



NSW NATIONAL PARKS & WILDLIFE SERVICE

# Palm Grove Nature Reserve

Plan of Management



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Palm Grove Nature Reserve lies in the traditional Country of the Guringai and Darkinjung people.

This plan of management was prepared by staff of the Hunter Central Coast Branch of the NSW National Parks and Wildlife Service (NPWS).

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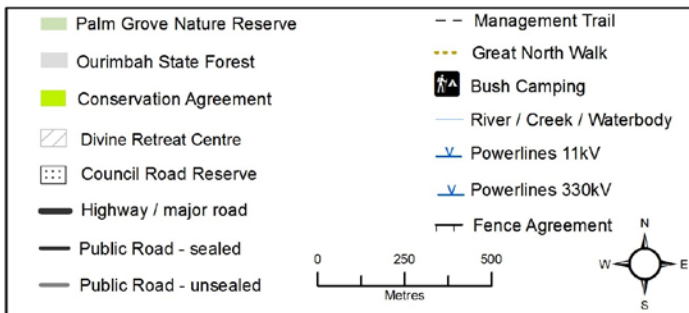
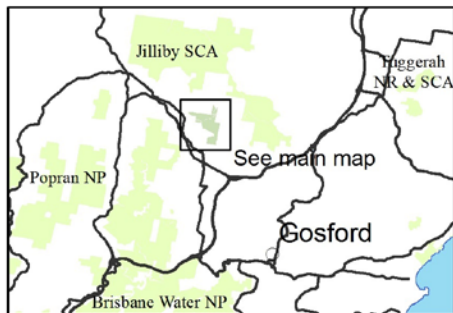
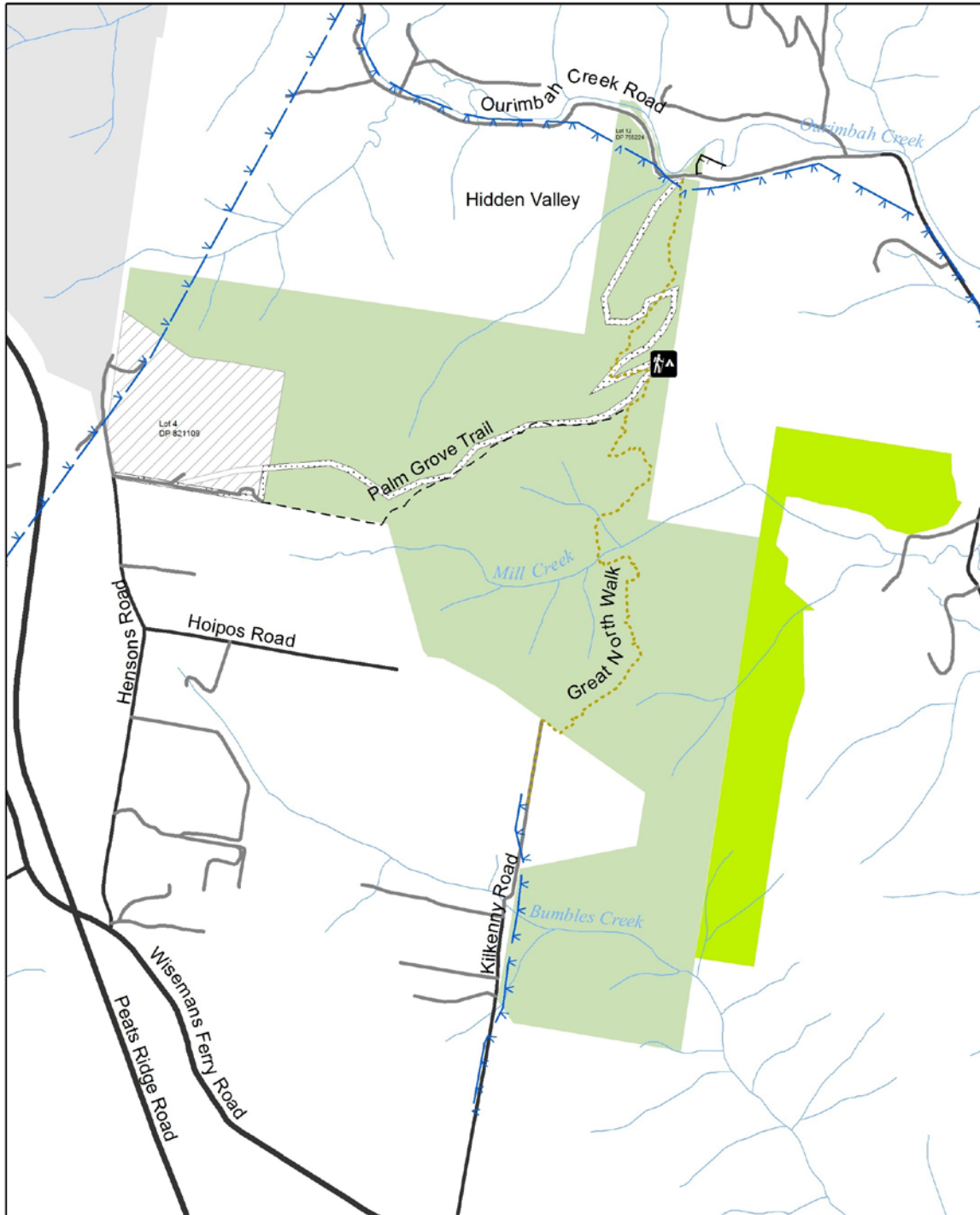
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**Figure 1: Palm Grove Nature Reserve**

# 1. Introduction

## 1.1 Location, reservation and regional setting

Features	Description
Location	Palm Grove Nature Reserve (referred to as ‘the reserve’ in this plan) is located in the Ourimbah Creek valley, approximately 11 kilometres north-west of Gosford on the NSW Central Coast.
Area	The reserve is 240 hectares and forms a green corridor connecting the Somersby Plateau with Ourimbah Creek valley. A 43.6-hectare voluntary conservation agreement adjoins the eastern side of the reserve, increasing the size of protected areas and the connectivity across the landscape. A council road reserve bisects the reserve (see Figure 1 and Section 4.3).
Reservation date	Palm Grove Nature Reserve was reserved on 28 February 2007.
Previous tenure	The reserve was previously Crown land and was recommended for reservation to protect its remnant rainforest vegetation.

### Regional context

Biogeographic region	The reserve lies in the Sydney Basin Bioregion (Thackway & Cresswell 1995) and provides a habitat link between Brisbane Water National Park in the south and Jilliby State Conservation Area in the north.
Surrounding land use	The reserve is adjacent to small semirural holdings including hobby farms, market gardens, poultry farms and equestrian facilities. The western edge of the reserve connects to Ourimbah State Forest and the eastern edge adjoins a voluntary conservation agreement over private property. A privately run retreat neighbours the reserve on its western side.
Other authorities	The reserve is located within the administrative areas of Darkinjung Local Aboriginal Land Council, Central Coast Council and Greater Sydney Local Land Services.

## 1.2 Statement of significance

Palm Grove Nature Reserve is significant because of its natural and cultural values, including:

### Landscape and catchment values

- The reserve forms part of a forested protected corridor that provides landscape connectivity between the northern outskirts of Sydney and the Hunter Valley.
- The network of creeks draining the reserve contributes to the catchment values of Ourimbah Creek and the Tuggerah Lake system.

