NSW NATIONAL PARKS & WILDLIFE SERVICE

Queens Lake Nature Reserve and Queens Lake State Conservation Area

Plan of Management

environment.nsw.gov.au

Cover photo: Queens Lake Nature Reserve. John Spencer/DPIE

This plan was adopted by the Minister for Energy and Environment on 22 July 2020.

NPWS acknowledges that Queens Lake Nature Reserve and State Conservation Area are part of the Country of the Birpai Aboriginal People, and in the area represented by the Bunyah and Birpai local Aboriginal land councils.

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

For additional information or any inquiries about this park or this plan of management, contact the NPWS Port Macquarie Office, PO Box 5657, Port Macquarie NSW 2444 or by telephone on (02) 6588 5555.

Published by:

Environment, Energy and Science
Department of Planning, Industry and Environment
Locked Bag 5022, Parramatta NSW 2124
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment, Energy and Science enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
See also www.environment.nsw.gov.au

ISBN 978-1-922431-67-7
EES 2020/0315
August 2020

Find out more about your environment at:

www.environment.nsw.gov.au

Contents

List of tables

List of figures

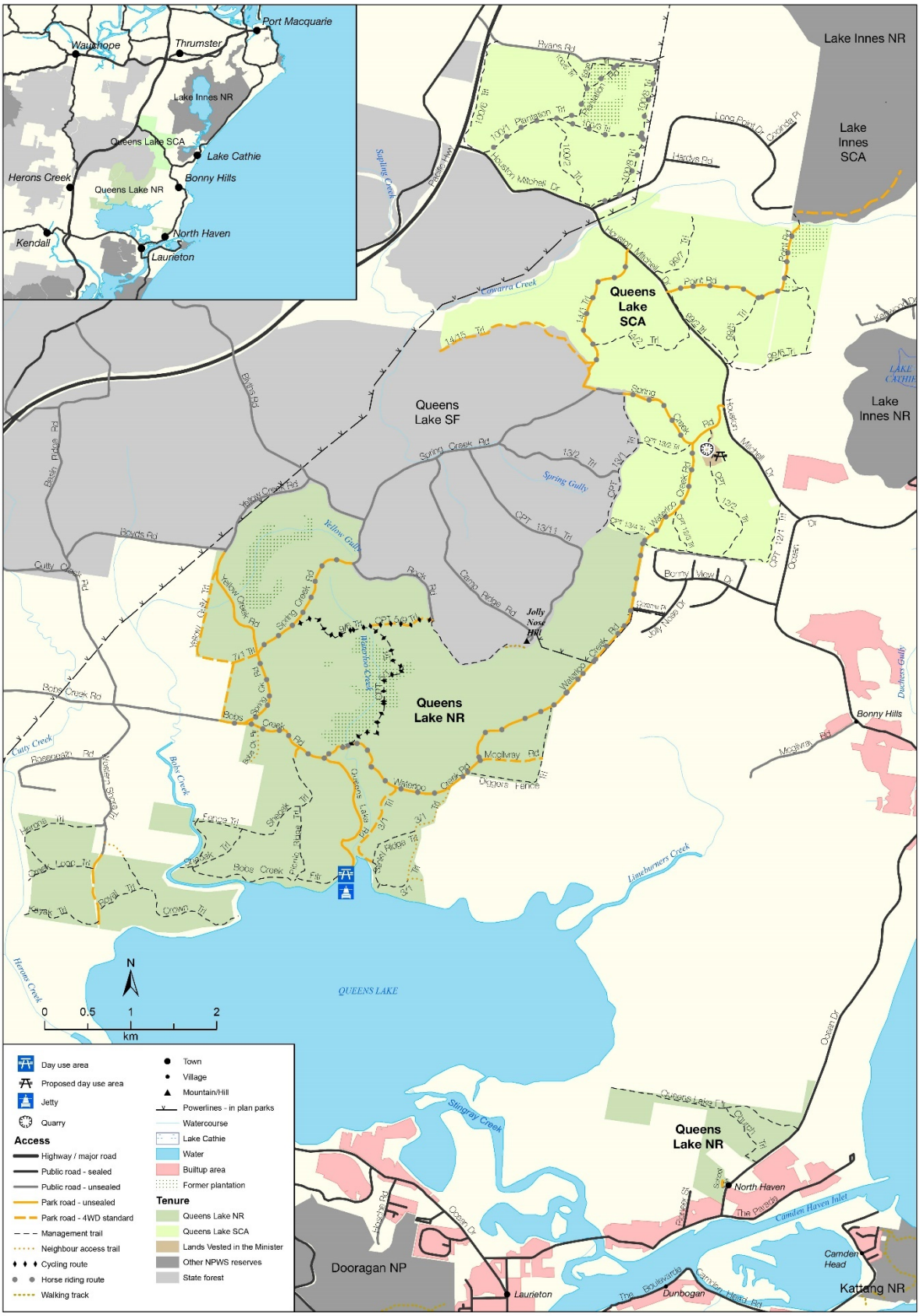

Figure 1 **Queens Lake Nature Reserve and State Conservation Area**

1. Introduction

1.1 Location, reservation and regional setting

Features	Description
Location	Queens Lake Nature Reserve and Queens Lake State Conservation Area (referred to as 'the parks' in this plan) are located on the NSW Mid North Coast, mostly north of Queens Lake. The parks are relatively long and narrow, stretching approximately 12 kilometres from north to south, in several disjunct sections. The northern extremity of these parks is about 14 kilometres south of Port Macquarie. The southernmost section borders the village of North Haven. See Figure 1.
Area	The area covered by this plan includes the following parks (total area 2449 hectares) reserved under the *National Parks and Wildlife Act 1974*: Queens Lake Nature Reserve – 1423 hectares Queens Lake State Conservation Area – 1026 hectares. The area covered by this plan also includes some roads and a quarry that lie on Crown land that is vested in the Minister for Energy and Environment under Part 11 of the National Parks and Wildlife Act. These Part 11 lands (totalling 15.3 hectares) do not form part of the reserved area of these parks, however, their management is subject to this plan and the National Parks and Wildlife Regulation (see Section 3.5). The parks do not include any submerged lands associated with Queens Lake. The shore fronting the lake above the mean high water mark is included in the nature reserve but only east of Bobs Creek. West of Bobs Creek, a strip of Crown land reserved for access to navigable waters lies between the lake's foreshore and the nature reserve (see Figure 1).
Reservation date	Dedication of the nature reserve occurred in stages, with the first sections reserved on 1 January 1999 via the *National Park Estate (Land Transfers) Act 1998* (formerly known as the *Forestry and National Park Estate Act 1998*), and additions reserved in March 1999 (North Haven 1), March 2002 (North Haven 2), July 2003 and July 2006 (Waterloo Creek plantation site). The state conservation area was reserved on 1 July 2003 through operation of the *National Park Estate (Reservations) Act 2003*.
