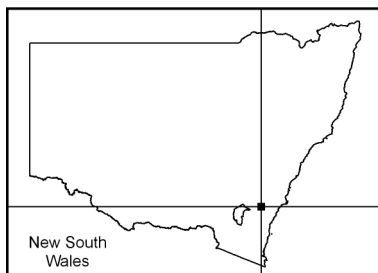




# Plan of Management



## Nadgigomar Nature Reserve





# **NADGIGOMAR NATURE RESERVE**

## **PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service**

**October 2011**

**This plan of management was adopted by the Minister for the Environment on 17<sup>th</sup> October 2011.**

### **Acknowledgments**

The National Parks and Wildlife Service acknowledges that this reserve is in the traditional country of the Ngunnawal, Wandandian, Walbanja, Gundungara, Dharawal and Dhurga Aboriginal people.

'Nadgigomar' is an Aboriginal word and pronounced with a long 'o' with the emphasis on this syllable.

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

FRONT COVER: Nagigomar Nature Reserve, by David Burns/NPWS

For additional information about the reserve or enquiries about any aspect of the plan, contact the following offices:

- Northern (Sunset Mountain and East Nadgigomar) sections: Bungonia State Conservation Area office, phone (02) 4844 4277, or Fitzroy Falls office, phone (02) 4887 8244.
- Southern (Durrans Durra) section: Braidwood Office, phone (02) 4842 1426 or Narooma office, phone (02) 4476 2888.

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## FOREWORD

Nadgigomar Nature Reserve covers an area of 5,596 hectares in three disjunct sections known as Sunset Mountain, East Nadgigomar and Durran Durra. It is located 55 kilometres south of Goulburn and 20 kilometres north of Braidwood on the Southern Tablelands of New South Wales.

Nadgigomar Nature Reserve conserves examples of long unburnt and largely unmodified tablelands woodland communities which are rare or otherwise not well represented in the reserve system. These include areas of Frost Hollow Grassy Woodland, Southern Tablelands Flats Forest, and Yellow Box Dry Herb/Grass Woodland which is part of the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland.

Nadgigomar Nature Reserve also contains populations of threatened native animal species and threatened and regionally rare plants.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each national park. A draft plan of management for Nadgigomar Nature Reserve was placed on public exhibition from 6<sup>th</sup> March until 15<sup>th</sup> June 2009. The submissions received were carefully considered before adopting this plan.

The plan contains a number of actions to protect the natural values of the reserve, including native plant and animal surveys, implementation of actions to assist the recovery of threatened species, control of introduced plants and animals, and fire management strategies. The plan also contains a number of actions to improve visitor and tourism experiences, including the construction of a car parking area and information signs, as well as providing for bushwalking, cycling and bush camping.

