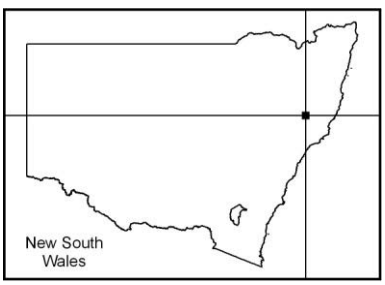
Office of Environment & Heritage
NSW National Parks & Wildlife Service

Plan of Management

Watchimbark Nature Reserve



Watchimbark Nature Reserve
Plan of Management

NSW National Parks and Wildlife Service

March 2013

This plan of management was adopted by the Minister for the Environment on the 12th March 2013.

Acknowledgements

This plan of management is based on a draft plan prepared by staff of the Lower North Coast Region of the NSW National Parks and Wildlife Service (NPWS), part of the Office of Environment and Heritage.

The NPWS acknowledges that this reserve is in the traditional country of the Biripi people.

Cover photo by Sean Thompson, NPWS.

For additional information or any inquiries about this reserve or this plan of management, contact the NPWS Barrington Tops Area Office, 59 Church St Gloucester or by telephone on 02 65385300.

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FOREWORD

Watchimbark Nature Reserve covers an area of 744 hectares and is situated 40 kilometres north-west of Gloucester. It was purchased with Commonwealth National Reserve System funds in 2002 and reserved in 2006 to conserve the unique vegetation communities that occur on its serpentine geology and are not present in any other conservation reserve in NSW.

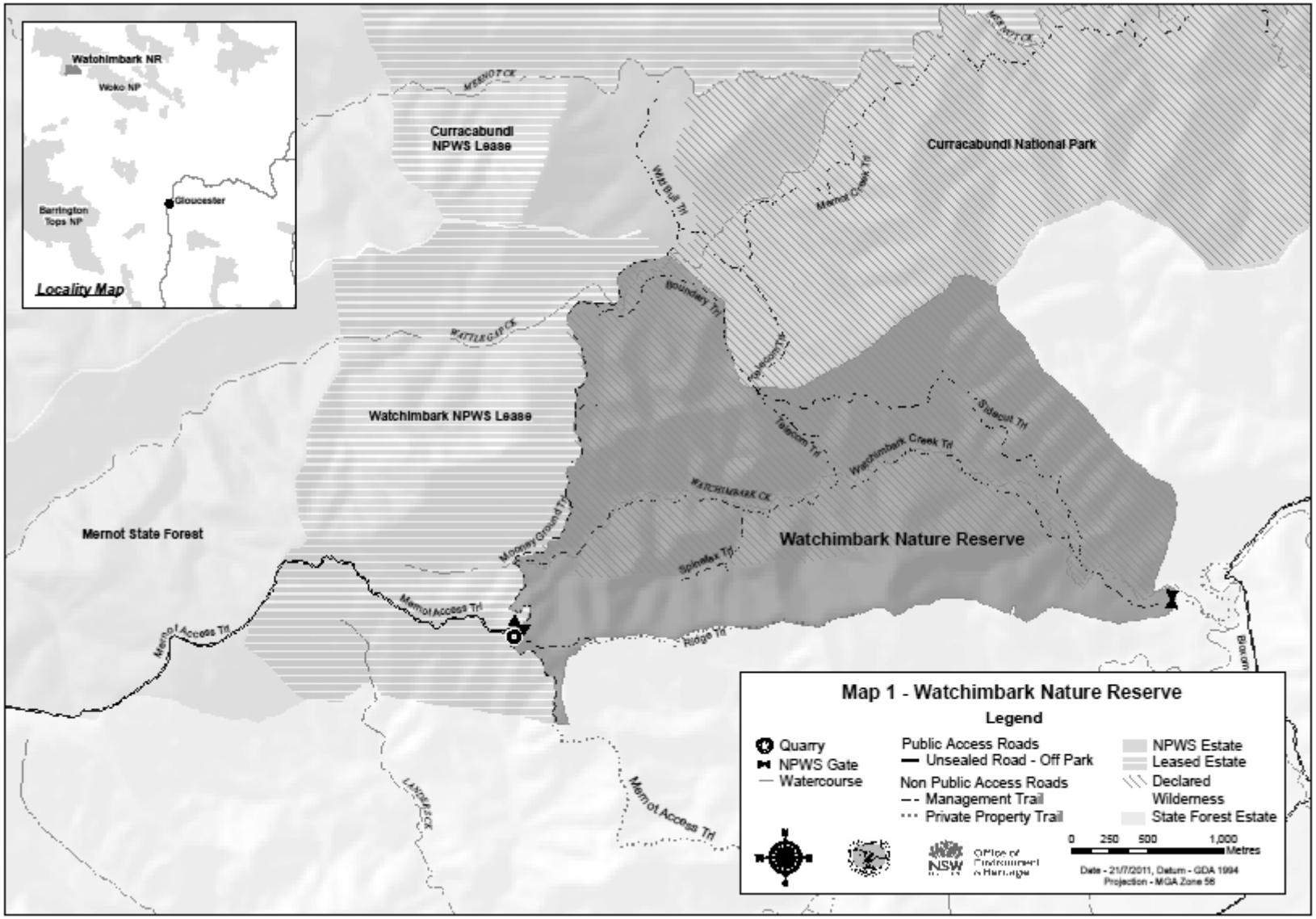
Watchimbark Nature Reserve contains a rare serpentinite geological outcrop, Grassy Heath and Mallee Woodland communities, and a stand of Dry Rainforest. It also contains four threatened plant species and a large number of rare plant species that are endemic to the serpentinite vegetation communities of the area, have a limited distribution or represent an extension of their known distribution. Eleven threatened animal species have been recorded in the reserve. Much of Watchimbark Nature Reserve is declared wilderness.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A draft plan of management for Watchimbark Nature Reserve was placed on public exhibition from 27 April until 30 July 2012. The submissions received were carefully considered before adopting this plan.

