocols to undertake research and monitoring of flora and fauna to provide information about the reserves' natural and cultural heritage in order to facilitate management.
- Permit appropriate research by other organisations and individuals and promote research that is directly useful for management purposes.
- Require any research structures and long term markers to be placed in locations that will minimise their visual impact and require their removal upon completion of the research.
- Prepare a prospectus as a guide to preferred research projects in the reserves.
- Encourage volunteers, bird watchers or similar groups to pass on information gathered in the reserves.

## 7. MANAGEMENT OPERATIONS

There are no NPWS facilities within the reserves other than management trails and some loading ramps.

Management trails in the reserves have been identified and classified according to their management status and maintenance schedule. Trails to be maintained are shown on the attached maps. Some trails will be managed as dormant trails and will not be maintained. These trails will be able to be reopened should they be required in an emergency.

A number of trail construction works were carried out in the Jingellic NR prior to gazettal. Some of these trails have now been classified as being unnecessary for management purposes and are causing erosion and sedimentation problems in their current state. Trails in Jingellic NR to be closed to allow revegetation are shown on the attached map.

A trail in the Clarkes Hill NR adjacent to Tooma Rd was constructed to facilitate stock movements on the Tooma Rd. This old trail is poorly designed and is now eroding and contributing sediment loads to creeks in the area. This trail will be closed and rehabilitated.

The Ournie block of the Bogandyera NR is a large area that is currently difficult to access due to very steep topography. A new management trail will be constructed in the location shown on the map. This trail will be a low key trail constructed for the purpose of fire management and pest control works.

Loading ramps are required in the reserves in key locations to assist with the loading and unloading of plant and vehicles. Loading ramps will be constructed at selected key locations within the reserves.

Access to the reserves by NPWS staff is commonly through private property and currently there are no formalised arrangements with neighbours for such access. Formalised access agreements shall be entered into with neighbours where required. In addition there are many circumstances where the reserve cadastral boundary requires rationalisation in relation to actual and cadastral roads. The *National Parks Estate (Southern region Reservations) Act 2000* provides a process for all boundary rationalisation issues.

### Desired Outcomes

- Management trails to be retained within the reserves are in a stable and trafficable condition.
- Management trails not required will be rehabilitated to as near natural condition as possible.
- Plant and equipment can be safely unloaded from vehicles at key points in the reserves.

**Strategies**

- Close and rehabilitate those trails identified as being not required for management.
- Maintain management trails to NPWS standards.
- Construct a new management trail in the Ournie Block of Bogandyera NR.
- Construct loading ramps in selected locations within the reserves.
- Investigate boundary rationalisation and prepare submissions for rationalisation of boundary where required.

## 8. PLAN IMPLEMENTATION

This plan of management establishes a scheme of operations for the reserves. The plan is part of a system of management developed by the National Parks and Wildlife Service. The system includes the NPW Act, management policies, established conservation and recreation philosophies and strategic planning at corporate, branch and regional levels. The latter may include development of related plans such as regional recreation plans, species recovery plans, fire management plans and strategies and conservation plans.

Section 81 of the Act requires that this plan of management shall be carried out and given effect to, and that no operations shall be undertaken in relation to Jingellic, Bogandyera and Clarkes Hill Nature Reserves unless they are in accordance with the plan.

Implementation of this plan will be undertaken within the annual programs of the Service's Snowy Mountains Region. The actions identified in the plan are those to which priority will be given in the foreseeable future. Other management actions may be developed consistent with the plan objectives and strategies.

Relative priorities for identified activities are set out in the table below. These priorities are determined in the context of branch and regional strategic planning, and are subject to the availability of necessary staff and funds and to any special requirements of the Director-General or Minister. The implementation of the plan will be monitored and its success in achieving the identified objectives will be assessed.

The environmental impact of proposed activities will be assessed at all stages in accordance with established environmental assessment procedures. Where impacts are found to be unacceptable, activities will be modified in accordance with the plan policies.