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

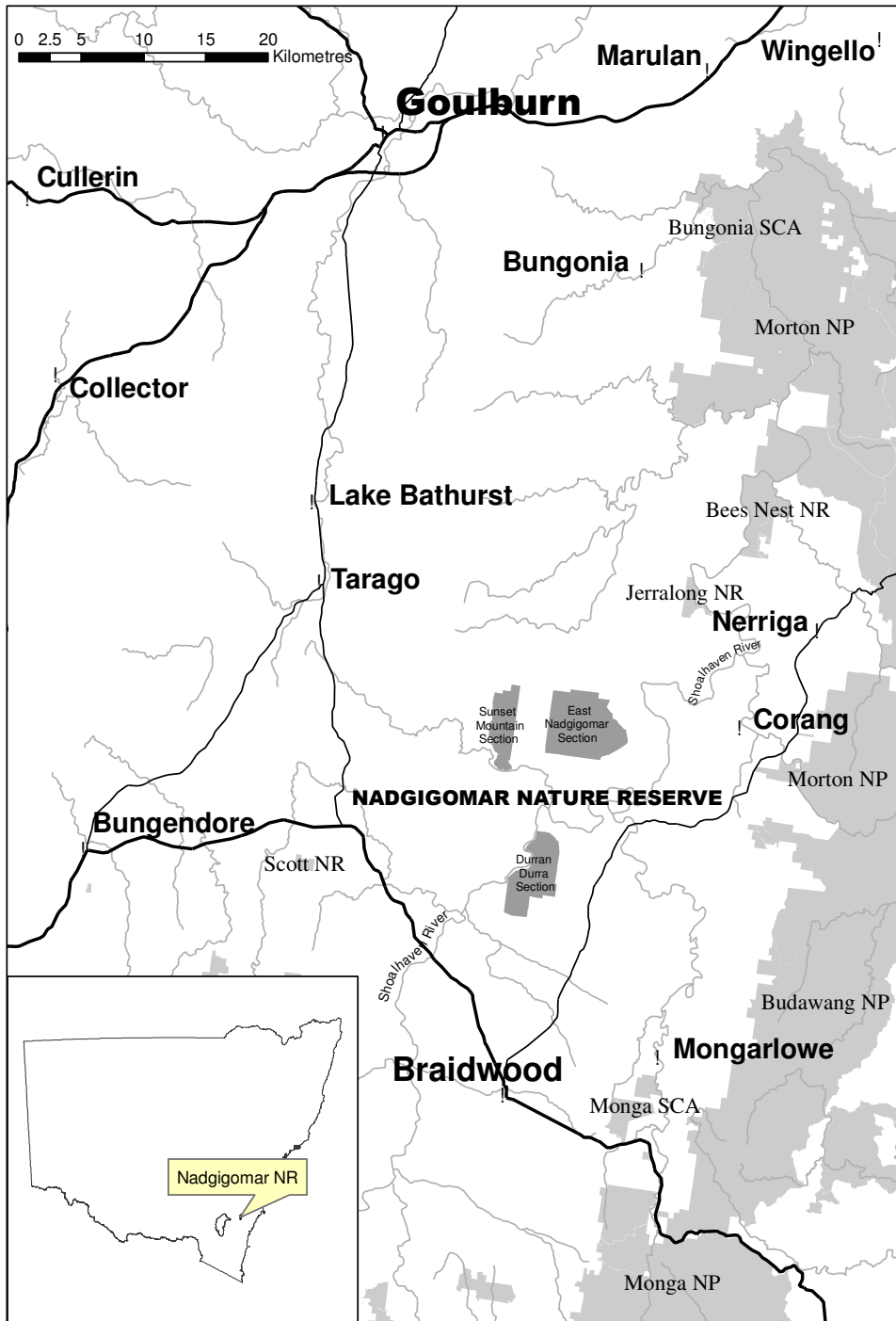


**Robyn Parker**  
**Minister for the Environment**



## 1. LOCATION, GAZETAL AND REGIONAL CONTEXT

Nadgigomar Nature Reserve is situated approximately 55 kilometres southeast of Goulburn, 35 kilometres east of Bungendore and 20 kilometres north of Braidwood, on the southern tablelands. It is comprised of three disjunct sections referred to as Sunset Mountain, East Nadgigomar and Durran Durra (see Map below).



Location Map

The reserve was gazetted on 25 October 2002 and has a total area of 5596 hectares. It is comprised of land formerly acquired and managed by the Sydney Catchment Authority as part of the catchment for a proposed dam at Welcome Reef. The NSW Government indefinitely postponed the dam, allowing some of the land to be available for reservation as Nadgigomar Nature Reserve.

The reserve was named for its location partially in the Parish of Nadgigomar and on the headwaters of Little Nadgigomar Creek, and for the nearby Nadgigomar Trigonometric Station. The name has Aboriginal significance – see section 3.5.

Surrounding land are partially cleared and used primarily for grazing. The reserve is isolated from other reserves, the nearest being Jerralong Nature Reserve to the north and Morton National Park to the east.

The two northern sections of the reserve (Sunset Mountain and East Nadgigomar) fall within the Goulburn Mulwaree Local Government Area and the area of the Pejar Local Aboriginal Land Council. The southern section (Durrans Durra) is in Palerang Shire and the area of the Batemans Bay Local Aboriginal Land Council. Surrounding land is used primarily for sheep grazing.



## 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* (NPW Act), the NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS).

Other legislation, 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, the plan must be carried out and no operations may be undertaken within Nadgigomar Nature Reserve except in accordance with the plan. The plan will also apply to any future additions to the nature reserve. Should management strategies or works be proposed for the reserve or any future additions that are not consistent with the plan, an amendment to the plan will be required.

### 2.2 MANAGEMENT PURPOSES AND PRINCIPLES

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 function, 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 nature 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 provision for visitor use as a management principle.

### 2.3 STATEMENT OF SIGNIFICANCE

Nadgigomar Nature Reserve is of regional significance for its plant and animal communities. It contains examples of old growth woodland communities that are rare or not well represented in the reserve system. It has one of the best remaining grassy forest and woodland communities on the southern tablelands and provides significant habitat for several threatened animal species and uncommon plant species.

## **2.4 SPECIFIC MANAGEMENT DIRECTIONS**

Management of the nature reserve will focus on protection of its significant vegetation communities and fauna habitats. Major strategies to achieve these objectives will be:

- treatment and monitoring of introduced species, particularly pine wildings, serrated tussock and blackberry;
- appropriate fire management; and
- control of off-road vehicle use.

Public access will be restricted to low impact activities such as walking, cycling and bird watching.

### 3. VALUES

This plan of management aims to conserve both the natural and cultural values of the reserve. The location, landforms and plant and animal communities of the area have determined how it has been used and valued by both Aboriginal and non-Aboriginal people. For reasons of clarity and document usefulness, components of natural heritage, cultural heritage, threats and on-going use are dealt with individually, however their inter-relationships are recognised.

#### 3.1 GEOLOGY, LANDSCAPE AND SOILS

The northern sections of the reserve are mainly flat to gently undulating. Low hills and ridges occur in the southern half of the Sunset Mountain section and along the western edge and centre of the East Nadgigomar section. Elevations range from 600 metres above sea level around the northern and eastern boundaries to 739 metres at Sunset Mountain and 670 metres at the Mayfield Trigonometric Station.

The southern part of the Durran Durra section lies on the Durran Durra range, a low range running in a south easterly direction. The remainder of the Durran Durra section is quite dissected, with a north-south ridgeline near the eastern boundary and spur ridges and gullies running towards the Shoalhaven River. The river itself lies in a small gorge. The elevation ranges from 570 metres at the Shoalhaven River to 700 metres on the range.

Sunset Mountain and the Durran Durra Range are local landmarks and the elevated, forested reserve areas provide diversity in an otherwise largely modified landscape.

The higher parts of each section of the reserve lie on metamorphosed Ordovician sediments of slate and greywacke. Ridges in the Durran Durra section are capped in places with ironstone. Lower areas of the reserve are primarily much younger Cainozoic sandstone, conglomerate and siltstone, while Quaternary sand and gravel occur along the Shoalhaven River and other watercourses. Perched alluvium in the East Nadgigomar section has been blown into a dune and swale type formation.

Gravelly soils on the ridges give way to sandy or silty soils in the lower areas that are quite deep in places. Soils in the reserve are generally of low fertility and highly erodible if disturbed, particularly the dispersible soils in the Durran Durra section. Off-road motorcycle riding is causing trail formation and erosion in some areas of the reserve, particularly in the Durran Durra section (see 5.1).