The plan contains a number of actions to achieve the NSW 2021 goal to protect our natural environment, including strategies to assist the recovery of threatened species and ecological communities, establish and maintain strict quarantine and hygiene protocols, manage weeds and pest animals, and to manage fires in the serpentinite vegetation communities.

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

Robyn Parker MP
Minister for the Environment


Watchimbark NR
Woko NP
Barrington Tops NP
Gloucester
Locality Map
Curracabundi NPWS Lease
Curracabundi National Park
Watchimbark NPWS Lease
Mernot State Forest
Watchimbark Nature Reserve
MERNOT CK
WATTLEGAP CK
WATCHIMBARK CK
LANGFORD CK
Wattle Bull Trl
Mernot Creek Trl
Boundary Trl
Harrison Trl
Tallicum Trl
Sidecut Trl
Watchimbark Creek Trl
Mooney Ground Trl
Spinifex Trl
Mernot Access Trl
Ridge Trl
Map 1 - Watchimbark Nature Reserve
Legend
Quarry
NPWS Gate
Watercourse
Public Access Roads
Unsealed Road - Off Park
Non Public Access Roads
Management Trail
Private Property Trail
NPWS Estate
Leased Estate
Declared Wilderness
State Forest Estate
0 250 500 1,000 Metres
Date - 21/7/2011, Datum - GDA 1994
Projection - MGA Zone 56

1. Location, Gazettal and Regional Context

Watchimbark Nature Reserve (the reserve) is located approximately 40 kilometres to the north west of Gloucester, in the upper Manning River area of the NSW mid north coast (refer Map). The reserve covers 744 hectares, and was previously part of Crown Lease 19/11. This lease was purchased by the National Parks and Wildlife Service (NPWS) with Commonwealth National Reserve System funds in 2002, and the reserve gazetted on 13 January 2006 to protect the high conservation values of its serpentinite geology and associated endemic vegetation communities. The unique vegetation associations present do not occur in any other conservation reserve in NSW.

The remainder of Crown Lease 19/11 covers 520 hectares of the eastern portion of Mernot State Forest, which adjoins the western boundary of the reserve. The lease is held by NPWS, and the intention is to have the area added to the reserve.

The reserve name was derived from the original grazing lease 'Watchimbark Creek'. The name Watchimbark is thought to have been derived from the Aboriginal name for the place.

The Mernot Access trail in the south western corner of the reserve provides the only practical access to Mernot State Forest (refer map) and private land to the west of the reserve. The trail is on private property and is therefore not a gazetted road, or Part 11 road under the NPW Act.

The reserve adjoins the southern boundary of Curracabundi National Park, and is located at the central southern edge of a larger complex of almost contiguous reserves. To the far north lies Nowendoc National Park, which links to Curracabundi National Park and State Conservation Area, Mernot and Monkeycot Nature Reserves, and Woko National Park to the south east. The majority of these reserves are within the Curracabundi Wilderness area covering approximately 34,600 hectares. These reserves, together with Barakee National Park, and Bretti, Camels Hump, and Khatambuhl Nature Reserves combine to form a large protected area across the Upper Manning River landscape.

Adjacent land use is primarily grazing in lightly timbered and open grasslands to the south and east (refer section 4.3). Mernot State Forest adjoins the reserve to the west.

The reserve is within the geographical area of the Gloucester Shire Council, the Hunter Central Rivers Catchment Management Authority, and the Taree Purfleet Local Aboriginal Land Council.

2. Management Context

2.1 Legislative and Policy Framework

The management of nature reserves in NSW is in the context of the legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the National Park and Wildlife Regulation, *Threatened Species Conservation Act 1995* (TSC Act), the *Wilderness Act 1987* when declared wilderness is present, and the policies of the NPWS.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) may require the assessment and mitigation of the environmental impacts of works proposed in this plan.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within the reserve except in accordance with this plan. This plan will also apply to any future additions to the reserve. Should management strategies or works be proposed for the reserve or any additions that are not consistent with this plan, an amendment to this plan or a new plan will be prepared and exhibited for public comment.