The plan applies both to the land currently reserved and to any future additions. Where management strategies or works are proposed for additions (or the existing area) that are not consistent with the plan, an amendment to the plan will be required.

### **Strategies**

- Undertake an annual review of progress in implementing this plan of management.
- Undertake an assessment after 5 years of the effectiveness of managing the reserves in accordance with this plan and of the degree of success in achieving the plan's objectives and desired outcomes. Base the evaluation on the monitoring programs set out in this plan and any others that may be developed.



### Implementation Table

Priority	Activity	Plan reference
HIGH	Undertake vegetation surveys, in particular in poorly researched areas, and check for additional significant species.	3.2
	Introduce a long term program to monitor selected vegetation and fauna survey plots for response to fire, weed control and other disturbance factors	3.2, 3.3
	Liaise with neighbours, Landcare, vegetation management committees and land use authorities to encourage retention, and if possible expansion, of areas of native vegetation close to the park.	3.2
	Undertake fauna surveys, in particular to survey poorly researched areas and to record the distribution of threatened and significant fauna species.	3.3
	Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact on Aboriginal sites and places.	3.4
	Carry out a risk assessment of heritage places that have the potential to present a risk to the public.	3.5
	Identify, map and assess all active erosion gullies. Monitor other areas of erosion. Treat if necessary.	4.1
	Undertake rehabilitation works on eroded gullies in the Clarkes Hill NR area.	4.1
	Investigate the potential for re-routing the road to Mannus Falls where possible to reduce the grade of the trail and hence the erosion potential, and rehabilitate the closed section.	4.1
	Investigate the structural integrity of the old bridge on Sapling Yards Creek, and remove if deemed unsafe and replace with an appropriate crossing.	4.1
	Close and rehabilitate those trails identified as not being required.	4.1, 7.
	Control blackberry, St Johns wort and ox eye daisy on trails and boundaries.	4.3
	Control Patersons curse in Clarkes Hill NR.	4.3
	Control willows on creeklines with high quality vegetation.	4.3
	Control wild dogs, pigs and foxes in all reserves.	4.3
	Control goats in Bogandyera NR.	4.3
	Seek the cooperation of neighbours in implementing weed and pest animal control programs. Undertake control in cooperation with the Hume Rural Lands Protection Board and Tumbarumba Shire Council.	4.3
	Use prescribed fire to achieve a variety of fire regimes that maintain fire thresholds for each vegetation community in accordance with the Fire Management Strategy.	4.4
	Undertake fuel reduction programs, trail maintenance, research and monitoring programs in accordance with the policies outlined above and the Fire Management Strategy.	4.4
	Maps of the reserves showing the trail network will be provided to emergency response organisations.	5.1

Priority	Activity	Plan reference
	Permit only low impact mountain bike riding, bushwalking, minimum impact remote camping, and public vehicle access to Mannus Falls.	5.2
	Identify access issues and resolve in accordance with legislative procedures.	5.3
	Maintain management trails to NPWS standards.	7.
	Investigate boundary rationalisation and prepare submissions for rationalisation of boundary where required.	7.
<b>MEDIUM</b>	Implement recovery plans for threatened species when they have been prepared.	3.2, 3.3
	Actively revegetate previously cleared areas within Clarkes Hill NR, including the property Teebles, using locally sourced plant material.	3.2
	Introduce a program to monitor the status of the significant communities and identified threatened plant species and to evaluate the success of management programs.	3.2
	Develop appropriate site management strategies and manage cultural sites, places and features in accordance with the Regional Cultural Heritage Management Strategy.	3.4
	Progressively identify, record and assess the significance of historic places and features.	3.5
	Develop management strategies and manage historic places and features identified as being of high significance to protect their cultural and heritage values.	3.5
	Remove pine wildlings from the reserves or where there are impacts on neighbours.	4.3
	Control rabbits where warrens are accessible.	4.3
	Assess the abundance and impact of deer in the reserves and implement a control strategy if necessary.	4.3
	Encourage maintenance of effective fencing of boundaries with grazing properties to prevent domestic stock from entering into the park. Provide fencing assistance where possible and appropriate.	4.3
	Implement a monitoring program to measure the effectiveness of control programs for pest animal species.	4.3
	Prepare a neighbour newsletter and send to neighbours and stakeholders advising of management operations and other related information about the reserves	5.1
	Produce media releases and attend meetings with neighbours and community organisations to promote community understanding of reserve values and management strategies.	5.1
	Provide directional signposting within the reserve to facilitate navigation, particularly for fire fighters.	5.1
	Place orientation signs at relevant locations within Bogandyera NR to advise of the areas that are publicly accessible within the reserve with and without authorisation.	5.1
	Support and assist educational use of the reserves by schools, community groups and individuals through provision of relevant information.	5.1
	Negotiate with individuals and authorities to have unlicensed developments and activities removed from the reserves or licensed where consistent with the purposes of the NPW Act, other relevant legislation and this plan.	5.3