#### 3.2 HYDROLOGY

The reserve lies in the Shoalhaven River catchment. The northern sections contain intact catchments for Boro, Spring and Little Nadgigomar Creeks, all of which flow directly or eventually into the Shoalhaven. Most of the Durran Durra section drains directly to the Shoalhaven River.

The drainage lines are predominantly ephemeral, particularly in the East Nadgigomar dune country where they dry quickly following rain.

The upper catchments of gullies in the Durran Durra section are often flat and swampy, providing relief from the dry shaly ridges and adding to habitat diversity. There are also several small wetlands in the East Nadgigomar section. It has been suggested that there may be loess layers in the dunes of the East Nadgigomar section that create shallow perched aquifers, thus supporting swamps and forests on the otherwise infertile and free-draining sand (Douglas, pers. comm. 2010).

Each section of the reserve would be located on the foreshores, and be partly inundated by, the proposed Welcome Reef Dam if constructed. The dam was proposed as a contribution to Sydney's water supply but construction has been indefinitely shelved in favour of alternative water supply measures. Should a decision be made to proceed with the dam, any areas of the reserve to be inundated would need to be revoked, and measures put in place to protect the new foreshore areas from erosion, weed invasion and other potential impacts.

While water quality is generally good, erosion from unsealed trails and off-road motorcycle riding have the potential to cause siltation of water courses (see 5.1).

### 3.3 NATIVE PLANTS

The reserve's vegetation communities are considered floristically interesting due to an unusual mix of typical tableland canopy species with a seemingly coastal understorey (Brooker 1981). The majority of the vegetation communities are old growth or mature forest and woodland, an uncommon occurrence on the tablelands.

Dominant tree species in the highest areas of the reserve include silvertop ash (*Eucalyptus sieberi*) which in some parts occurs in almost pure stands and elsewhere occurs in conjunction with thin-leaved stringy-bark (*Eucalyptus eugenioides*) and red stringybark (*Eucalyptus macrorhyncha*). The forests are quite open and there is often little ground cover. A mid-storey of black she-oak (*Allocasuarina littoralis*) often accompanies the eucalypts on higher ground and in the East Nadgigomar section occurs in places as the dominant canopy species. These latter areas are long-unburnt and provide important threatened species habitat.

With decreasing altitude the ash and stringy-barks give way to an open forest typically containing a mix of scribbly gum (*Eucalyptus rossii*), snappy gum (*E. mannifera*) and broad-leaved peppermint (*E. dives*), with an open shrubby ground cover. Broad-leaved peppermint has been found in hybrid form with narrow-leaved peppermint (*E. radiata*) in the Durran Durra section (ANPS 2008). Lower slopes support more woodland species such as candle-bark (*E. rubida*), yellow box (*E. melliodora*) and apple box (*E. bridgesiana*), which are sometimes fringed by snow gum (*E. pauciflora*) and black sally (*E. stellulata*) where they border cold air drainage lines.

There are small areas of heathland dominated by *Kunzea* sp. on rocky slopes in the northern part of the Durran Durra section.

Riparian zones along the Shoalhaven River and to a lesser extent on smaller streams are dominated by manna gum (*Eucalyptus viminalis*), commonly with an understorey of *Lomandra* sp. and silver wattle (*Acacia dealbata*). There are stands of swamp paperbark (*Melaleuca parvistaminea*) in some riparian areas. Wetlands along upper drainage lines in the East Nadgigomar section have dense stands of sedges such as *Restio* sp. and *Juncus* sp.

Vegetation surveys undertaken in the reserve in 2010 identified nine vegetation communities, based on the NSW Native Vegetation Mapping Program, which aims to produce a uniform coverage of vegetation maps throughout central and eastern NSW. Several of the communities are rare, have a restricted distribution or are poorly represented in conservation reserves. The areas of Frost Hollow Grassy Woodland belong to the endangered ecological community Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland. Southern Tablelands Flats Forest also has an affinity with this endangered community. In addition, an area of yellow box (*E. melliodora*) on the eastern edge of the East Nadgigomar section may be Tableland Grassy Box-Gum Woodland, part of the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland. This area is regenerating following clearing and grazing and it is not possible at present to place it in any particular community.

Community	Structural Species	Sections	Location	Status
Tableland Low Woodland	<i>E. rossii</i> , <i>E. mannifera</i> , <i>E. macrorhyncha</i> , <i>E. dives</i>	All sections	Low ridges and slopes on sandy loam soils. Most common community in reserve	Relatively widespread, moderately well conserved
Braidwood Dry Forest	<i>E. dives</i> , <i>E. mannifera</i>	All sections, particularly Durran Durra	Undulating rises with deep sandy loams. Second most common community in the reserve.	Restricted distribution, poorly conserved
Eastern Tablelands Dry Forest	<i>E. sieberi</i> , <i>E. agglomerata</i> , <i>E. globoidea</i> , <i>E. rossii</i> , <i>E. mannifera</i>	All sections	Highest areas	Relatively widespread, moderately well conserved
Western Tablelands Dry Forest	<i>E. macrorhyncha</i> , <i>E. mannifera</i> , <i>E. rossii</i> , <i>E. dives</i>	Sunset Mountain	Mid slopes	Widespread, moderately well conserved
Frost Hollow Grassy Woodland	<i>E. pauciflora</i> , <i>E. rubida</i>	Sunset Mountain and Durran Durra	Low areas on northern and southern boundaries	Rare and poorly conserved. Part of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland endangered community
Southern Tablelands Flats Forest	<i>E. viminalis</i> , <i>E. pauciflora</i> , <i>E. radiata</i>	East Nadgigomar and Durran Durra	Drainage lines and low lying flats on sand	Uncommon, moderately well conserved
Tableland Bog	<i>Lepidosperma limicola</i> , <i>Epacris microphylla</i> , <i>Leptospermum</i>	East Nadgigomar and Durran Durra	Poorly drained areas	Rare, scattered distribution, moderately well conserved