2.2 Management Purposes and Principles

Nature Reserves

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

Under the Act (section 30J), 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 the provision of recreation as a management principle.

Wilderness

In February 2011, 556 hectares within Watchimbark Nature Reserve was declared wilderness under the Wilderness Act. This declaration was part of the larger Curracabundi Wilderness area. Wilderness areas are large natural areas of land that, together with their native plant and animal communities, are essentially unchanged by human activity.

Management of natural and cultural heritage, of introduced species and of fire is carried out in wilderness areas in the same manner as other parts of the reserve, with special attention to minimising impacts on wilderness values.

In accordance with Section 9 of the Wilderness Act, wilderness areas are managed according to the following management principles:

- to restore (if applicable) and to protect the unmodified state of the area and its plant and animal communities;
- to preserve the capacity of the area to evolve in the absence of significant human interference; and
- to provide opportunities for solitude and appropriate self-reliant recreation.

2.3 Statement of Significance

Watchimbark Nature Reserve is considered to be of significance due to its geological and biological values. The reserve:

- Includes a rare serpentinite geological outcrop with vegetation associations that are not represented anywhere else in the NSW conservation system. These comprise Grassy Heath and Mallee Woodland communities, and a stand of Dry Rainforest. The Grassy Heath and Mallee Woodland communities contain the largest known example of porcupine grass east of the Great Dividing Range.
- Conserves the extreme upper limit of the riparian forest River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion endangered ecological community (EEC), as well as wet and dry sclerophyll forest, dry and subtropical rainforest and native grassland vegetation communities.
- Conserves four threatened plant species including a significant occurrence of Austral toadflax (*Thesium australe),* and a large number of rare plant species that are endemic to the serpentinite vegetation communities of the area, have a limited distribution or represent an extension of their known distribution.
- Provides habitat for known populations of threatened animal species including the spotted-tailed quoll *(Dasyurus maculatus)*, glossy black-cockatoo *(Calyptoryhynchus lathami)*, masked owl *(Tyto novaehollandiae)*, greater broad-nosed bat *(Scoteanax rueppellii)*, koala *(Phascolarctos cinereus)*, and New Holland mouse *(Pseudomys novaehollandiae)*. The presence of additional threatened fauna in the area is likely due to the unique nature of the habitat.
- Includes 556 hectares of declared wilderness which forms part of the larger Curracabundi Wilderness.

2.4 Specific Management Directions

In addition to the general principles for the management of Nature Reserves (refer section 2.2), the following specific management directions apply to the management of the reserve:

- Protection of the rare and unique Grassy Heath, Mallee Woodland and Dry Rainforest serpentinite vegetation communities, and the riparian forest EEC in the reserve.
- Protection of threatened fauna species and their habitat.
- Close the reserve to public access and control vehicle access to prevent the introduction of soil pathogens such as Phytophthora.
- Control of introduced plant and animal species.
- Fire management to protect life and property and vegetation communities.

3. Values

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

3.1 Geology, Landscape and Hydrology

The topography of the reserve features low foothills, undulating to steep slopes and grassy valley-floor flats. Altitude ranges from 330 metres above sea level to 934 metres above sea level. Soils range from rocky outcrops in the western portion of the reserve, to alluvial deposits on the creek banks and valley floor. Uncommon serpentinite geology is found in the centre of the reserve. Serpentinite is formed by regional metamorphism of deep sea rocks from the oceanic mantle.

The serpentinite lithology and associated eroded serpentinite soils is a dominant feature of the landscape. Serpentinite soils are formed by the weathering of igneous or metaphorphic rocks that are comprised of at least 70% ferromagnesian minerals (Brady *et al* 2005). Serpentinite is high in magnesium and aluminium, both of which are known to be toxic to many plant species. This toxic exclusion results in localised endemism for species tolerant to these conditions (Ecological 2009). Serpentinite also characteristically features low nutrient availability, shallow soils, high permeability and consequent low moisture holding capacity, and high levels of potentially phytotoxic elements such as chromium and nickel (Specht *et al* 2001), which combine to severely limit plant growth.

Most of the reserve forms the primary catchment area for Watchimbark Creek, which runs west to east through the reserve. The northwest quarter of the reserve drains into Wattle Gap Creek, a tributary of Mernot Creek. These creeks eventually drain into the Curricabark River, which is south and east of the reserve, and eventually into the Manning River.

3.2 Native Plants

The reserve is located in the NSW north coast bioregion, near the southern boundary of the New England tablelands bioregion.

A vegetation survey of the reserve completed in late autumn 2009 (Ecological 2009) assessed the area as having a moderate to high flora species diversity. The vegetation communities occurring on the serpentinite outcrops in the centre of the reserve exhibit a very high level of endemism, and it could reasonably be expected that survey work conducted during spring would identify additional species (Ecological 2009).

The reserve has 10 distinct vegetation communities, including one endangered ecological community and three others assessed as having high conservation value.