Priority	Activity	Plan reference
	Investigate the location, ownership and responsibility for maintenance of the fences along Tooma Rd and elsewhere in the reserves, with a view to removing the fences if they are no longer required.	5.3
	Implement monitoring programs as required for reporting on Bogandyera NR for the State of the Parks monitoring program.	6.
	Develop appropriate protocols to undertake research and monitoring of flora and fauna to provide information about the reserves natural and cultural heritage in order to facilitate management.	6.
	Prepare a prospectus as a guide to preferred research projects in the reserves.	6.
	Construct a new management trail in the Ournie Block of Bogandyera NR.	7.
<b>LOW</b>	Prepare and implement a conservation management plan for historic places identified as being of high significance.	3.5
	Encourage research into the ecological effects of fire in the reserves, particularly the fire response of significant plant species and the fire requirements of the vegetation communities.	4.4
	Place orientation signs at the northern end of Bogandyera NR and near Seymours Pine plantation.	5.1
	Monitor and record numbers and impacts of visitors using the reserves.	5.2
	Prepare a rehabilitation plan for the Bogandyera quarry.	5.3
	Revegetate new additions to reserves with species propagated from locally harvested seed.	5.3
	Construct loading ramps in selected locations within the reserves	7.
	Undertaken an annual review of progress in implementing this plan of management.	8.

### Legend

**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.

## REFERENCES

Lunney, D, Curtin, A, Ayers D, Cogger H, Dickman C, Maitz W, Law B, Fisher D. (2000) *The threatened and non threatened vertebrate fauna of New South Wales: status and ecological attributes*. NSW National Parks and Wildlife Service.