	<i>continentale</i> , <i>L. myrtifolium</i> , <i>Kunzea parvifolia</i> , <i>Melaleuca parvistaminia</i> .			
Tablelands Ridge Forest	<i>E. radiata</i>	Durrans Durra	Southern slopes and gullies	Relatively widespread, well conserved
Southern Montane Heath	<i>Allocasuarina nana</i>	Durrans Durra	Small area on ridgeline in northern part of section.	Restricted distribution but well conserved

Most of the above ecosystems are rare or poorly represented in conservation reserves. The Tablelands and Slopes Yellow Box Dry Herb/Grass Woodland is part of the endangered ecological community White Box Yellow Box Blakely's Red Gum Woodland. The Eastern Tableland Snow Gum-Manna Gum Dry Shrub/Grass Forest is likely to belong to a preliminary endangered ecological community, Tablelands Frost Hollow Grassy Woodlands.

The 2010 vegetation surveys, combined with surveys of the Sunset Mountain and Durrans Durra sections by the Australian Native Plant Society of Canberra (ANPS 2008 and ANPS 2008) have identified a total of 343 plant species in the reserve. Several species found are of biogeographical significance:

- *Styphelia adscendens*, an uncommon species at the northern limit of its distribution;
- *Persoonia microphylla*, has a relatively restricted range and is regionally significant;
- *Isopogon prostratus*, a rare plant found in the northern part of the reserve;
- *Petrophile canescens*, tentatively found in the northern part of the reserve and would be close to its southern limit of distribution;
- *Acacia obtusata*, tentatively recorded in the Durrans Durra section and would be close to its southern limit. It has been suggested that this may be an undescribed taxon or subtaxon (Douglas, 2010).

The endangered Michelago dillwynia (*Dillwynia glaucula*) has been identified in the Durrans Durra section of the reserve. It is being significantly affected by grazing by feral goats. The dwarf kerrawang (*Rulingia prostrata*), an endangered species under both NSW and Commonwealth legislation, occurs in the East Nadgigomar section. As a prostrate shrub it is vulnerable to trampling and vehicle use.

Another two threatened species have been tentatively found in the reserve and a further five may occur:

- delicate pomaderris (*Pomaderris delicata*): a critically endangered species has been tentatively found in the Durrans Durra section but its identity needs to be confirmed. It is known from only two other sites and only two plants were observed in the reserve. The plants are vulnerable to browsing by feral goats.
- Kydra dampiera (*Dampiera fusca*): an endangered species that occurs in a few scattered populations on the eastern edge of the southern tablelands. It has been tentatively found in the Durrans Durra section but its identity needs to be

confirmed. Some plants occur beside trails and hence are vulnerable to trail management works.

- black gum (*Eucalyptus aggregata*): a vulnerable woodland tree found in the higher and wetter part of the southern and central tablelands. It occurs close to the southern boundary of the Durran Durra section.
- doubletail buttercup (*Diurus aequalis*): an endangered species that occurs in grassy forest and woodland areas in the southern and central tablelands, in populations of a few, scattered individuals. It is vulnerable to clearing, grazing and vehicle access.
- few-seeded bossiaea (*Bossiaea oligosperma*): a vulnerable species known from two disjunct areas - the lower Blue Mountains and the Windellama area, where it is locally abundant in low woodland. It is threatened by clearing and too-frequent fire.
- Mongarlow mallee (*E. recurva*): an endangered species from the Windellama and Mongarlow areas. The species is extremely rare but the reserve provides suitable habitat and should be surveyed to check whether the species is present.
- pale pomaderris (*Pomaderris pallida*): a vulnerable species found on the southern tablelands including the Shoalhaven River to the north and the Queanbeyan River to the west. It is threatened by browsing, weed competition and too-frequent fire.

In addition to the above species, *Eucalyptus bridgesiana*, *E. melliodora*, *E. stellulata* and *E. viminalis* are of conservation interest because they are uncommon in the region, have a restricted distribution and/or have been extensively cleared.

The reserve's plant communities are generally in good condition but are threatened by weed invasion, off-road motorcycle riding, isolation and potentially by inappropriate fire regimes (see sections 4 and 5).

### 3.4 NATIVE ANIMALS

The reserve protects high quality, largely undisturbed habitat for many native animal species. Much of the area is long-unburnt with large hollow bearing trees and a lot of fallen timber. This provides shelter and nesting sites.

The reserve is part of a wildlife corridor between Tallaganda National Park and Morton National Park that also incorporates Jerralong and Bees Nest Nature Reserves. Other components of the corridor are state forest and Crown leasehold land.

The area is particularly rich in bird life, thought to be due in part to the high diversity of plant life growing on the poor soils. Brooker (1981) recorded 155 bird species in the adjacent area proposed for inundation by the Welcome Reef Dam, while targeted fauna surveys by Gaia Research (2004) in the northern part of the reserve identified 49 bird species in a relatively short period. Brooker found the greatest bird species diversity in areas of manna gum forest.