The uncommon serpentine geology supports a low and stunted vegetation association that is not protected elsewhere in NSW (DECCW 2010). These porcupine grass (*Triodia scariosa* ssp *scariosa)* dominated Grassy Heath and Mallee Woodland vegetation communities are characteristic of more typical semi-arid regions of Australia, and contrast the surrounding tall

open forests and rainforests. The occurrence of this serpentinite vegetation in eastern Australia is considered to be a relic of a past period of aridity during the last ice age 10,000 years ago (Davie & Benson 1996, DECCW 2010). These communities are of very high conservation significance given their restricted distribution, high levels of endemism and large numbers of rare or threatened plant species they contain.

Mallee Woodland features serpentinite mallee *(Eucalyptus serpentinicola)* as the dominant canopy tree layer, with occasional specimens of rough-barked apple *(Angophora floribunda)* and forest red gum (*E. tereticornis*). The shrub layer is dominated by grass trees (*Xanthorrhoea glauca*) and features serpentinite oak *(Allocasuarina ophiolitica), Grevilla granulifera,* blackthorn (*Bursaria spinosa*), rice flower (*Pimelea linifolia*), dogwood (*Jacksonia scoparia)* and broom bitter pea *(Daviesia genistifolia).* The ground layer is dominated almost exclusively by porcupine grass *(T. scariosa* ssp *scariosa)*, although kangaroo grass *(Themeda australis)* occurs on the edge of the community. The Grassy Heath community has a similar species composition, but with no canopy layer.

The Mallee Woodland and Grassy Heath communities are of specific concern regarding the susceptibility of a number of species, including the dominant grass trees (*X. glauca)* to impacts from soil pathogens such as *Phytophthora cinnamomi* (see section 4.1). Inappropriate fire regimes also pose a degree of risk to the woodland, as too frequent fires will reduce the occurrence of serpentinite mallee *(E. serpentinicola)*, and will also impact negatively on grass trees (*X. glauca)* (see section 4.2).

Riparian forest dominated by river oak *(Casuarina cunninghamia)* and paperbark (*Melaleuca* sp. aff. *Pallida)* occurs along creek lines throughout the reserve. This community is floristically similar and generally aligns with River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion EEC, and represents its extreme upper limit in terms of elevation.

Dry rainforest dominated by small-leaved lilly pilly (*Acmena smithii* var *minor)* occurs along Watchimbark Creek. This unusual rainforest community is unique to the area and is consequently considered to have very high conservation value (Ecological 2009).

The creeklines and sheltered gullies with southern aspects contain subtropical and dry rainforest. In these locations the subtropical rainforest tree canopy layer features giant stinging tree *(Dendrocnide excelsa)*, black apple *(Pouteria australis)*, Moreton Bay fig *(Ficus macrophylla)* and sassafras *(Doryphora sassafras).* The dry rainforest canopy is dominated by shatterwood *(Backhousia sciadophora).* Orange thorn *(Pittosporum multiflorum)* is a common shrub layer, with water vine *(Cissus Antarctica),* slender grape (*Cayratia clematidea)* and Austral sarsaparilla *(Smilax australis)* common climbers. Epiphytes in both rainforest types are abundant, with birds nest fern *(Asplenium australasicum),* rock felt-fern *(Pyrosia confluens),* and strap fern *(Dictymia brownie)* common, and a variety of orchids occurring in the dry rainforest.

Sclerophyll and dry sclerophyll forest communities adjoin the serpentinite vegetation and the grazing derived grassland communities of the reserve. Grey gum *(E. biturbinata)* and thin-leaved stringybark *(E. eugenioides)* are the most common overstorey species in the sclerophyll forest, with forest red gum *(E. tereticornis)* and rough-barked apple *(A. floribunda)* common in dry sclerophyll community. The ground layer of these communities is dominated by tussock grass *(Poa labillardieri),* kangaroo grass *(T. australis)*, barbed wire grass *(Cymbopogon refractus),* swamp fox-tail *(Pennisetum alopecuroides)* and blady grass *(Imperata cylindrica)*.

The grazing derived grasslands in the reserve are dominated by native species. Trees are largely absent although occasional individuals of forest red gum *(E. tereticornis)*, rough-

barked apple *(A. floribunda)*, and broad-leaved apple *(A. subvelutina)* occur. The ground layer is dominated by tussock grass *(P. labillardieri),* swamp foxtail *(P. alopecuroides),* and kangaroo grass *(Themeda australis).* Blady grass *(Imperata cylindrica)* occurs in small patches, particularly at the interface with woodland communities. There are numerous pockets of forest red gum *(E. tereticornis)*, rough-barked apple *(A. floribunda)*, and broad-leaved apple *(A. subvelutina)* seedlings scattered throughout the grasslands, possibly in response to the infrequent fire events and absence of cattle grazing since acquisition of the area by NPWS.

Table 1 lists threatened and significant species recorded in the reserve.

Table 1: Threatened and significant plant species recorded in the reserve.