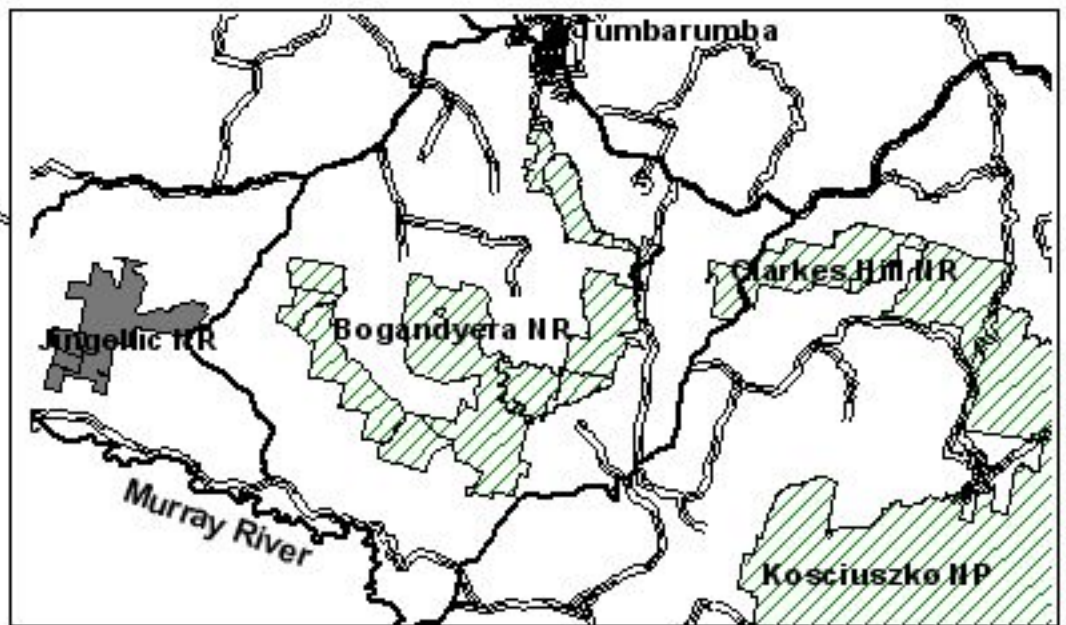
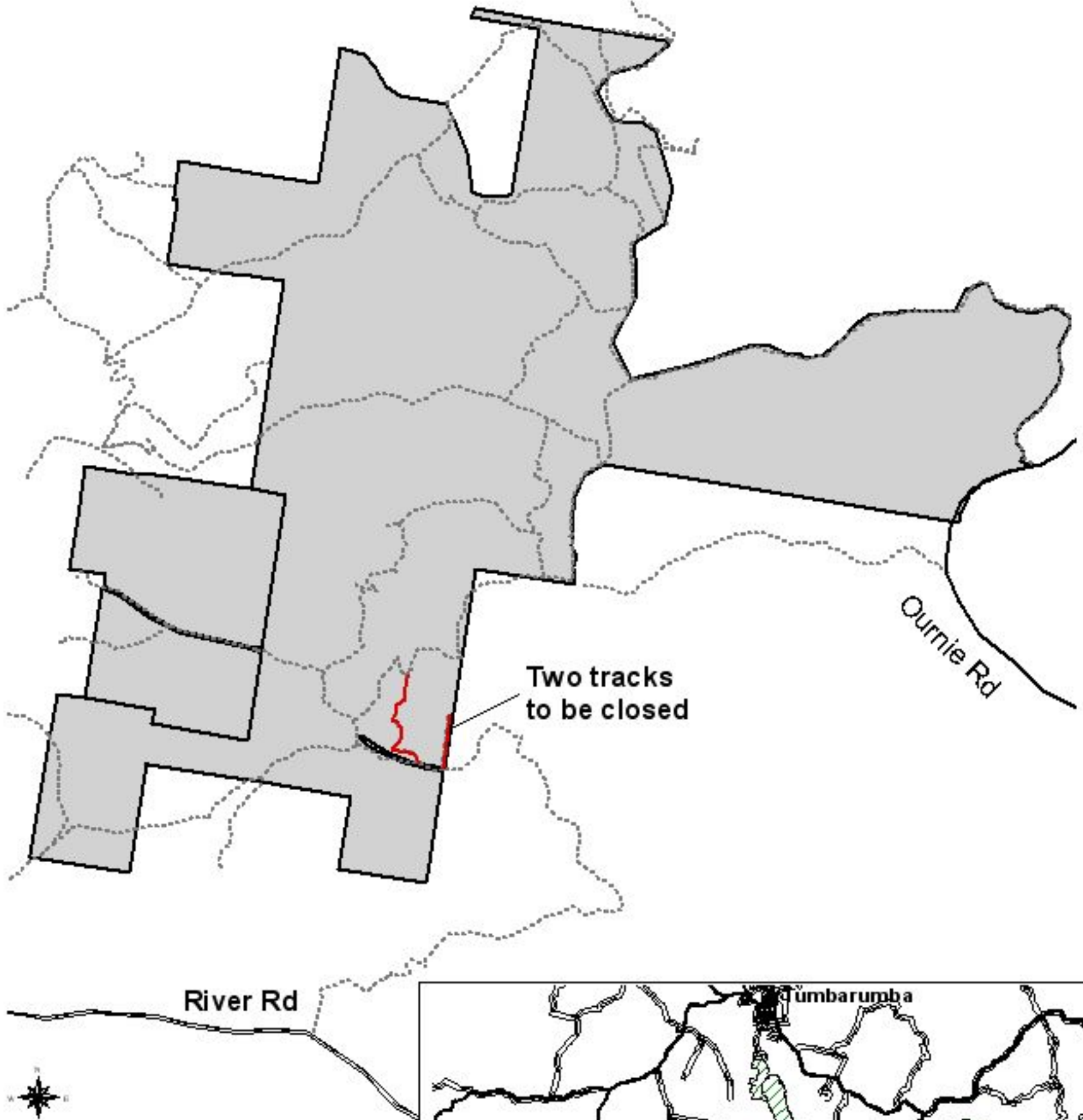
Mitchell T. W. 1981, *Corryong and the "Man from Snowy River" district*. Wilkinson Printers for R. Boyes