Brooker also recorded 16 species of frogs, 19 reptiles and 15 native mammals in and around the reserve. Gaia Research, however, found only two species of arboreal

# Nadgigomar Nature Reserve

**Sunset Mountain Section**

Middle Trail  
Sunset Mt Trail  
Sunset Mountain

**East Nadgigomar Section**

Silver Top Ash Trail  
Spring Creek

Natural Gas Pipeline  
(Not maintained by NPWS)

Mayfield

**Durrán Durra Section**

Shoalhaven River

Euradux Fire Trail  
Pines Stn Tr  
Pines 9th Trail

Cable Fire Trail  
Cable Link Fire Trail  
Durrán Durra Fire Trail

Mayfield Road

Sandy Point Road

Stewarts Crossing Road

Euradux Road

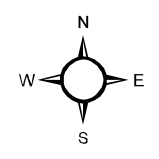
Comies Creek

Little Nadgigomar Creek

Mogoro Road

Nerriga Road

- Management trail
- Private road
- Unsealed public road
- Main road
- River
- Creek
- Trig station
- Gate
- Nature reserve





mammal in the reserve, as well as 9 species of insectivorous bat and seven reptile species. The diversity of insectivorous bats is thought to be a consequence of the abundance of roost sites available in old-growth timber. The low diversities of herpetofauna could be a result of low soil fertility, the absence of loose rock and predation on terrestrial fauna by foxes, but further survey should be taken outside a drought period.

Four animal species listed as vulnerable under the Threatened Species Conservation Act have been recorded in the reserve:

- glossy black-cockatoo (*Calyptorhynchus lathami*): regularly visits areas of black she-oak to feed on seed cones. Breeds in tree hollows.
- gang-gang cockatoo (*Callocephalon fimriatum*): a seed-eating, hollow nesting species.
- brown treecreeper (*Climacteris picumnus*): a hollow roosting and nesting insectivore.
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*): known to breed nearby at Bungonia State Conservation Area. It was caught only once in the reserve, which may reflect the fact that it spends most of its time feeding above the canopy.

Gaia Research also recorded the chestnut-rumped heathwren (*Hylacola pyrrhopygia*), a regionally significant bird, in the reserve.

The threatened powerful owl (*Ninox strenua*), koala (*Phascolarctos cinereus*) and grey-headed flying fox (*Pteropus poliocephalus*) have been recorded in adjacent areas and are likely to occur in the reserve.

The ephemeral wetlands and areas along the Shoalhaven River adjacent to the Durran Durra section are likely to be important frog breeding sites when inundated. The wetlands are also an important water source for other wildlife and aquatic invertebrates.

The small size and isolation of the three reserve sections are the most significant threats to long term conservation of its native animal communities. Reduction in the number of trails will assist in minimising habitat fragmentation (see 5.1).

### **3.5 ABORIGINAL HERITAGE**

The word Nadgigomar refers to a culturally significant Aboriginal site in the local area (outside the nature reserve) thought to have been used for ceremonial purposes (R Wellington, pers. comm.).

The reserve lies along the upper Shoalhaven River corridor, which may have served as an important access route for Aboriginal people between the coast and the Snowy Mountains. Various Aboriginal groups had associations with the area including the Ngunnawal, Wandandian, Walbanja, Gundungara, Dharawal and Dhurga groups.

Each group had certain rights for use or access. Today the reserve falls within the area of the Pejar Local Aboriginal Land Council (northern sections) and Batemans Bay Local Aboriginal Land Council (Durrans Durra section).

The reserve's landscape and its plants and animals are an integral part of Aboriginal culture. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Natural features are central to Aboriginal spirituality and contribute to identity. Aboriginal cultural heritage and nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

No comprehensive survey has been undertaken for Aboriginal sites within the reserve and no sites have been recorded. However, wider surveys indicate that the general area was well used by Aboriginal people. More than 100 sites have been recorded along the Southern Gas Pipeline, which runs along the southern boundary of the East Nadgigomar section, and in the area surveyed for the Welcome Reef Dam proposal (Attenbrow, 1984). These sites are primarily artefact scatters but also include open camp sites, scarred trees, axe grinding grooves and rock shelters with art. A site located close to the reserve boundary on Box Flat Creek had one of the highest artefact densities recorded in Attenbrow's survey.

Unknown heritage sites may be at risk from off-road motorcycle use and use of heavy machinery for fire suppression. Section 5.2 provides for surveys to improve knowledge of the location of sites.

### **3.6 HISTORIC HERITAGE**

Prior to gazettal as a nature reserve, the three sections were managed by the Sydney Catchment Authority as part of the catchment of the proposed Welcome Reef Dam site. They had previously been Crown leasehold land, subject to grazing licences from the early part of the 20<sup>th</sup> century, although only small areas have noticeable grazing impacts. Evidence of past grazing use includes fences, a dam in the northeastern corner of the Durrans Durra section, and two water bores in the East Nadgigomar section.

There are abandoned gold mines just east of the East Nadgigomar section and former gold fields to the north of both the East Nadgigomar and Sunset Mountain sections but there is no evidence that mining occurred in the reserve.

Some logging for silvertop ash previously occurred in the Durrans Durra section, possibly for mining timber, and a small gravel quarry was operated in the southeastern corner.

The reserve land was identified in the 1970s as land of conservation value by the Goulburn Field Naturalists Group as well as the NPWS.

Fence lines provide a record of past use and posts should be retained (see 5.2).

### **3.7 VISITOR USE AND EDUCATION**

Public vehicle access is available to the boundaries of each of the reserve's three sections and they are crossed by management trails.

The reserve has no visitor facilities but the management trails provide easy access for bushwalking and cycling. The understorey diversity attracts a large number of bird species, making the reserve popular with bird watchers.