Common name	Scientific name	Status
White flowered wax plant	*Cynanchum elegans*	Endangered*#
	Senna acclinis	Endangered*
	Grevillea obtusiflora	Endangered*
Australian toadflax	*Thesium australe*	Vulnerable*
Barrington wattle	*Acacia barringtonensis*	^
Serpentinite oak	*Allocasuarina ophiolitica*	^
Serpentinite mallee	*Eucalyptus serpentinicola*	^
	Grevillea granulifera	^
	Hibbertia hermanniifolia	^
	Acacia serpentinicola	^

* Status under TSC Act
# Denotes species also listed as nationally threatened under the EPBC Act.
^ Denotes species listed as a Rare or Threatened Australian Plant (ROTAP) according to Briggs and Leigh (1996)

Seven plant species previously unknown to science have also been identified in the serpentinite vegetation communities, and at least eight other species are considered to have conservation significance due to their limited distribution, endemism to serpentinite areas, or status representing an extension of their known distribution (Ecological 2009, Thompson pers. obs. 2010). These are listed in table 2.

Table 2: Other significant plant species recorded in the reserve.

Scientific name	Significance
Calotis sp. aff. *dentex*	Species previously unknown to science
Coronidium sp. aff. *collinum*	Species previously unknown to science
Cryptandra amara s. l.	Species previously unknown to science
Diuris aff. *chrysantha serpentinite*	Species previously unknown to science
Lepidosperma sp. aff. *laterale*	Species previously unknown to science
Melaleuca sp. aff. *pallida*	Species previously unknown to science
Plectranthus sp. aff. *argentatus*	Species previously unknown to science
Hovea sp. aff. *lorata*	Highly restricted distribution; endemic to serpentinite
Leptospermum sp. aff. *brevipes*	Highly restricted distribution; endemic to serpentinite
Lissanthe sp. aff. *strigosa*	Highly restricted distribution; endemic to serpentinite
Acacia serpentinicola	Highly restricted distribution; endemic to serpentinite

Scientific name	Significance
Hibbertia sp. aff. *riparia*	Highly restricted distribution; endemic to serpentinite
Solanum curvicuspe	New southerly range extension
Cassinia telfordii	New southerly range extension
Minuria scoparia	New southerly range extension

Strategies for the recovery of threatened species, populations and ecological communities have been set out in a state-wide Threatened Species Priorities Action Statement (PAS). Individual recovery plans may also be prepared for threatened species to consider management needs in more detail. Relevant PAS and recovery plans for individual species, populations, and communities will be applied as appropriate.

3.3 Native Animals

Knowledge of native fauna in the reserve has been improved by survey work completed in 2011 which focussed on the serpentinite vegetation communities (Landmark 2011). A total of 132 vertebrate species have been recorded in the reserve, comprising five frogs, seven reptiles, 86 birds and 34 mammals.

Table 3 lists threatened species recorded in the reserve. Other native mammal fauna observed in the reserve include the swamp wallaby *(Wallabia bicolor),* eastern grey kangaroo *(Macropus giganteus)*, red-necked wallaby *(Macropus rufogriseus)*, greater glider *(Petauroides volans)*, and long-nosed bandicoot *(Perameles nasuta)* occurring in grasslands (Landmark 2011). Small mammal species recorded within the serpentinite community include the brown antechinus *(Antechinus stuartii)*, yellow-footed antechinus *(Antechinus flavipes)*, bush rat *(Rattus fuscipes)*, and swamp rat *(Rattus lutreolus)* (Landmark 2011). Other bat species recorded within the reserve include the eastern horseshoe-bat *(Rhinolophus megaphyllus)*, Gould's wattled bat *(Chalinolobus gouldii),* chocolate wattled bat *(Chalinolobus morio)* and the little forest bat *(Vespadelus vulturnus)*. Other avian species of particular interest include barn owl *(Tyto alba)* and wedge-tailed eagle *(Aquila audax).*

Populations of the threatened brush-tailed rock wallaby *(Petrogale pencillata)* have been recorded immediately to the north and east of the reserve, and in the NPWS-held lease in the adjoining Mernot State Forest.

Table 3: Threatened animal species recorded in the reserve.

Common name	Scientific name	Status*
Glossy black-cockatoo	*Calyptohynchus lathami*	Vulnerable
Powerful owl	*Ninox strenua*	Vulnerable
Masked owl	*Tyto novaehollandiae*	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable
Spotted-tailed quoll	*Dasyurus maculatus*	Vulnerable[#]
Yellow-bellied glider	*Petaurus australis*	Vulnerable
Little bentwing bat	*Miniopterus australis*	Vulnerable
Eastern bentwing bat	*Miniopterus schreibersii oceanensis*	Vulnerable
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable
Greater broad-nosed bat	*Scoteanax rueppellii*	Vulnerable
New Holland mouse	*Pseudomys novaehollandiae*	Vulnerable[#]

* Status under TSC Act

[#] Denotes species also listed as nationally threatened under the EPBC Act.

The Threatened Species Priorities Action Statement (PAS) also identifies strategies and actions to promote the recovery of threatened animal species, populations and ecological communities and manage key threatening processes (DEC 2006). The PAS will be used to guide management of threatened fauna in the reserve.