Tindale, N. 1974. *Aboriginal Tribes of Australia*, Australian National University Press.

NPWS, Various CRA reports.

Rooks A. 1998. *Place Names of Tumbarumba and District*.

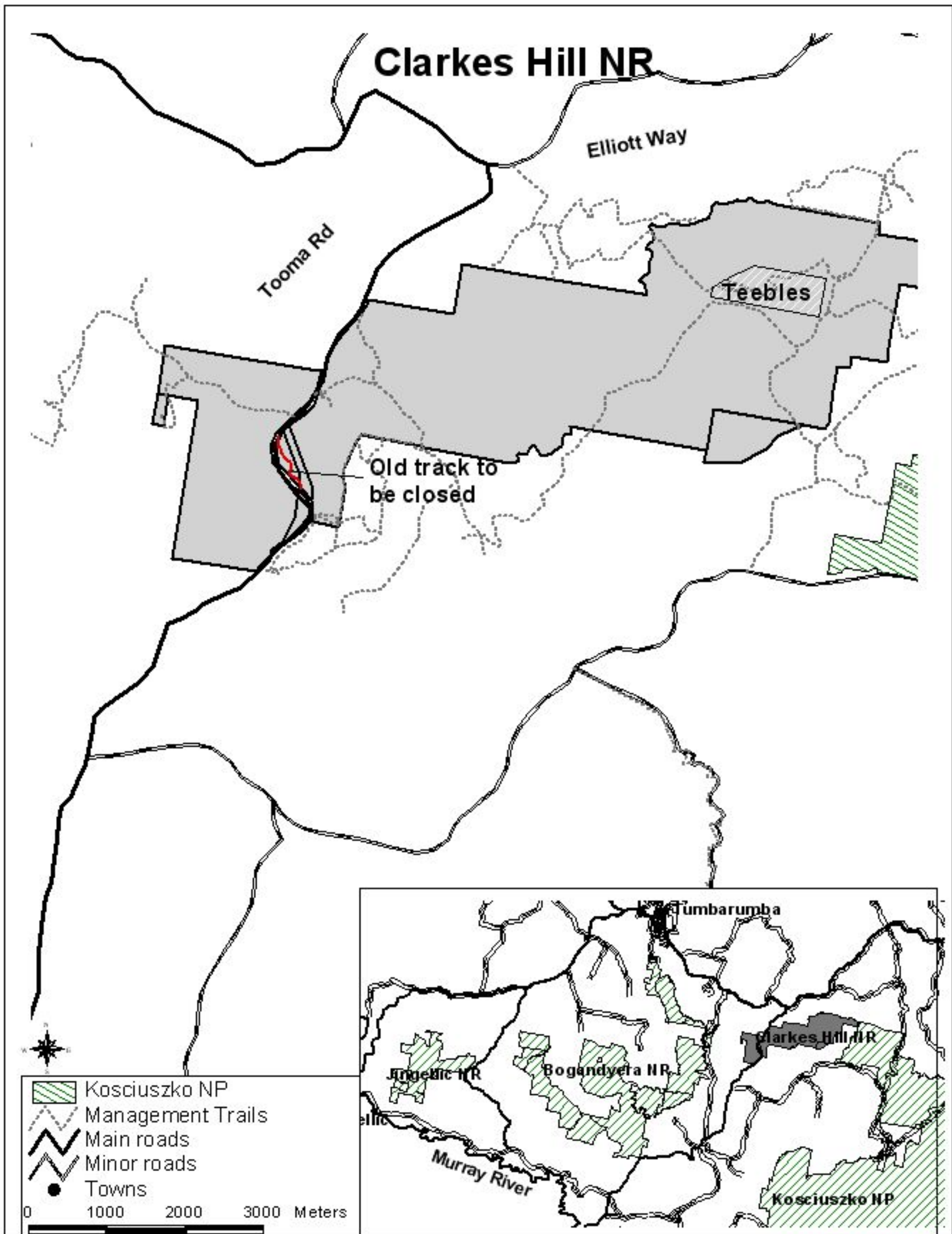
# Jingellic NR



- Minor roads
- Main roads
- Management trails
- Nature Reserve
- Towns

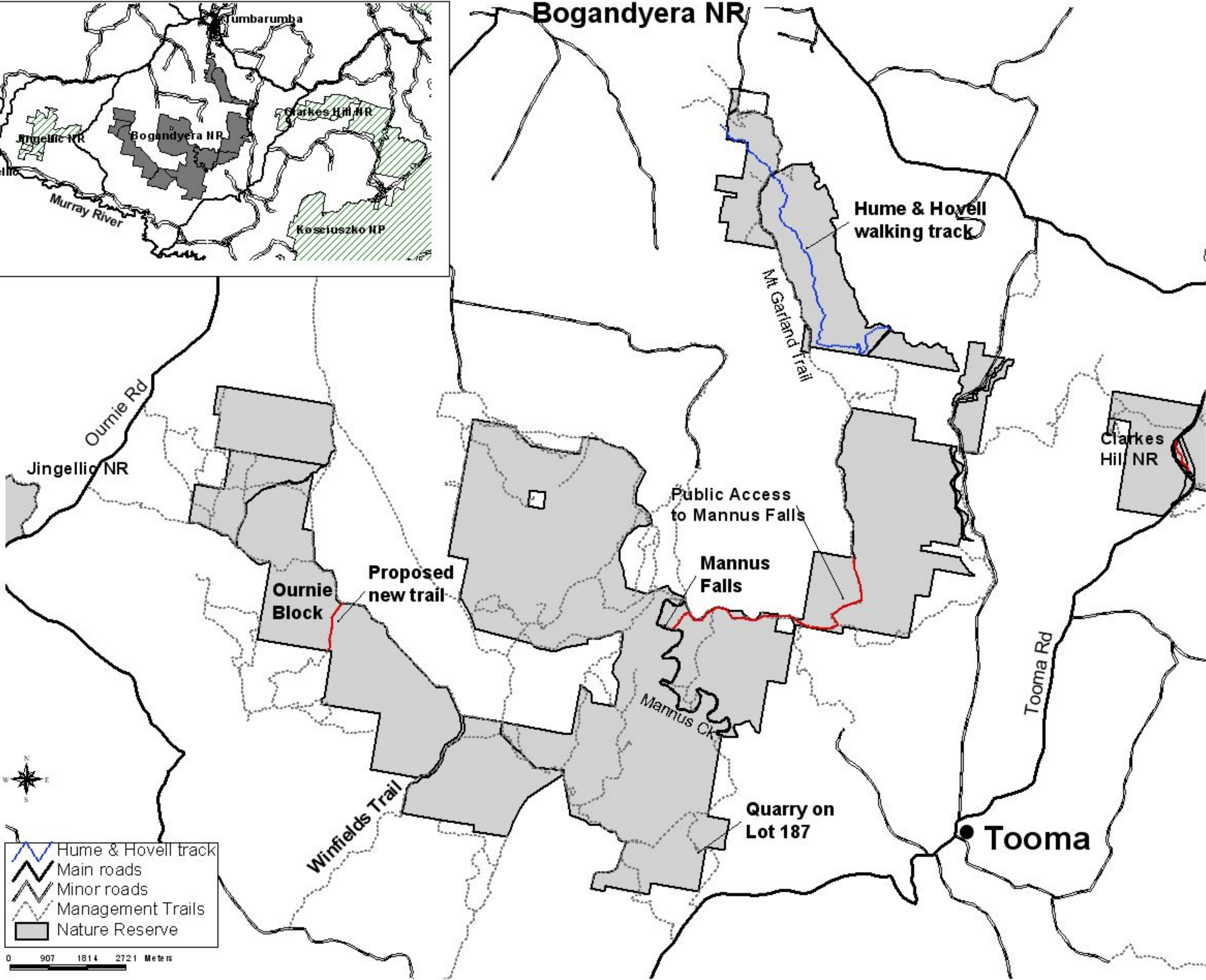
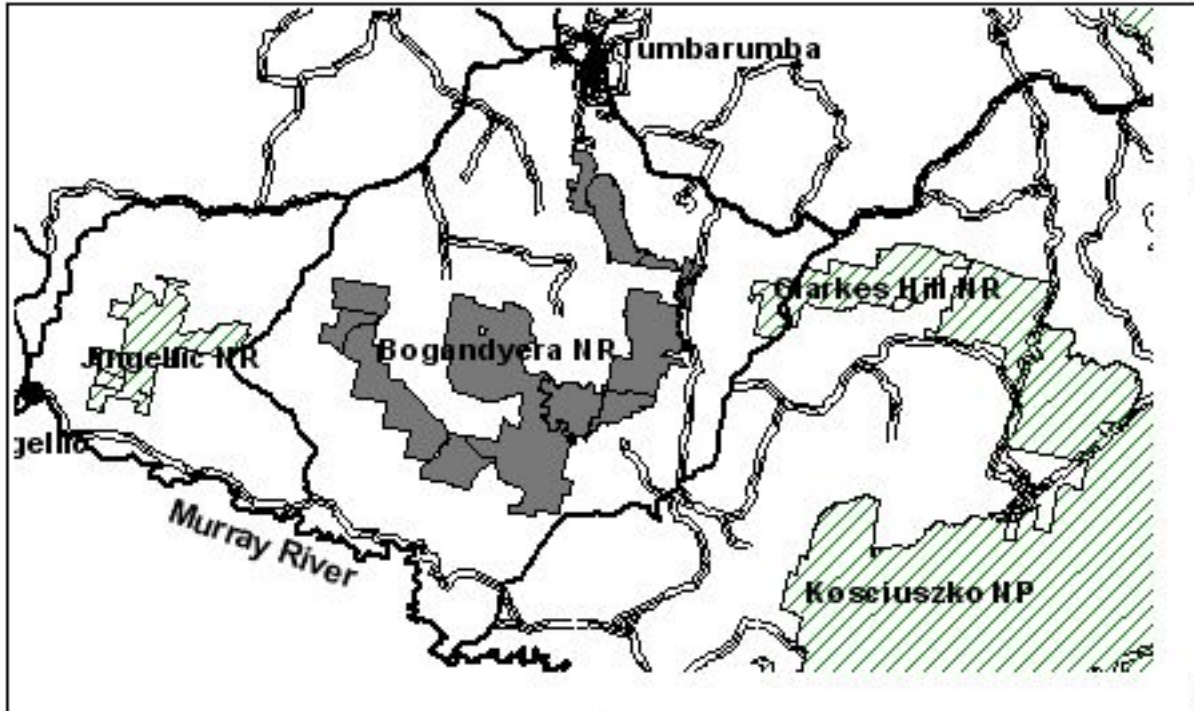
0 700 1400 Meters

# Clarkes Hill NR





# Bogandyera NR



- Hume & Hovell track
- Main roads
- Minor roads
- Management Trails
- Nature Reserve

0 907 1814 2721 Meters