Filtered views are available over the northern part of the reserve and adjacent areas from Sunset Mountain, a 1.5 kilometre walk from Sandy Point Road.

The Durrans Durra section borders an area of Shoalhaven River frontage on Crown land that is used for a small amount of picnicking, camping, swimming and fishing.

## 4. ISSUES

### 4.1 WEEDS, PEST ANIMALS AND OTHER IMPACTS

The reserve is in good condition overall and mainly free of weeds. There are, however, infestations of willow and blackberry along the Shoalhaven River, pine wildings on the boundaries of the East Nadgigomar and Durran Durra sections and serrated tussock on the northern boundary of the Sunset Mountain section.

Pest animals observed in the reserve include foxes, rabbits, feral pigs and occasionally goats and deer.

Past use for grazing, timber cutting, pig hunting and ongoing off-road trail-bike use have resulted in vegetation disturbance, introduced species infestations and trail formation in some areas. While these impacts are not widespread, there are localised significant impacts, particularly in an area used for unauthorised trail bike hill climbs in the Durran Durra section.

### 4.2 ISOLATION AND FRAGMENTATION

The three sections of the reserve are relatively small and isolated and subject to edge effects, making them more vulnerable to disturbances. In particular, adjacent agricultural land uses place pressures on the reserve through the incursion of non-native plant and animal species such as pasture species, pine wildings and serrated tussock. Cooperative management with neighbours will be important for the management of access, fire, weeds and pest animals.

### 4.3 CLIMATE CHANGE

Climate change has been listed as a key threatening process under the Threatened Species Conservation Act. Projections of future changes in climate for NSW include higher air and water temperatures, elevated CO<sub>2</sub>, 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 and increased erosion.

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 on Nadgigomar Nature Reserve.

## 5. IMPLEMENTATION

Current Situation	Desired Outcomes	Management Response	Priority
<p><b>5.1 ON-PARK ECOLOGICAL CONSERVATION</b></p> <p><b>Soil and water conservation</b></p> <p>The reserve soils are highly erodible if disturbed. While the reserve is generally well vegetated, off-road motorcycle activity is causing vegetation loss and trail formation in a number of areas and has the potential to result in localised erosion and siltation. This is particularly of concern in the centre of the Durran Durra section, where riders are preventing revegetation of a cleared valley floor and have created a large number of hill climbs on the adjacent steep slope.</p> <p>Section 5.3 provides for prohibition of public vehicle access within the nature reserve to minimise impacts such as erosion, and for works to close the Durran Durra section.</p> <p>Management trails in the Sunset and East Nadgigomar sections have been gated to keep out public vehicles but some unauthorised motorcycle entry and trail formation are still occurring, particularly off Mogo Road.</p> <p>A section of management trail east of Sunset Mountain is quite steep and susceptible to erosion. It should be re-aligned if feasible.</p> <p>Water quality is generally good as most areas of the reserve are at the head of catchments. A concrete flume and associated earth dam were previously constructed by the Sydney Catchment Authority to catch sediment from the cleared valley floor in the Durran Durra section.</p>	<p>Soil erosion is minimised.</p> <p>Water quality and health of reserve streams and wetlands are maintained.</p>	<p>5.1.1 Undertake all works in a manner that minimises erosion and water pollution.</p> <p>5.1.2 Liaise with relevant authorities to maintain water quality in the reserve's catchments where needed.</p> <p>5.1.3 Maintain trail gating in the Sunset and East Nadgigomar sections. Fence along part of Mogo Road to keep out unauthorised vehicles. Use fencing or other means elsewhere where needed to prevent illegal vehicle entry, in conjunction with the Sydney Catchment Authority and other neighbours.</p> <p>5.1.4 Maintain management trails to minimise erosion and soil movement to waterways.</p> <p>5.1.5 Realign the eastern end of the Sunset Mountain Trail if feasible, in order to reduce erosion potential.</p> <p>5.1.6 Retain the concrete flume in the Durran Durra section unless no longer needed following revegetation upstream.</p>	<p>Ongoing</p> <p>Ongoing</p> <p>High</p> <p>High</p> <p>Medium</p> <p>Ongoing</p>