3.4 Aboriginal Heritage

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

Aboriginal sites are places with evidence of Aboriginal occupation or that are related to other aspects of Aboriginal culture. They are important as evidence of Aboriginal history and as part of the culture of local Aboriginal people.

While the NPWS has legal responsibility for the protection of Aboriginal sites and places under the NPW Act, 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 reserve lies within the traditional country of the Biripi people. The reserve is located within the area of the Taree-Purfleet Local Aboriginal Land Council (LALC), close to the boundary with the Forster LALC area. Initial consultation has occurred with representatives from Taree-Purfleet LALC, Forster LALC, and local Aboriginal elders.

Documentation of local Aboriginal use and occupation of the local area is scant. There is one site recorded within the reserve, although more extensive investigations have yet to be undertaken and a paucity of physical sites does not mean the area was not utilised by Aboriginal people. There is the potential for the reserve, as part of the broader landscape to have been used by the Biripi people for a range of purposes, including as a source of food, medicinal and other important natural resources. For example grass trees (*X. glauca)* are known to have been widely used for a range of purposes by Aboriginal communities. The concentration of this species in the reserve is a unique landscape and natural resource feature within the broader landscape, and it is reasonable to expect it to have been well known to local Aboriginal communities.

Sites are recorded in the surrounding area, including within neighbouring Curracabundi National Park. It is recognised that whilst there may be a paucity of physical sites, this does not suggest the area was not utilised by, or is not of interest to Aboriginal people.

3.5 Historic Heritage

Prior to acquisition, the reserve was used primarily for grazing purposes. It was held under Crown Lease 19/11, Parish of Barnard, County Hawkes. There are no known sites of historical interest in the reserve.

4. ISSUES

4.1 Pest Animals and Weeds

Pest species are plants and animals that have negative environmental, economic and social impacts and are most commonly introduced species. Pests can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values. The Draft Hunter Region Pest Management Strategy (OEH 2011) identifies pest species across the region's parks and details priorities for control (including actions listed in the PAS and Threat Abatement Plan (TAPs) prepared under the TSC Act).

Records and observations for pest animals in the reserve include the pig *(Sus scrofa)*, European red fox *(Vulpes vulpes)*, wild dog *(Canis familiaris domesticus)*, rabbit *(Oryctolagus cunniculus)* and feral cat *(Felis catus)*. Occasionally livestock make their way into the reserve, and there have been small numbers of unbranded cattle *(Bos taurus)* seen in the reserve. Fox control is undertaken annually as part of the NSW Fox Threat Abatement Plan (FoxTAP) around the brush-tailed rock wallaby control sites in the Curricabark River valley. Pig control is undertaken opportunistically, and cattle removal has been undertaken with assistance of local landowners.

Common weed species in the reserve include blackberry *(Rubus fruiticosus)*, lantana *(Lantana camara)*, moth vine *(Araujia sericifera)*, tobacco tree *(Solanum mauritianum)*, prickly pear *(Opuntia stricta)* and crofton weed *(Ageratina adenophora)*. Blackberry, lantana, and prickly pear occur mostly in the sclerophyll/dry sclerophyll and grassland margins. Tobacco tree and mothvine are mostly confined to the Watchimbark creekline. Crofton weed heavily infests the moist gullies located above and below Sidecut Trail. Weed control programs are focussed along tracks and trails within the reserve. Control activities also focus on limiting moth vine encroachment into rainforest remnants.

The introduction of plant and soil pathogens is a major threat to the reserve. *Phytophthora cinnamomi* is a soil-borne pathogen which infects a large range of plant species and in some circumstances may contribute to plant death where there are other stresses present such as waterlogging, drought and perhaps wildfire (NSW Scientific Committee 2002). *P. cinnamomi* may be dispersed in flowing water, such as storm runoff, from infected roots to roots of healthy plants as well as by vehicles, animals and walkers. Dieback caused by *P. cinnamomi* is currently listed as a key threatening process under the TSC Act and the EPBC Act.

P. cinnamomi occurs in Barrington Tops National Park and various locations throughout the Lower Hunter region, and if introduced into the reserve could have an extremely deleterious impact on the Mallee Woodland community (Ecological 2009).

4.2 Fire

The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, whilst managing fire regimes to maintain and protect biodiversity and cultural heritage.

Fire is a natural feature of many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can lead to loss of particular plant and animal species and communities, and high frequency fires have been listed as a key threatening process under the TSC Act.

The Mallee Woodland association may be vulnerable to frequent fire events. There is some indication that the northern facing slopes located on the southern side of the Watchimbark Creek have experienced higher fire frequencies than the communities on the northern side of the creek. This is evident by the extensive coverage of porcupine grass with hummocks at an early stage of development, and the almost complete absence of *E. serpentinicola* and a comparatively sparse shrub layer. That area was also subject to a wildfire event prior to the acquisition in 2002.