### Biological values

- The reserve is part of an important corridor for wildlife movement connecting landscape values such as ridgelines and creeks.
- It protects regionally important remnant forest communities, including two endangered ecological communities and habitat for two threatened plants.
- The reserve provides habitat for a diversity of wildlife, particularly frogs and reptiles, including 14 threatened animals.

**Aboriginal heritage values**

- Aboriginal sites within the reserve provide evidence of previous occupation, including rock shelters with art (charcoal and pigment drawings, stencils and paintings), grinding grooves, earth mounds with shells, and stone artefacts.

**Historic heritage values**

- A memorial located within the reserve recognises the contribution made by local conservationists in establishing the reserve.
- The reserve retains historical links to early land use practices in the Ourimbah area.

**Recreation and tourism values**

- The reserve provides excellent recreational opportunities to explore, learn and interact with nature, including bushwalking along a section of the Great North Walk.

**Research and education values**

- The diversity of the reserve's natural and cultural values provides opportunities for community education and outdoor learning experiences.
- There is opportunity for regionally significant research into the reserve's reptiles and amphibians.

## **2. Management context**

### **2.1 Legislative and policy framework**

The management of nature reserves in New South Wales is in the context of a legislative and policy framework, primarily the NSW *National Parks and Wildlife Act 1974* (NPW Act) and Regulation, the *Biodiversity Conservation Act 2016* (BC Act) and policies of the National Parks and Wildlife Service (NPWS).

Other legislation, strategies and international agreements may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) may require the assessment of environmental impact of works proposed in this plan. The NSW *Heritage Act 1977* may apply to the excavation of known archaeological sites or sites with potential to contain historical archaeological relics. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may apply in relation to actions that impact matters of national environmental significance, such as migratory and threatened species listed under that Act.

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 in relation to the lands to which the plan relates unless the operations are in accordance with the plan. This plan will also apply to any future additions to Palm Grove Nature Reserve. Should management strategies or works be proposed in future that are not consistent with this plan, an amendment to the plan will be required.

### **2.2 Management purposes and principles**

Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena. Under the Act (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
- provide for appropriate research and monitoring.

The primary purpose of nature reserves is to conserve nature. Nature reserves differ from national parks in that they do not have the provision of visitor use as a management purpose or principle.

### **2.3 Specific management directions**

In addition to the general principles for the management of nature reserves (see Section 2.2), the following specific management directions apply to the management of Palm Grove Nature Reserve:

- Manage the infrastructure on the Great North Walk in the reserve for visitor use in conjunction with the Department of Primary Industries – Lands (DPI – Lands).
- Control priority weed species in the reserve to protect biodiversity values.
- Encourage visitation in the reserve that focuses on nature appreciation, birdwatching, photography and bushwalking.
- Work with neighbouring landholders to encourage the protection and enhancement of native vegetation in the vicinity of the reserve.

### **3. Values**

This plan aims to conserve both natural and cultural values of the reserve. The location, landforms and plant and animal communities of an area have determined how it has been used and valued by both Aboriginal and non-Aboriginal people. 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. To make this plan clear and easy to use, various aspects of natural heritage, cultural heritage, threats and ongoing use are dealt with individually, although these features are interrelated.

#### **3.1 Geology, landscape and hydrology**

Palm Grove Nature Reserve is characterised by ridge lines of the Somersby Plateau. The ridges run in a north-east direction and have moderate to steep slopes with the central ridge, roughly dividing the reserve into east and west sections. The ridges are intersected by and drain to low-lying creek valleys, such as that of Mill and Bumbles creeks. These creeks drain to Ourimbah Creek, a major water source for the Tuggerah Lake system.

The reserve is dominated by two main sedimentary geological units from the Triassic period: Hawkesbury Sandstone and the Clifton subgroup of the Narrabeen Group (Murphy 1993). In the south-west of the reserve, Hawkesbury Sandstone is found in the Somersby Plateau and is characterised by sandstone quartz with some shale deposits. In the north-east of the reserve, the Narrabeen Group consists of sandstones, siltstones and claystone and is found on the ridge lines and valleys (Murphy 1993).

The soils found in the reserve fall into the residual, erosional, colluvial and alluvial soil landscape classifications. All soil types have high erosion potential and low to moderate fertility. It is standard NPWS practice to minimise soil disturbance where possible and to use measures as required to prevent and control erosion.

#### **Issues**

- The soils of the reserve have a naturally high erosion potential.
- Increased frequency of flooding events along Ourimbah Creek resulting from climate change (see Section 4.4) may increase riparian erosion and the spread of weeds along Bumbles Creek and Mill Creek.
- There is evidence of high nutrient runoff draining into Bumbles Creek from roads and properties within the catchment, promoting weed growth in the reserve and impacting on its biodiversity. In addition, there is a high potential for weed propagules to enter the reserve via Bumbles Creek.

#### **Desired outcomes**

- Soil erosion within the reserve is minimised and the health of all creeks is improved, including Ourimbah Creek, Bumbles Creek and Mills Creek.
- The impact on biodiversity of nutrient runoff and the spread of weeds from properties along Kilkenny Road and others within the Mill Creek and Bumbles Creek catchments are minimised.

#### **Management response**

- 3.1.1 Continue bush regeneration programs to stabilise the riparian zone along Ourimbah Creek in conjunction with park neighbours.
- 3.1.2 Undertake a bush regeneration program along Bumbles Creek and in the Kilkenny Road area.



- 3.1.3 Work with relevant agencies such as Central Coast Council and the local community to enable improved management of stormwater from Kilkenny Road properties and other properties into the Bumbles Creek and Mill Creek catchment.

### 3.2 Native plants

Palm Grove Nature Reserve's unique floristic values were initially recognised by local conservationists who lobbied for the reserve's establishment (see Section 3.5). Of these values, remnant rainforest is one of the most important.

A floristic survey of the reserve (Payne 1993) and regional vegetation studies (Bell 2009; Bell & Driscoll 2008) have identified a high native plant diversity of 160 species within 11 distinct vegetation communities (see Table 1), including plants recognised as threatened, rare and regionally significant (see Table 2).

**Table 1: Vegetation communities recorded in the reserve**

Community name	Landscape position	Location
Coastal Ranges Dry Blackbutt Forest	Ridges and slopes	Lower slopes
Coastal Warm Temperate Rainforest <sup>1</sup>	Gullies	Mill and Bumbles creeks
Coastal Wet Gully Forest <sup>1</sup>	Gullies	Northern part of reserve
Exposed Hawkesbury Woodland	Ridges and slopes	Upper slopes and ridges
Hawkesbury Banksia Scrub Woodland	Ridges and slopes	Main north–south ridge
Hawkesbury Peppermint – Apple Forest	Ridges and slopes	Mid to lower slopes and ridges
Riverine Alluvial Rainforest <sup>1</sup>	Gullies	Along Ourimbah Creek
Sandstone Hanging Swamp	Gullies	Adjacent to Bumbles Creek on the Somersby Plateau
Sandstone Ranges Gully Rainforest	Gullies	Northern part of reserve on Somersby Plateau
Sheltered Blue Gum Forest	Ridges and slopes	Eastern side of Main Ridge
Somersby Plateau Forest <sup>2</sup>	Ridges and slopes	Southern end of reserve on Somersby Plateau

<sup>1</sup> Considered part of the Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions Endangered Ecological Community.

<sup>2</sup> Considered part of the Duffys Forest Ecological Community in the Sydney Basin Bioregion Endangered Ecological Community.