Current Situation	Desired Outcomes	Management Response	Priority
<p><b>Native plant and animal conservation</b></p> <p>The reserve's vegetation is in good condition apart from small areas in each section that have been affected by grazing or off-road vehicles. Six rare or poorly reserved plant communities, including at least one endangered ecological community, are likely to occur. Survey is needed to confirm this and to check for significant plant species, particularly the five threatened species that may occur.</p> <p>Several threatened fauna species have been recorded and it is probable that others occur. The primary requirement for maintenance of the populations of threatened fauna is protection of the vegetation communities they rely on, particularly areas with black she-oak and hollow trees. Under the Threatened Species Conservation Act, strategies for promoting the recovery of most threatened species have been set out in a state-wide Species Priorities Action Statement. These provide primarily for survey, monitoring and management of any threats to habitat.</p> <p>Because of their small size and significance, it is important to minimise fragmentation of the reserve sections and where possible to reduce the existing number of trails and disturbances. Overgrown former vehicle trails will be permitted to completely revegetate and motorcycle trails will be closed if possible (see 5.1).</p> <p>An ephemeral swamp in the East Nadgigomar section is bisected by a vehicle trail that has only minor management value. It would not be feasible to relocate the trail and it should be closed to allow rehabilitation of the wetland.</p>	<p>All native plant and animal species and communities are conserved.</p> <p>Significant vegetation communities are protected.</p> <p>Habitat for threatened species is maintained.</p>	<p>5.1.7 Undertake surveys to validate the vegetation community modelling and look for threatened and rare plant species.</p> <p>5.1.8 Undertake targeted surveys for threatened native animal species that may occur in the reserve.</p> <p>5.1.9 Implement priority measures included in the Priorities Action Statement for threatened species occurring in the reserve.</p> <p>5.1.10 Close and rehabilitate Portion 86 Trail through the wetland in the East Nadgigomar section.</p>	<p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Management Response	Priority
<p><b>5.2 CULTURAL HERITAGE</b></p> <p>There are no known Aboriginal sites or places in the reserve but it is probable that sites occur given the rich archaeological record on adjacent land.</p> <p>There are no known features of historic interest within the reserve apart from indicators of previous grazing such as fences, bores and a small dam. The internal fences are in a state of disrepair. Fencing wire poses a barrier to wildlife movement and should be removed.</p> <p>Cultural sites are potentially at risk from off-road vehicle use and from management activities such as use of heavy machinery for fire suppression. It would therefore be desirable to conduct surveys to improve understanding of the type and distribution of any cultural features in the reserve.</p>	<p>Cultural features are conserved and managed in accordance with their significance.</p> <p>Knowledge of cultural sites is improved.</p>	<p>5.2.1 Precede all ground disturbance work by a check for cultural features.</p> <p>5.2.2 Consult and involve the Pejar and Batemans Bay Local Aboriginal Land Councils and other relevant Aboriginal organisations and individuals in all aspects of management of Aboriginal sites, places and values.</p> <p>5.2.3 Remove wire from internal fences but retain posts as a record of past fence lines.</p> <p>5.2.4 Conduct surveys to improve knowledge of cultural features in the reserve, including checking for Aboriginal sites in locations where they may be threatened by fire suppression activities.</p>	<p>Ongoing</p> <p>High</p> <p>Low</p> <p>High</p>
<p><b>Current Situation</b></p> <p><b>5.3 VISITOR USE AND SERVICES</b></p> <p>The reserve is remote from major population centres and visitor numbers are low. Public vehicle access is available to the boundaries of each section via Sandy Point, Mogo and Eurodux Roads.</p> <p>Roads within the two northern sections are closed to public vehicles to prevent off-road vehicle use and other inappropriate activities such as rubbish dumping. The Durran Durra section is currently open to vehicle use but needs to be closed to address unauthorised trail formation and erosion (refer section 5.1).</p>	<p>Visitor use is appropriate and ecologically sustainable.</p> <p>Negative impacts of visitors on reserve values are minimised.</p>	<p><b>Management Response</b></p> <p>5.3.1 Prohibit public vehicle use within the reserve and close vehicle access to the Durran Durra section. Maintain or install gates and signage as appropriate.</p> <p>5.3.2 Allow walking throughout the reserve and allow cycling on management trails. Continue to prohibit horse riding.</p>	<p><b>Priority</b></p> <p>Ongoing</p> <p>Ongoing</p>

<p>The open vegetation and management trails provide for easy walking and cycling and good opportunities for bird watching. Sunset Mountain and the Shoalhaven River provide destinations for walkers, although views from Sunset Mountain are limited.</p> <p>Information signs are provided for visitors to the Sunset Mountain section. A small car park and style would facilitate access. Similarly, a car park and information sign will be needed for the Durran Durra section following its closure to public vehicle access. The East Nadgigomar section receives minimal use and a car park is not considered necessary. A small information sign could be provided at the Mogo Road gate if needed.</p> <p>The banks of the Shoalhaven River adjacent to the Durran Durra section are Crown land. The Crown land and adjacent reserve areas are occasionally used for picnicking, camping, swimming and fishing, but there is very little flat land available. Pedestrian access will continue to be available through the nature reserve to the river. Large easily accessible camping areas with extensive sandy beaches are located downstream on Crown land at Stewarts Crossing a few kilometres north of the Durran Durra section and at Oallen Ford near the East Nadgigomar section.</p> <p>No horse riding occurs in the reserve and riding is not permitted in nature reserves except, where appropriate, on roads open to public vehicle use. This does not apply to Nadgigomar Nature Reserve.</p>		<p>Low</p> <p>Medium</p> <p>Ongoing</p> <p>Ongoing</p>
<p>5.3.3 Maintain information signs at entrances to the Sunset Mountain section. Provide a small car park at the start of the Sunset Mountain Trail and a style for pedestrians to cross the fence.</p> <p>5.3.4 Provide a small car park and information sign for the Durran Durra section at the northern end of Eurodoux Road.</p> <p>5.3.5 Prohibit camping in the Sunset Mountain and East Nadgigomar sections. Allow walk-in camping in the Durran Durra section more than 250 metres away from public roads.</p> <p>5.3.6 Monitor levels and impacts of use and take action to ameliorate impacts where necessary.</p>		