A separate (map-based) fire management strategy has been prepared for the reserve (DECCW 2008). The fire management strategy outlines the recent fire history of the reserve, key assets within and adjoining the reserve including sites of natural and cultural heritage value, fire management zones which may include asset protection zones, and fire control advantages such as management trails and water supply points.

4.3 Isolation and fragmentation

The general area south of the reserve has been extensively cleared, which has resulted in a high loss of biodiversity and fragmentation of habitat in the region.

The reserve is located at the southern edge of the central portion of a larger complex of almost contiguous reserves, linked by the adjoining Curracabundi National Park along the northern boundary of the reserve. Long term conservation of biodiversity depends upon the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands. Nearby vegetated areas contribute to the habitat values of the reserve and provide ecological corridors to other vegetated areas. Maintaining the integrity of the remaining habitat within the reserve and, where possible, linking this to adjacent areas of vegetation to facilitate wildlife corridors is important in ensuring long term viability of the reserve's biological values.

4.4 Climate Change

Climate change has been listed as a key threatening process under the TSC Act. Projections of future changes in climate for NSW include higher temperatures, increasing sea levels and water temperatures, elevated carbon dioxide, more intense but possibly reduced annual average rainfall, increased temperature extremes and higher evaporative demand. These changes are likely to lead to greater intensity and frequency of fires, more severe droughts, reduced river runoff and water availability, regional flooding, increased erosion and ocean acidification.

Climate change may significantly affect biodiversity by changing population size and distribution of species, modifying species composition, and altering the geographical extent of habitats and ecosystems. The potential impact of climate change is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from feral animals. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates.

Programs to reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires, pollution and urban expansion, will help reduce the severity of the effects of climate change. Maintaining and where possible enhancing the connectivity with the surrounding reserves provides an important corridor with other north east escarpment reserves including the Barrington Tops and Liverpool Range reserves.

4.5 Access

The reserve is remote from population centres and there is no public access or recreational facilities as the only access routes are across private property on trails that are not gazetted roads. Prior to acquisition the reserve was used for cattle grazing, and public access was excluded. However, there is a history of illegal access for pig hunting and theft of rare plants.

Outdoor or natural area based recreational opportunities are available to the south of the reserve in Barrington Tops National Park and adjacent NPWS reserves and state forests. These include vehicle touring, camping, horse riding, cycling and bushwalking.

5. Management Operations And Other Uses

Management trails are located on or in close proximity to the southern, western and along part of the northern boundaries of the reserve, as well as through the centre of the reserve (see Map 1).

The only practical accesses to the reserve are from the south and east through private property. Whilst access for management purposes is possible from the north via management trail through Curracabundi National Park, the route is remote and traverses challenging terrain. From the south, the Mernot Access Trail provides the only practical vehicle access to Mernot State Forest and private properties to the west of the state forest.

A quarry is located adjacent to the Mernot Access Trail (see Map 1), and is a valuable source of gravel for maintaining management trails in the reserve.

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7. IMPLEMENTATION

Current Situation	Desired Outcomes	Management Response	Priority*
7.1 On-Park Ecological Conservation			
The reserve contains rare serpentinite geology with Grassy Heath, Mallee Woodland and Dry Rainforest dominated by small-leaved lilly pilly vegetation communities that are not represented anywhere else in the NSW conservation estate. The Grassy Heath and Mallee Woodland communities are the largest known example of porcupine grass vegetation east of the Great Dividing Range. The reserve provides important habitat to a number of rare and threatened plants and animals. Four threatened plant species and one EEC listed under the TSC Act, and another twenty one plant species with conservation significance occur in the reserve. The serpentinite vegetation communities exhibit a high degree of endemism, and eight new plant species have been recorded. Eleven threatened animal species occur in the nature reserve. The serpentinite vegetation communities are highly susceptible to impacts from soil pathogens. Although closed to public access since before acquisition, there is a history of illegal access to the reserve for pig hunting and theft of rare plants. Climate change has been identified as a key threatening process under the TSC Act.	Native plant and animal species and communities are conserved. Landscape and catchment values are protected. The effects of climate change on natural systems are reduced. The habitat and populations of all threatened plant and animal species are protected and maintained.	7.1.1 Implement relevant strategies in the PAS and recovery plans for threatened species, populations and ecological communities present in the reserve. 7.1.2. Keep the reserve closed to public access to reduce the potential for the introduction of soil pathogens (eg. *Phytophthora cinnamomi*), theft of rare plants, inappropriate off-road vehicle use, and negative impacts from arson. 7.1.3. Establish and maintain strict quarantine and hygiene protocols for all management vehicles, plant, materials and equipment entering the reserve which may be carriers for soil or plant pathogens or disease. Develop *Phytophthora* awareness and hygiene training for relevant personnel entering the reserve. 7.1.4 Maintain existing fire, pest and weed management programs to increase the reserve's ability to cope with future disturbances, including climate change, and encourage research into appropriate indicator species to monitor the effects of climate change. 7.1.5 Encourage scientific research into the geological and ecological values of the reserve.	High High High/ Ongoing Ongoing Low