Six of the woodland and forest communities are dominated by species adapted to the Hawkesbury sandstone–derived soils and five are warm temperate rainforest communities. The main temperate rainforest community has a distinctive southern aspect and belongs to the *Caldcluvia – Schizomeria* alliance described by Floyd (1990). This is the only known location of this rainforest alliance in the Central Coast Local Government Area (Latham 1999).

As indicated in Table 1, the reserve supports vegetation considered to be part of two endangered ecological communities listed under the BC Act: Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions; and Duffys Forest Ecological Community in the Sydney Basin Bioregion.

The reserve also protects several significant plant species listed in Table 2. Four of these species are considered regionally significant as they are at the southern limit of their distribution; and three are restricted in their distribution in the region. Of special conservation

significance is the magenta lilly pilly (*Syzygium paniculatum*) found in the Riverine Alluvial Rainforest along the edges of Ourimbah Creek in the northern part of the reserve. Two remnant red cedar trees (*Toona ciliata*) growing near Ourimbah Creek Road are of historical significance because they reflect the past forestry use of the Ourimbah area (see Section 3.5).

**Table 2: Significant plant species recorded in the reserve**

Common name	Scientific name	BC Act status	EPBC Act status
<b>Threatened species</b>			
Bristly shield fern	<i>Lastreopsis hispida</i>	Endangered	–
Magenta lilly pilly	<i>Syzygium paniculatum</i>	Endangered	Vulnerable
<b>Otherwise significant species</b>		<b>Description</b>	
	<i>Arthropteris beckleri</i>	Restricted regional distribution+	
Soft corkwood	<i>Caldcluvia paniculosa</i>	Southern limit of distribution+	
	<i>Callistemon shiressii</i>	Rare	
Yaroong	<i>Cissus sterculiifolia</i>	Restricted regional distribution+	
	<i>Hymenophyllum australe</i>	Restricted regional distribution+	
	<i>Parsonsia velutina</i>	Southern limit of distribution+	
Native guava	<i>Rhodomyrtus psidioides</i>	Southern limit of distribution+	
Small supplejack	<i>Ripogonum fawcettianum</i>	Southern limit of distribution+	

+ Regionally significant according to Payne (1993) and/or Bell and Driscoll (2008).

BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act.

Strategies for the recovery of threatened plant species, populations and ecological communities have been set out in the statewide *Biodiversity Conservation Program* (formerly known as the *Threatened Species Priorities Action Statement* [DECC 2007]). These actions are currently prioritised and implemented through the *Saving our Species* program, which aims to maximise the number of threatened species that can be secured in the wild in New South Wales for 100 years (OEH 2013b).

A national recovery plan has been prepared for the magenta lilly pilly (OEH 2012a) and this provides direction for the management of the species in the reserve and surrounding area.

### Issues

- The main threats to vegetation communities are competition from weeds and possible infection from myrtle rust (see Section 4.1), inappropriate fire regimes (see Section 4.2) and further isolation and fragmentation of habitat (see Section 4.3).

### Desired outcomes

- Negative impacts on threatened species and ecological communities are minimised.
- The habitat and populations of threatened plant species are protected and maintained.

### Management response

- 3.2.1 Implement relevant strategies in the *Biodiversity Conservation Program* and recovery plans for threatened species, populations and ecological communities present in the reserve.
- 3.2.2 Encourage research into the reserve's threatened species and communities.

### 3.3 Native animals

Information about the reserve's native animals is based on surveys targeting small mammals, reptiles and frogs undertaken since the reserve's reservation in 2007, and opportunistic sightings recorded in BioNet.

A total of 130 animal species consisting of 81 birds, 27 reptiles, 13 amphibians and nine mammals have been recorded in the reserve. Of these, 20 are of conservation significance (see Table 3), including 14 listed threatened species and six species which are considered regionally significant because they reach their distributional limit within the reserve.

**Table 3: Significant animal species recorded in the reserve**

Common name	Scientific name	BC Act status or other significance
<b>Frogs</b>		
Giant barred frog	<i>Mixophyes iteratus</i>	Endangered <sup>E</sup>
Green and golden bell frog	<i>Litoria aurea</i>	Endangered <sup>V</sup>
Green-thighed frog	<i>Litoria brevipalmata</i>	Vulnerable
Red-backed toadlet	<i>Pseudophryne coriacea</i>	Southern limit of distribution
Red-eyed tree frog	<i>Litoria chloris</i>	Southern limit of distribution
Stuttering frog	<i>Mixophyes balbus</i>	Endangered <sup>V</sup>
Whirring tree frog	<i>Litoria revelata</i>	Southern limit of distribution
<b>Reptiles</b>		
Broad-tailed gecko	<i>Phyllurus platurus</i>	Northern limit of distribution
Land mullet	<i>Bellatorias major</i>	Southern limit of distribution
Pale-headed snake	<i>Hoplocephalus bitorquatus</i>	Vulnerable
Southern angle-headed dragon	<i>Hypsilurus spinipes</i>	Southern limit of distribution
<b>Birds</b>		
Gang-gang cockatoo	<i>Callocephalon fimbriatum</i>	Vulnerable
Glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	Vulnerable
Masked owl	<i>Tyto novaehollandiae</i>	Vulnerable
Powerful owl	<i>Ninox strenua</i>	Vulnerable
Varied sittella	<i>Daphoenositta chrysoptera</i>	Vulnerable
<b>Mammals</b>		
Eastern freetail-bat	<i>Mormopterus norfolkensis</i>	Vulnerable
Greater broad-nosed bat	<i>Scoteanax rueppellii</i>	Vulnerable
Southern myotis	<i>Myotis macropus</i>	Vulnerable
Spotted-tailed quoll	<i>Dasyurus maculatus</i>	Vulnerable <sup>E</sup>

<sup>E, V</sup> Denotes species listed under Environmental Protection and Biodiversity Conservation Act as endangered or vulnerable, respectively.

BC Act = Biodiversity Conservation Act.

Apart from threatened species, the reserve protects a high diversity of reptiles and amphibians (herpetofauna), which is considered to have significant regional conservation value (Clulow 2008).

The stuttering frog is considered particularly significant because it is endangered in New South Wales and vulnerable nationally. A targeted survey for this stream-dwelling frog in 2009 recorded few individuals, and further investigation was required to determine the population's viability (Clulow 2009). A detailed population survey, which included swabbing for amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), was undertaken in 2012–13. No mature or juvenile frogs tested positively for chytrid, however the fungus was found in the tadpole population. The study confirmed the population was small, isolated and vulnerable to extinction (Clulow 2013).

The reserve provides good habitat connectivity between Brisbane Water National Park, Jiliby State Conservation Area and Ourimbah State Forest. This green corridor acts as an important habitat pathway facilitating movement of native animals, such as spotted-tailed quolls and common mammals, through the area.

As for threatened plants, strategies for the recovery of threatened animal species and populations have been set out in the statewide *Biodiversity Conservation Program* (formerly known as the *Threatened Species Priorities Action Statement* [DECC 2007]) and are currently prioritised and implemented through the *Saving our Species* program. Management of powerful and masked owls in the reserve is guided by the *Recovery Plan for the Large Forest Owls* (DEC 2006).

Management of threatened species without priority recovery actions will focus on minimising the impacts of threats and key threatening processes, including fragmentation and loss of habitat, competition from pest species and inappropriate fire regimes.