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<p><b>5.4 COMMUNITY PROGRAMS AND EDUCATION AND OFF-PARK ECOLOGICAL CONSERVATION</b></p> <p>Promotion of community understanding and appreciation of the conservation values of the reserve will be important for minimising damaging activities and encouraging appropriate activities such as bushwalking and bird watching.</p> <p>Naturally vegetated private land and other public land tenures connect the three reserve sections to each other and to other conservation reserves along the Shoalhaven River corridor. Maintenance of these connections is vital to fauna habitat value and long term viability.</p>	<p>The community is aware of the significance of the reserve and of management programs.</p> <p>Connection between the reserve sections and with other reserves is maintained.</p>	<p>5.4.1 Organise media releases and contact with neighbours and community organisations as needed.</p> <p>5.4.2 Encourage conservation of remnant native vegetation connecting or adjacent to the reserve sections through establishment of voluntary conservation agreements or similar mechanisms.</p>	<p>Ongoing</p> <p>Medium</p>
<p><b>Current Situation</b></p> <p><b>5.5 WEEDS AND PEST ANIMALS</b></p> <p>Most of the reserve is weed-free and it is fairly resilient to weed introduction because of the poor soils. The greatest concentration of weeds is along the Shoalhaven River in the Durran Durra section and on adjacent Crown land, brought in by periodic flooding. This area has extensive occurrences of crack willow (<i>Salix fragilis</i>) and a few blackberry (<i>Rubus fruticosus</i>) and gorse (<i>Ulex europaea</i>) plants have been recorded.</p> <p>A Weed Management Strategy has been prepared for the reserve that gives highest priority for control to blackberry, crack willow and serrated tussock (<i>Nasella trichotoma</i>). Serrated tussock occurs on adjacent cleared land and has extended a short distance into the reserve on the northern boundary of the Sunset Mountain section where it threatens an area of the endangered ecological community Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland. This weed has the potential to invade more open</p>	<p>The impact of introduced species on native species and neighbouring land is minimised.</p>	<p>5.5.1 Control, and as far as possible eliminate, introduced species in the reserve.</p> <p>5.5.2 Implement actions from the reserve's Weed Management Strategy. In particular, undertake on-going control programs for blackberry, willow and serrated tussock.</p> <p>5.5.3 Monitor the reserve for weed species, particularly those that occur in adjacent land close to the reserve's boundaries.</p>	<p>Ongoing</p> <p>High</p> <p>Ongoing</p>

<p>areas in the reserve.</p> <p>Commercial pine plantations adjoin the northern boundary of the East Nadgigomar section and the eastern boundary of the Durran Durra section. <i>Pinus radiata</i> wildings have invaded the reserve along the common boundaries and extend some distance into the north eastern corner of the Durran Durra section. Pine wilding control is being undertaken but the plantations are likely to be a continuous source of weed invasion.</p> <p>Rabbits, feral pigs and foxes have been observed in all three sections of the reserve. Rabbits generally occur in formerly grazed areas and are in low numbers. Feral pigs have long been associated with the low-lying parts of the reserve and surrounding areas. Pig activity promotes weed invasion through ground disturbance. Direct predation on terrestrial wildlife and foraging by overturning logs and rocks in search of prey is likely to impact on diversity of ground dwelling species in the reserve. Unfortunately, illegal hunting in the reserve disperses pigs and disrupts control programs.</p> <p>Foxes are a significant threat to wildlife but their control is not feasible unless undertaken cooperatively over a wide area with other land owners. Some fox control is undertaken in conjunction with baiting for wild dogs when needed, for protection of neighbouring stock. However dogs are not known to be a significant problem in the area.</p> <p>Goats have been reported occasionally in the Durran Durra section and deer in the northern sections.</p> <p>A number of the reserve boundaries adjacent to private land are unfenced or the fences are in poor condition. Fortunately stock incursion is not currently a problem.</p>		<p>5.5.4 Undertake ongoing pine wilding control, beginning with areas furthest from the reserve boundaries and working towards the boundaries.</p> <p>5.5.6 Monitor for goats, deer and pigs and control as needed.</p> <p>5.5.7 Manage wild dogs in accordance with relevant wild dog management plans.</p> <p>5.5.8 Seek the cooperation of other authorities and neighbours in implementing weed and pest animal control programs including pig trapping and fox baiting.</p> <p>5.5.9 Encourage effective fencing of adjacent grazing properties if needed.</p>	<p>Ongoing</p> <p>High</p> <p>High</p> <p>Ongoing</p> <p>Ongoing</p>
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Current Situation	Desired Outcomes	Management Response	Priority
<p><b>5.7 INFRASTRUCTURE AND MAINTENANCE</b></p> <p>The Southern Gas Pipeline borders the southeastern corner of the East Nadgigomar section. Access for maintenance is available along the line.</p> <p>An underground Telstra fibre optic cable and associated access trail (Cable Fire Trail) runs across the southern end of the Durran Durra section. The presence of the cable beneath the trail restricts maintenance of the trail and hence erosion-mitigation along steeper sections.</p> <p>Private properties adjacent to the southeastern part of the East Nadgigomar section are accessed via Mogo Road, along the reserve boundary. A shared gate on Mogo Road provides access for these neighbours and also for reserve management. A single high security lock is fitted to the gate and all relevant property owners/land managers have a key.</p> <p>Private properties to the east of the Durran Durra section are accessed via Eurodux Road (a public road), which runs along the eastern boundary of the reserve.</p> <p>There is no public access between the Sunset Mountain and East Nadgigomar sections and a formal arrangement with neighbours is needed if management access is to be secured.</p>	<p>Private property access and services continue to be provided for where appropriate.</p> <p>Management access is maintained.</p>	<p>5.7.1 Continue to permit access along the Cable Fire Trail for maintenance of the Telstra fibre optic cable across the Durran Durra section.</p> <p>5.7.2 Seek information about the location of the fibre optic cable and develop a trail maintenance strategy for the Cable Fire Trail, in conjunction with Telstra. Arrange an easement and maintenance agreement.</p> <p>5.7.3 Maintain lock arrangements for neighbour and management access along Mogo Road.</p> <p>5.7.4 Seek formal arrangements for management access between the Sunset Mountain and East Nadgigomar sections.</p>	<p>Ongoing</p> <p>High</p> <p>Ongoing</p> <p>High</p>

## LEGEND FOR PRIORITIES

**High** priority: those activities that are 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 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.

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