Current Situation	Desired Outcomes	Management Response	Priority*
Climate change may significantly affect biodiversity by changing the population size and distribution of species, modifying species composition, and altering the geological extent of habitats and ecosystems.			
7.2 Cultural Heritage The existing level of knowledge about the Aboriginal cultural values, significance, interest, or use of the reserve is minimal. More consultation and research is required. There are no known historic sites within the reserve.	Aboriginal places and values are identified and protected. Aboriginal people are involved in management of the Aboriginal cultural values of the reserve. Negative impacts on Aboriginal heritage values are stable or diminishing.	7.2.1 Consult and involve the Taree-Purfleet Local Aboriginal Land Council, Forster Local Aboriginal Land Council as appropriate, and traditional owners and elders in further research into the Aboriginal heritage values of the reserve, and in the management of Aboriginal sites, places and values. 7.2.2 Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact on Aboriginal or historic sites and places.	Ongoing Ongoing
7.3 Weeds and Pest Animals Noxious weeds and other pest plant species occur as a result of previous land uses. Lantana, blackberry, crofton weed and prickly pear are present. Heavy infestations of crofton weed occur in moist gullies near Sidecut trail. Moth vine is also invading rainforest areas. The reserve is listed as a control site for the NSW Fox TAP, primarily as one location for the ground	Introduced plants and animals are controlled. Negative impacts of weeds on park values are stable or diminishing. Negative impacts of	7.3.1 Manage introduced species in accordance with the Region Pest Management Strategy. 7.3.2 Monitor and undertake on-going control programs focussing on weeds prioritised in the Regional Pest Management Strategy. Continue to focus control activities along management trails and moth vine encroachment into rainforest.	High High/On going

Current Situation	Desired Outcomes	Management Response	Priority*
baiting control program associated with the brush tailed rock wallaby control sites in the Curricabark River valley. Pest animals recorded include foxes, pigs, and wild dogs. Straying stock occasionally occur in the reserve.	pest animals on park values are stable or diminishing. Pest control programs are undertaken where appropriate in consultation with neighbours.	7.3.3. Implement the threat abatement plan for the European red fox. This requires an annual ground based baiting program in the reserve to protect the brush-tailed rock wallaby. 7.3.4 Seek the cooperation of neighbours in maintaining the reserve free of straying stock through well maintained boundary fencing, including fencing agreements where appropriate.	Ongoing Ongoing
7.4 Fire Management Fire is a natural feature of many environments but inappropriate fire regimes can lead to loss of particular plant and animal communities. High frequency fires have been listed as a key threatening process under the TSC Act. Fire threats include those to the Mallee Woodland, and the rainforest vegetation communities. Fire ecology of serpentinite vegetation communities is not well understood.	Life, property, and natural and cultural values are protected from fire. Fire regimes are appropriate for conservation of native plant and animal communities. Negative impacts of fire on natural and cultural heritage values are stable or diminishing.	7.4.1 Implement the Reserve Fire Management Strategy for the reserve. 7.4.2 Participate in the Gloucester Bush Fire Management Committee. Maintain cooperative arrangements with local Rural Fire Service brigades and fire control officers, Forests NSW and surrounding landowners in regard to fuel management and fire suppression. 7.4.3 Suppress unplanned fires which will have a negative impact on the serpentinite vegetation communities as quickly as possible. 7.4.4 Manage fire in the reserve to protect biodiversity in accordance with the identified fire regimes/thresholds identified in the fire management strategy. 7.4.5 Manage fire to allow for natural regeneration to occur, particularly along dry sclerophyll forest margins, and to maintain native and derived grasslands. 7.4.6 The use of heavy machinery off tracks will be avoided.	High Ongoing High High High High

Current Situation	Desired Outcomes	Management Response	Priority*
		7.4.7 Encourage fire ecology research for serpentinite and derived grassland communities. If appropriate, update the Reserve Fire Management Strategy accordingly.	High
7.5 Infrastructure and Maintenance The reserve is adequately serviced by a network of management trails. No new trails are considered necessary. Access to the reserve is via private property trails. The Mernot Access trail provides the only practical access to Mernot State Forest and private land further west of the reserve. The roadside quarry on the Mernot Access trail provides suitable road base material for all roads and trails within the reserve.	Management facilities and operations adequately serve management needs and have minimal impact. Infrastructure and assets are routinely maintained. Unauthorised public vehicle access is excluded.	7.5.1 Maintain all management trails as shown on the map, along with any ancillary structures, such as gates and signs. 7.5.2 Gate and signpost management trail access points into the reserve to restrict unauthorised vehicle access. 7.5.3 Negotiate legal access arrangements to the reserve with neighbouring property owners for management purposes as necessary. 7.5.4 Grant licences where necessary to allow continued access to private property under Section 153C of the NPW Act. 7.5.5 Undertake environmental assessment for the quarry and, if ongoing use is acceptable, prepare a quarry management and rehabilitation plan.	High High High High Medium

* **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.

Ongoing is for activities that are undertaken on an annual basis or statements of management intent that will direct the management response if an issue that arises.