### **Issues**

- The main threats to native animals are degradation of habitat values caused by weed invasion, competition or predation by pest animals, inappropriate fire regimes, and habitat isolation and fragmentation (see Sections 4.1, 4.2 and 4.3).
- The population of the endangered stuttering frog within the reserve is at risk of extinction due to its small population size, isolation and chytrid fungus infection. As a stream-dwelling species, reduced water quality due to polluted runoff from upstream sources is a significant impact (see Section 3.1).
- Amphibians are susceptible to disease and pathogens.

### **Desired outcomes**

- The habitat and populations of all threatened animals species are protected, maintained or improved.
- Negative impacts on threatened species are minimised.

### **Management response**

- 3.3.1 Implement relevant strategies in the *Biodiversity Conservation Program* and recovery plans for threatened species and populations present in the reserve.
- 3.3.2 Develop and implement a program to monitor stuttering frogs in the reserve.
- 3.3.3 Implement effective amphibian hygiene protocols as required.
- 3.3.4 Encourage research into the reserve's wildlife, particularly its threatened species.

### **3.4 Aboriginal heritage**

The reserve lies in a culturally significant landscape between the coast and inland within the traditional Country of the Guringai and Darkinjung peoples. 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 through ongoing cultural practice and ceremony. 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.

Several Aboriginal sites have been found in the reserve, and others are likely to exist. Aboriginal occupation is evident through features such as rock shelters with art (charcoal and pigment drawings, stencils and paintings), grinding grooves, earth mounds with shells, and stone artefacts. Some of these sites are connected with ceremony. Participation in ceremony is important in strengthening and maintaining Aboriginal culture and the fulfilment of cultural obligations to the Aboriginal community.

Although the NSW Government has legal responsibility for the protection of Aboriginal sites and places, NPWS acknowledges the right of Aboriginal people to make decisions about their own heritage. Aboriginal communities will be consulted and involved in managing Aboriginal sites, places and related issues; and in promoting and presenting Aboriginal culture and history.

The reserve is in the Darkinjung Local Aboriginal Land Council area. Consultation and liaison with the council and other relevant Aboriginal community members and groups guides ongoing management of these sites.

#### **Issues**

- Aboriginal heritage is subject to natural erosion and impact from human activities.

#### **Desired outcomes**

- Aboriginal places and values are identified and protected.
- Aboriginal people are involved in managing Aboriginal cultural values in the reserve and are encouraged to take part in cultural practice.
- Impacts on Aboriginal heritage values are minimised.
- Understanding of the cultural values of the park is improved.

#### **Management response**

- 3.4.1 Continue to consult and involve the Darkinjung Local Aboriginal Land Council and other relevant Aboriginal community organisations and custodial families in the management of their Country, including the management of Aboriginal sites, places and cultural and natural values. This includes the continuation of cultural practices such as ceremony.
- 3.4.2 Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact Aboriginal sites or values.
- 3.4.3 Encourage further research into the Aboriginal cultural heritage values of the reserve in collaboration with the Darkinjung Local Aboriginal Land Council and other relevant Aboriginal community organisations and custodial families.

### 3.5 Historic heritage

Heritage places and landscapes are made up of living stories as well as connections to the past that individuals and communities have inherited and wish to conserve for current and future generations, and can include natural resources, objects, customs and traditions. Cultural heritage comprises places and items that may have historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. NPWS conserves the significant heritage features of NSW parks and reserves.

There are no recorded historic heritage items in the reserve, however, the reserve has strong connections to early settlement and land use practices.

The Ourimbah Creek area has evidence of European settlement dating from around 1820. The main industry was timber harvesting with the highly prized red cedar, turpentine (*Syncarpia glomulifera*) and eucalypt species harvested for the construction of houses, and supply of railway sleepers and mine props (Jones & Evers 1988). Tree stumps with springboard marks and snig trails provide evidence of early timber harvesting practices in the reserve.

There are anecdotal reports that the remains of the Jaques family sawmill and school house are located in the reserve on the flat land beside Ourimbah Creek Road. This area is heavily infested with lantana and no structural remains have been located.

An important part of the reserve's history lies in the story of its reservation. Local conservationists, Andrew Sourry OAM and Lois Sourry, who were founding members of the National Parks Association (formed in 1957), campaigned for the protection of the area and many other parks and reserves on the NSW Central Coast. A plaque and sandstone boulder, acknowledging their contribution to the recognition of the reserve's values and its subsequent establishment, is located in the northern section of the reserve.

#### Issues

- Historic heritage items in the reserve are yet to be recorded.

#### Desired outcomes

- Negative impacts on historic heritage values are minimised.
- Understanding of the cultural values of the reserve is improved.
- Significant historic features are appropriately identified, recorded, conserved and managed.

#### Management response

- 3.5.1 Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact historic sites and places.
- 3.5.2 Record and assess historic items and manage them in accordance with their assessed level of significance.

### 3.6 Visitor use

NPWS parks and reserves provide a range of recreational opportunities. NPWS aims to ensure that visitors enjoy, experience and appreciate reserves while natural and cultural values are conserved and protected.

The reserve provides opportunities for visitation in a natural hinterland setting which includes threatened lowland rainforest vegetation and creeks. It generally experiences low to moderate levels of visitation mainly focused on nature appreciation, birdwatching, photography and bushwalking. Most visitor activity in the reserve is concentrated along the Great North Walk.

The reserve encompasses a 2.8-kilometre section of the 250-kilometre Great North Walk (see Figure 1). The track is mainly used for day walks, although a small basic camping area with a bush fireplace (no other facilities) is located at the northern end of the main ridge line in the reserve. Track infrastructure for the Great North Walk is managed in conjunction with DPI Lands. The Great North Walk is accessible for walkers via Kilkenny Road in the south and Ourimbah Creek Road in the north. The last 250-metre section of Kilkenny Road to the park boundary is not suitable for vehicles. People accessing the park from the south via Kilkenny Road have to walk the last section to the park.

Horse riding is a popular recreational activity that has cultural associations for many Australians. The NPWS *Strategic Directions for Horse Riding in NSW National Parks* (OEH 2012c) provides a framework to improve riding opportunities in eight priority regions in New South Wales, including the Hunter Central Coast Branch. Horse riding opportunities in numerous national parks in the branch are being progressed in accordance with the *Central Coast Hunter Region Horse Riding Work Plan* (OEH 2013a). There is no public vehicle access in the reserve and horse riding is not permitted in this reserve.

Cycling is also not permitted in the reserve due to its small size and a lack of connectivity of the reserve's only management trail to other trails. In accordance with NPWS policy and the *Sustainable Mountain Biking Strategy* (OEH 2011b) cycling is not permitted on walking tracks.

Organised activities and commercial activities undertaken in the reserve require a consent or licence under the NPW Act or Regulation.

Large-scale commercial activities are restricted in nature reserves, and a lease or licence will be granted for activities in the reserve only if consistent with the reserve's management principles (see Section 2.2).

### **Issues**

- No formal agreement exists between NPWS and DPI Lands regarding management of the Great North Walk. DPI Lands maintains directional signage along the Great North Walk.
- The bush fireplace located at the Great North Walk campsite at the end of Palm Grove Trail is a potential fire hazard.
- Collection of firewood from the reserve for use in the Great North Walk campsite results in habitat loss, especially hollow logs and dead trees. The removal of dead wood and dead trees is listed as a key threatening process under the BC Act (NSW SC 2003).

### **Desired outcomes**

- Visitor use is appropriate and ecologically sustainable, with negative impacts on reserve values minimised.
- Visitor opportunities encourage appreciation and awareness of the reserve's values and their conservation.
- Facilities and activities are planned and managed to provide a satisfying visitor experience and minimise impacts.
- A formal agreement is established with DPI Lands regarding management of the Great North Walk.

### **Management response**

- 3.6.1 Provide and promote opportunities for nature appreciation, birdwatching, photography and bushwalking in the reserve.
- 3.6.2 Develop a memorandum of understanding with DPI Lands outlining management responsibilities for the section of the Great North Walk within the reserve, including

management of directional signage and the removal and rehabilitation of the bush fireplace.

3.6.3 Maintain the remote bush campsite.

3.6.4 Negotiate removal and rehabilitation of the bush fireplace located at the Great North Walk campsite with DPI Lands, and encourage walkers to use portable fuel stoves for cooking.

### **3.7 Information and education**

Providing information for visitors assists the protection of natural and cultural heritage, promotes support for conservation, and increases visitors' enjoyment and satisfaction.

Park identification signs and regulatory symbols have been installed in the reserve, identifying the reserve boundary and pedestrian access points off Kilkenny Road and Ourimbah Creek Road.

To enhance the visitor experience, NPWS has installed five interpretive panels along the Great North Walk within the reserve. These panels help orientate visitors and provide them with information on the natural and cultural values of the reserve. DPI Lands maintains directional signage along the Great North Walk.

The reserve is promoted through the NPWS website, the NPWS Discovery program, the track information for the Great North Walk, and the DPI Lands website.

#### **Issues**

- Reserve information must be current and readily available to visitors.

#### **Desired outcomes**

- There is community understanding and appreciation of the reserve's natural and cultural values.
- Visitors are aware of the reserve's recreational opportunities and can locate facilities easily.
- The reserve is a useful educational resource for local schools and community organisations.

#### **Management response**

3.7.1 Support and assist educational use of the reserve by schools, community groups and individuals.

3.7.2 Maintain existing interpretive signs along the Great North Walk, and work with DPI Lands on any improvements to track signage.



## 4. Threats

### 4.1 Pests

Pest species are plants and animals that have negative environmental, economic and social impacts; commonly they are introduced species. Pests can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment values, scenic values and reserve neighbours. The significant pest species occurring in Palm Grove Nature Reserve are listed in Table 4.

**Table 4: Weed and pest animals recorded in the reserve**

Common name	Scientific name	Comment
<b>Weeds</b>		
Blackberry* #	<i>Rubus fruticosus</i> agg.	Isolated infestations restricted to a small geographic area of the reserve; localised impacts on biodiversity
Crofton weed	<i>Ageratina adenophora</i>	Isolated infestations restricted to a small geographic area of the reserve; impacts on endangered ecological community and threatened animals
Exotic vines° Japanese honeysuckle	<i>Lonicera japonica</i>	Isolated infestations restricted to a small geographic area of the reserve; localised impacts on biodiversity
Madeira vine* # Cape ivy morning glory	<i>Anredera cordifolia</i> <i>Delairea odorata</i> <i>Ipomoea indica</i>	
Lantana* #°>	<i>Lantana camara</i>	Scattered infestations throughout the reserve; impacts on endangered ecological community and threatened species
Privet°>	<i>Ligustrum sinense</i>	Scattered infestations throughout the reserve; localised impacts on biodiversity
Wild tobacco	<i>Solanum mauritianum</i>	Isolated infestations restricted to a small geographic area of the reserve; localised impacts on biodiversity
<b>Pest animals</b>		
Cat°>	<i>Felis catus</i>	Scattered populations throughout reserve; impacts on native animals
European red fox ~°>	<i>Vulpes vulpes</i>	Scattered populations throughout reserve; impacts on native animals
Wild dog / feral dog ~°	<i>Canis lupus familiaris</i>	Scattered populations throughout the reserve; impacts on native animals and neighbouring stock

\* Declared Weed of National Significance.

# Identified as a state level priority weed under the *Biosecurity Act 2015*

~ Declared pest under the *Local Land Services Act 2013*.

° Key threatening process under the Biodiversity Conservation Act.

> Key threatening process under the Commonwealth Environmental Planning and Assessment Act.

NPWS prepares regional pest management strategies that identify pest species across that region's reserves and priorities for control, including actions listed in the *Biodiversity Conservation Program*, threat abatement plans, wild dog management plans and other strategies such as the *NSW Biodiversity Priorities for Widespread Weeds* (NSW DPI & OEH 2011) and the *NSW Biosecurity Strategy 2013–2021* (DPI 2013).

The NPWS regional pest management (OEH 2012b) identifies the current pest species and priority programs for this reserve. The overriding objective of the pest management strategy is to minimise adverse impacts of introduced species on biodiversity and other reserve and community values while complying with legislative responsibilities. The strategy also identifies where other site- or pest-specific plans or strategies need to be developed to provide a more detailed approach.

## Weeds

Weeds in the reserve occur predominantly as scattered populations or isolated infestations. Infestations tend to be in areas that have been disturbed through previous land use activities, along road and powerline access ways, and along the interface with disturbed or cleared areas near the reserve.

The northern section of the reserve adjacent to Ourimbah Creek Road has been extensively disturbed through clearing and grazing. An area of the reserve (Lot 12 DP755224), which was previously leased for stock grazing but destocked following reservation, is of particular concern. It has a high density of weeds, predominantly introduced grasses, exotic vines (including Madeira vine) and privet, and requires active regeneration.

Control of lantana and crofton weed is a critical priority in the NPWS regional pest management strategy due to its impact on biodiversity values, especially the Lowland Rainforest Endangered Ecological Community and threatened magenta lilly pilli (see Section 3.2) and, in the case of lantana, threatened animals including the endangered stuttering frog (see Section 3.3). A coordinated weed control program for these species has been implemented in the reserve using a combination of chemical, hand removal and biological control techniques. Control programs for other species are constrained due to a lack of available resources. NPWS will investigate the possibility of forming a volunteer group to assist in the reserve's weed control programs.

Lantana is a large flowering shrub native to Central and South America. It is a vigorous invader of disturbed areas, often forming dense thickets. It is spread mainly by birds and thrives in warm environments with high rainfall, where it grows along forest edges, penetrates disturbed rainforest and invades open eucalypt woodlands and pastures. Lantana has been identified as a state level priority weed (Greater Sydney LLS 2017) in New South Wales and is also listed as a Weed of National Significance (Australian Weeds Committee 2012). A national plan has been developed which identifies the research, management and other actions needed to ensure the long-term survival of native species and ecological communities at risk from lantana (Biosecurity Qld 2010).

Scattered infestations of lantana occur throughout Palm Grove Nature Reserve, especially around the reserve boundary and in areas that have been previously disturbed. The three main priority areas for control of lantana are near Kilkenny Road, Ourimbah Creek Road and the Divine Retreat Centre. Weed control work has been occurring at two of the sites since 2010.

In November 2012, the South American leaf-feeding beetle (*Plectonycha correntina*) was introduced as a biological control for Madeira vine in the reserve. The effectiveness of this program is being monitored.

The *Biosecurity Act 2015* and regulations provide specific legal requirements for the prevention, eradication or containment of state level priority weeds. These requirements apply equally to both public and privately owned land. A regional strategic weed management plan prepared under the Biosecurity Act identifies those pest plants that are being prioritised for management action, investment and compliance effort within the Greater Sydney Local Land Services region (Greater Sydney LLS 2017). These priorities will be implemented via the relevant NPWS pest management strategy.

## **Pest animals**

Pest animals, in particular the European red fox and feral dogs, have been identified as having an impact on biodiversity values of the reserve. Feral dogs also impact neighbouring domestic stock.

Wild dogs, including dingos (*Canis lupus dingo*), feral dogs and their hybrids, are a declared pest for the purposes of the *Local Land Services Act 2013* due to their impacts on livestock. NPWS has a statutory obligation to control wild dogs on its estate. Wild dog management in the reserve is undertaken through a strategic wild dog control program conducted annually, as well as a reactive program following reports from reserve neighbours of threats to and loss of domestic stock. Control methods include ground and surface baiting, trapping and shooting and are undertaken in accordance with the cross-tenure *Cumberland North Wild Dog Management Plan: 2013–2016* (Cumberland LHPA 2013).

Foxes occur in the reserve and surrounding area including the semirural landscape adjacent to Ourimbah Creek. Native species most likely to be impacted in the reserve include small mammals, birds and frogs. Fox predation is a key threatening process under the BC Act (NSW SC 1998) and a threat abatement plan identifies priority sites across New South Wales to protect biodiversity. The reserve is not listed as a statewide priority site for fox control. Foxes are, however, controlled in the reserve through the wild dog baiting program which is undertaken annually using bait stations along Palm Grove Trail. This program is conducted in conjunction with a biannual community fox baiting program undertaken on private properties in the Ourimbah Creek valley.

## **Myrtle rust**

Myrtle rust is a plant disease caused by the exotic fungus *Uredo rangellii*. It was first detected on the NSW Central Coast in 2010 and has established through coastal New South Wales from the Shoalhaven River north into Queensland. It is believed to pose a threat to biological values and be widely distributed in the Central Coast Local Government Area.

Myrtle rust was first identified within the reserve in December 2010, affecting mainly scrub turpentine (*Rhodamnia rubescens*). Other Myrtaceae genera represented from the reserve include *Acmena*, *Angophora*, *Callistemon*, *Eucalyptus*, *Rhodomyrtus*, *Syncarpia*, *Syzygium* and *Tristaniopsis*.

The *Management Plan for Myrtle Rust on the National Parks Estate* (OEH 2011a) outlines how myrtle rust will be managed on national park estate and incorporates strategies to limit the spread of myrtle rust and minimise impacts to threatened species and ecological communities.

The scrub turpentine infected with myrtle rust in the reserve is predominantly along the edges of the Great North Walk. Heavily infected plants were treated with an antifungal agent in January 2011. Subsequent observations indicate that the myrtle rust infection is not killing the plants, but is affecting their ability to flower and fruit.

The risk of infection to other Myrtaceae in the reserve is unknown and needs to be monitored, especially on threatened species like the magenta lilly pilli.

## **Desired outcomes**

- Pest plants and animals are controlled and where possible eliminated.
- Negative impacts of introduced species on reserve values are minimised.
- Negative impacts of pest animals on neighbours are minimised.

## Management response

- 4.1.1 Continue weed control and pest animal control programs as outlined in pest management strategies relevant to the park. Priority will be given where weeds are impacting biodiversity values, especially threatened ecological communities and threatened species, and to continuing current control programs for wild dogs and foxes.
- 4.1.2 Survey the reserve to determine the presence and extent of pest animals and identify biodiversity most at risk.
- 4.1.3 Seek the cooperation of neighbours in implementing weed and pest control programs. Undertake control in cooperation with Greater Sydney Local Land Services, Central Coast Council and Forestry Corporation of NSW.
- 4.1.4 Monitor state level and regional level priority weeds and significant environmental weeds and their impacts. Treat any new outbreaks where possible.
- 4.1.5 Monitor the effectiveness of biological control on Madeira vine in the reserve.
- 4.1.6 Explore opportunities for supporting the formation of a bushcare group for Palm Grove Nature Reserve.
- 4.1.7 Manage myrtle rust on the reserve in accordance with the *Management Plan for Myrtle Rust on the National Parks Estate*. Practice appropriate hygiene protocols during bush regeneration and general maintenance work to reduce the risk of myrtle rust infection and other potential pathogens.
- 4.1.8 Survey and monitor threatened species, especially magenta lilly pilly, for myrtle rust infection and treat it as required.

## 4.2 Fire

The primary fire management objectives of NPWS are to protect life, property and community assets and cultural heritage from the adverse impacts of fire, while also managing fire regimes in parks to maintain and enhance biodiversity. NPWS also assists in developing fire management practices that contribute to conserving biodiversity and cultural heritage across the landscape, and implements cooperative and coordinated fire management arrangements with other fire authorities, neighbours and the community (OEH 2013c).

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 the loss of particular plant and animal species and communities, and high frequency fires have been listed as a key threatening process under the BC Act (NSW SC 2000b). Rainforest communities are at particular risk from fire.

The reserve's fire history is only partially known. The last recorded wildfire occurred in October 1994 and burned approximately half the reserve, west of the main ridge line.

The reserve's fire management strategy (NPWS 2009) defines the fire management approach for the reserve and outlines key assets within and adjoining the reserve (including sites of natural and cultural heritage value), fire management zones and fire control advantages such as management trails, asset protection zones and water supply points. It also contains fire regime guidelines for conservation of the reserve's vegetation communities and native animals.

The strategy classifies the majority of the reserve as land management zones, with the objective of conserving biodiversity and protecting cultural assets. The strategy also identifies an asset protection zone (an area in which fuels are maintained in the low to moderate range)

along Palm Grove Trail where it coincides with the reserve's boundary near the Divine Retreat Centre.

NPWS maintains cooperative arrangements with surrounding landowners and the Rural Fire Service and is actively involved with the Gosford and The Lakes bush fire management committees. Cooperative arrangements include fire planning, fuel management and information sharing. Hazard reduction programs, ecological burning proposals and fire trail works are submitted annually to the committees.

### **Desired outcomes**

- Negative impacts of fire on life, property and the environment are minimised.
- The potential for spread of bushfires on, from, or into the reserve is minimised.
- Fire regimes are appropriate for conservation of native plant and animal communities.
- Fire is excluded from the Lowland Rainforest Endangered Ecological Community.

### **Management response**

- 4.2.1 Implement the reserve fire management strategy for Palm Grove Nature Reserve including the suppression of unplanned fires, the rehabilitation of areas as soon as practical after a fire, and the maintenance of biodiversity, including the exclusion of fire from the Lowland Rainforest Endangered Ecological Community.
- 4.2.2 Continue to be involved in the Gosford and The Lakes bush fire management committees and maintain cooperative arrangements with local Rural Fire Service brigades, other fire authorities and landowners in regard to fuel management and fire suppression.
- 4.2.3 Encourage or undertake research on the fire ecology of the reserve's native plants.

## **4.3 Isolation and fragmentation**

The area surrounding Palm Grove Nature Reserve is partially cleared, which has resulted in significant loss of biodiversity and fragmentation of habitat. The reserve itself is relatively small, isolated and subject to edge effects, making it more vulnerable to disturbance. Adjacent land uses place pressures on the reserve through the incursion of non-native plant and animal species, stormwater drainage, encroachments and unauthorised recreational activities.

Cooperative arrangements with neighbours are particularly important for the management of access, fire, weeds and pest animals. Cooperative wild dog, fox and weed control programs are undertaken in the reserve (see Section 4.1) and vehicle access for management purposes is along Palm Grove Trail (see Section 5.1).

Additionally, long-term conservation of biodiversity depends on the protection, enhancement and connection of remaining habitat across the landscape, including vegetation remnants on both public and private lands. Habitat connectivity to the reserve is enhanced through a voluntary conservation agreement over private property adjoining the eastern edge of the reserve.

A council road reserve crosses the reserve and roughly follows Palm Grove Trail (see Figure 1). This trail only accesses the park and, north of the campground, the road reserve is fully vegetated and not 'made' (see Section 5.1). It would be desirable to have this road reserve incorporated into the reserve.

### **Desired outcomes**

- Negative impacts of isolation and fragmentation are reduced.

## Management response

- 4.3.1 Maintain cooperative arrangements with nearby landholders regarding access, fire and pest species management.
- 4.3.2 Encourage protection and enhancement of native vegetation on public and private land in the vicinity of the reserve through conservation programs and the land use planning initiatives of Central Coast Council.
- 4.3.3 Work with Central Coast Council to add the council road reserve that roughly follows Palm Grove Trail to the reserve.

## 4.4 Climate change

Human-induced climate change is listed as a key threatening process under the BC Act (NSW SC 2000a) and the associated loss of habitat is listed under the EPBC Act (TSSC 2001). The latest information on projected changes to climate are from the NSW and ACT Regional Climate Modelling (NARClm) project (OEH 2014). The climate projections for 2020–2039 are described as ‘near future’, and projections for 2060–2079 are described as ‘far future’. The snapshot shown in Table 5 is for the Central Coast Region which includes Palm Grove Nature Reserve (OEH 2014).

**Table 5: Central Coast climate change snapshot**

<b>Projected temperature changes</b>	
Maximum temperatures are projected to increase in the near future by 0.3–1.0°C	Maximum temperatures are projected to increase in the far future by 1.4–2.5°C
Minimum temperatures are projected to increase in the near future by 0.4–0.8°C	Minimum temperatures are projected to increase in the far future by 1.4–2.5°C
The number of hot days (>35°C) will increase	The number of cold nights (<2°C) will decrease
<b>Projected rainfall changes</b>	
Rainfall is projected to decrease in spring and winter	Rainfall is projected to increase in summer and autumn
<b>Projected Forest Fire Danger Index changes</b>	
Average fire weather is projected to increase in summer and spring	Severe fire weather days are projected to increase in summer and spring

Source: OEH 2014.

The projected increases in temperature, number of hot days and severe fire weather days (OEH 2014) are likely to influence bushfire frequency and intensity across the Central Coast Region, and result in an earlier start to the bushfire season (DECCW 2010). Higher rainfalls in summer and autumn are likely to increase runoff at these times of year, resulting in more frequent flooding on Ourimbah Creek and greater soil erosion caused by stormwater entering Bumbles Creek (see Section 3.1).

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

these other threats will help reduce the severity of the effects of climate change on the reserve (see Sections 4.1, 4.2 and 4.3).

**Desired outcomes**

- The effects of climate change on natural systems are reduced.

**Management response**

- 4.4.1 Continue existing fire, pest and weed management programs to increase the reserve's ability to cope with future disturbances, including climate change.

## **5. Management operations and other uses**

### **5.1 Management facilities and operations**

There is limited vehicle access for management operations in the reserve. Ourimbah Creek Road traverses the northernmost part of the reserve, isolating a small strip of reserve along Ourimbah Creek. A council road reserve bisects Palm Grove Nature Reserve. Some sections of this road reserve are fully vegetated (i.e. have not been 'made') and do not coincide with a constructed road or trail.

The only vehicle access for NPWS management to the reserve is currently through the privately operated Divine Retreat Centre (Lot 4, DP821109), off Hensons Road, Somersby. The access road through Divine Retreat Centre initially follows the council road reserve and then traverses a section of private property around an archery area. Divine Retreat Centre permits NPWS to access the reserve through this section of private property around the archery area. The trail (Palm Grove Trail) then enters the reserve along an asset protection zone on the reserve's boundary, then runs roughly parallel to the council road reserve until the campground located on the Great North Walk (see Figure 1). While the council road reserve extends beyond this point to the northern boundary of the park where it joins Ourimbah Creek Road, there is no vehicle access past the campground (see Figure 1). Palm Grove Trail is the only management trail in the reserve; it provides access for management vehicles undertaking park operations such as pest control and maintenance works.

Disused snig trails provide walking access to the reserve through private property on Ourimbah Creek Road. These trails are not suitable for vehicles but may have potential for fire management purposes and have been recorded and mapped in the reserve's fire management strategy (NPWS 2009).

Some park identification signs, regulatory symbols and interpretation panels have been installed in the reserve. However, parts of the reserve boundary are unmarked and unfenced. In some places the boundary is difficult to determine on the ground, and a survey is required. There is at least one boundary encroachment on the eastern side of the reserve, with a structure partly constructed within the reserve. This encroachment occurred before the establishment of the reserve.

In October 2008 a give-and-take boundary fencing agreement was negotiated between NPWS and the owner of the adjacent property to protect the riparian area of Ourimbah Creek from grazing. The agreement will expire when the property changes ownership.

#### **Issues**

- The number and extent of boundary encroachments are unknown.
- The boundary of the reserve requires clear definition.
- Access to Palm Grove Trail is reliant on an agreement with neighbouring property owners.

#### **Desired outcomes**

- Management trails are maintained and support management operations.
- The reserve boundary is easily identified and free from encroachments.
- NPWS has secure legal access to Palm Grove Trail for management purposes.

#### **Management response**

- 5.1.1 Investigate securing permanent legal access to Palm Grove Trail with adjoining landholders.



- 5.1.2 Survey and mark reserve boundaries to support management, especially in the identification of existing encroachments and prevention of future encroachments.
- 5.1.3 Manage the give-and-take boundary fencing agreement in accordance with NPWS policy.
- 5.1.4 Manage any boundary encroachments under NPWS policy.

## **5.2 Non-NPWS uses and operations**

### **Transmission lines**

A high-voltage electricity transmission line traverses the western section of the reserve (see Figure 1). This is covered by a formal easement granted under section 153 of the NPW Act.

Ausgrid manages two lower voltage powerlines which traverse the reserve adjacent to Kilkenny Road in the south and Ourimbah Creek Road in the north (see Figure 1). These powerlines are not covered by a formal easement. However, in accordance with the *Electricity Supply Act 1995*, a network operator can operate and use the existing powerlines whether or not there is a formal easement in place.

Transmission lines and associated management generate impacts from clearing or trimming of vegetation, use of herbicides and the maintenance of access trails, as well as the visual impact of the lines and towers. These impacts are minimised through a statewide agreement between TransGrid and NPWS for inspection and maintenance of TransGrid's lines and associated infrastructure. Ausgrid's powerlines are covered by a consent under the NPW Regulation enabling inspection, maintenance and emergency works in accordance with an agreed protocol that also aims to minimise impacts on reserve values.

### **Issues**

- Powerline easements have fragmented the reserve.

### **Desired outcomes**

- Non-NPWS related uses and activities are managed to minimise impacts on reserve values and infrastructure.

### **Management response**

- 5.2.1 Continue to liaise with TransGrid regarding access and maintenance needs in accordance with the agreement.
- 5.2.2 Continue to liaise with Ausgrid regarding access and maintenance needs in accordance with the protocol.

## 6. Implementation

This plan of management establishes a scheme of operations for the Palm Grove Nature Reserve. Implementation of this plan will be undertaken within the NPWS annual work program. Activities to be implemented are listed in Table 6. Priorities are allocated against each activity as follows:

- **High priority** activities are imperative to achieve the objectives and desired outcomes of this plan, and must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.
- **Medium priority** activities are necessary to achieve the objectives and desired outcomes of this plan but they are not urgent.
- **Low priority** activities are desirable to achieve the objectives and desired outcomes but can wait until resources become available.
- **Ongoing** activities are undertaken on an annual basis or in response to an issue that arises.

This plan of management does not have a specific term and will stay in force, and apply to any additions to Palm Grove Nature Reserve, until amended or replaced in accordance with the NPW Act.

**Table 6: List of management responses**

Plan ref.	Management response	Priority
<b>3.1</b>	<b>Geology, landscape and hydrology</b>	
3.1.1	Continue bush regeneration programs to stabilise the riparian zone along Ourimbah Creek in conjunction with park neighbours.	Ongoing
3.1.2	Undertake a bush regeneration program along Bumbles Creek and the Kilkenny Road area.	Low
3.1.3	Work with relevant agencies such as Central Coast Council and the local community to enable improved management of stormwater from Kilkenny Road properties and other properties into the Bumbles Creek and Mill Creek catchments.	Medium
<b>3.2</b>	<b>Native plants</b>	
3.2.1	Implement relevant strategies in the <i>Biodiversity Conservation Program</i> and recovery plans for threatened species, populations and ecological communities present in the reserve.	Ongoing
3.2.2	Encourage research into the reserve's threatened species and communities.	Medium
<b>3.3</b>	<b>Native animals</b>	
3.3.1	Implement relevant strategies in the <i>Biodiversity Conservation Program</i> and recovery plans for threatened species and populations present in the reserve.	Ongoing
3.3.2	Develop and implement a program to monitor stuttering frogs in the reserve.	Medium
3.3.3	Implement effective amphibian hygiene protocols as required.	Ongoing
3.3.4	Encourage research into the reserve's wildlife, particularly its threatened species.	Medium

<b>Plan ref.</b>	<b>Management response</b>	<b>Priority</b>
<b>3.4</b>	<b>Aboriginal heritage</b>	
3.4.1	Continue to consult and involve the Darkinjung Local Aboriginal Land Council and other relevant Aboriginal community organisations and custodial families in the management of their Country, including the management of Aboriginal sites, places and cultural and natural values. This includes the continuation of cultural practices such as ceremony.	Ongoing
3.4.2	Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact Aboriginal sites or values.	Ongoing
3.4.3	Encourage further research into the Aboriginal cultural heritage values of the reserve in collaboration with the Darkinjung Local Aboriginal Land Council and other relevant Aboriginal community organisations and custodial families.	Low
<b>3.5</b>	<b>Historic heritage</b>	
3.5.1	Undertake an archaeological survey and cultural assessment prior to all works with the potential to impact historic sites and places.	Ongoing
3.5.2	Record and assess historic items and manage them in accordance with their assessed level of significance.	Ongoing
<b>3.6</b>	<b>Visitor use</b>	
3.6.1	Provide and promote opportunities for nature appreciation, birdwatching, photography and bushwalking in the reserve.	Ongoing
3.6.2	Develop a memorandum of understanding with DPI Lands outlining management responsibilities for the section of the Great North Walk within the reserve, including management of directional signage and the removal and rehabilitation of the bush fireplace.	Low
3.6.3	Maintain the remote bush campsite.	Ongoing
3.6.4	Negotiate removal and rehabilitation of the bush fireplace located at the Great North Walk campsite with DPI Lands, and encourage walkers to use portable fuel stoves for cooking.	Medium
<b>3.7</b>	<b>Information and education</b>	
3.7.1	Support and assist educational use of the reserve by schools, community groups and individuals.	Medium
3.7.2	Maintain existing interpretive signs along the Great North Walk, and work with DPI Lands on any improvements to track signage.	Ongoing
<b>4.1</b>	<b>Pests</b>	
4.1.1	Continue weed control and pest animal control programs as outlined in pest management strategies relevant to the park. Priority will be given where weeds are impacting biodiversity values, especially threatened ecological communities and threatened species, and to continuing current control programs for wild dogs and foxes.	Ongoing
4.1.2	Survey the reserve to determine the presence and extent of pest animals and identify biodiversity most at risk.	Medium
4.1.3	Seek the cooperation of neighbours in implementing weed and pest control programs. Undertake control in cooperation with Greater Sydney Local Land Services, Central Coast Council and Forestry Corporation of NSW.	Medium
4.1.4	Monitor state level and regional level priority weeds and significant environmental weeds and their impacts. Treat any new outbreaks where possible.	Ongoing

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<b>Plan ref.</b>	<b>Management response</b>	<b>Priority</b>
4.1.5	Monitor the effectiveness of biological control on Madeira vine in the reserve.	Medium
4.1.6	Explore opportunities for supporting the formation of a bushcare group for Palm Grove Nature Reserve.	Low
4.1.7	Manage myrtle rust in the reserve in accordance with the <i>Management Plan for Myrtle Rust on the National Parks Estate</i> . Practice appropriate hygiene protocols during bush regeneration and general maintenance work to reduce the risk of myrtle rust infection and other potential pathogens.	Ongoing
4.1.8	Survey and monitor threatened species, especially magenta lilly pilly, for myrtle rust infection and treat it as required.	Ongoing
<b>4.2</b>	<b>Fire</b>	
4.2.1	Implement the reserve fire management strategy for Palm Grove Nature Reserve including the suppression of unplanned fires, the rehabilitation of areas as soon as practical and after a fire, and the maintenance of biodiversity, including the exclusion of fire from the Lowland Rainforest Endangered Ecological Community.	Ongoing
4.2.2	Continue to be involved in the Gosford and The Lakes bush fire management committees and maintain cooperative arrangements with local Rural Fire Service brigades, other fire authorities and landowners in regard to fuel management and fire suppression.	High/ Ongoing
4.2.3	Encourage or undertake research on the fire ecology of the reserve's native plants.	Low
<b>4.3</b>	<b>Isolation and fragmentation</b>	
4.3.1	Maintain cooperative arrangements with nearby landholders regarding access, fire and pest species management.	Ongoing
4.3.2	Encourage protection and enhancement of native vegetation on public and private land in the vicinity of the reserve through conservation programs and the land use planning initiatives of Central Coast Council.	Medium
4.3.3	Work with Central Coast Council to add the council road reserve that roughly follows Palm Grove Trail to the reserve.	Low
<b>4.4</b>	<b>Climate change</b>	
4.4.1	Continue existing fire, pest and weed management programs to increase the reserve's ability to cope with future disturbances, including climate change.	Ongoing
<b>5.1</b>	<b>Management operations and other uses</b>	
5.1.1	Investigate securing permanent legal access to Palm Grove Trail with adjoining landholders.	
5.1.2	Survey and mark reserve boundaries to support management, especially in the identification of existing encroachments and prevention of future encroachments.	Low
5.1.3	Manage the give-and-take boundary fencing agreement in accordance with NPWS policy.	Ongoing
5.1.4	Manage any boundary encroachments under NPWS policy.	High
<b>5.2</b>	<b>Non-NPWS uses and operations</b>	
5.2.1	Continue to liaise with TransGrid regarding access and maintenance needs in accordance with the agreement.	Ongoing

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<b>Plan ref.</b>	<b>Management response</b>	<b>Priority</b>
5.2.2	Continue to liaise with Ausgrid regarding access and maintenance needs in accordance with the protocol.	Ongoing

## References

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