Previous tenure	Most of these parks were previously parts of Queens Lake, Burrawan and Cowarra state forests. The North East Regional Forest Agreement provided for major additions to the park system, including the dedication of the nature reserve, its additions in 1999, 2003 and 2006, and the reservation of the state conservation area. The south-east section of nature reserve, near North Haven, was formerly a mix of Crown land (60 hectares) and private land (20 hectares), the latter area being donated to the NSW Government for addition to the reserve.
Regional context	
Biogeographic region	The parks lie within the Macleay Hastings subregion of the NSW North Coast Bioregion (Thackway & Cresswell 1995).
Surrounding land use	Surrounding land uses include forestry to the west and north-west (primarily based on public native forests and hardwood plantations); grazing and rural residential settlement to the north and east; and some suburban residential lands associated with the growing coastal villages of Lake Cathie, Bonny Hills and North Haven to the east and south-east. North Haven Public School is a neighbour of the nature reserve's south-east section. An urban land release site,

Features	Description
	currently known as ‘Area 14 Rainbow Beach’, lies to the east of the parks between Lake Cathie and Bonny Hills. The parks are named after Queens Lake. This is part of the estuary of the Camden Haven River that supports both commercial and recreational fisheries. North-east of the parks, Lake Innes State Conservation Area and Lake Innes Nature Reserve provide a relatively continuous corridor of native vegetation to Port Macquarie.
Other authorities	The parks are located within the administrative areas of the Bunyah and Birpai local Aboriginal land councils, Port Macquarie-Hastings Council and North Coast Local Land Services.

1.2 Statement of significance

The parks are significant because of a range of values, as outlined below.

Landscape: The parks are underlain by a range of rock formations, of sedimentary, igneous and metamorphic origin, some up to 350 million years old. These are substantially different from the relatively recent sand environments protected by most other coastal parks in the region.

Catchment/scenic values: The parks contribute to the healthy catchment conditions of Queens Lake and its tributaries, and the dramatic aesthetic qualities of the forest landscapes north of Queens Lake, including the Jolly Nose Hill.

Biological values: The parks support a range of plant community types, and plant and animal species, reflecting the diversity of the underlying geology and topography. The parks protect stands of several threatened ecological communities and the habitat for approximately 170 species of native animal, including 19 threatened species.

Aboriginal heritage: Based on written accounts from the first half of the 19th century, the parks once supported a strong local population of Aboriginal people, particularly in and around the shores of Queens Lake. While only four Aboriginal sites are currently recorded in the parks, there are many more in the general area and significant potential for further sites to be identified within the parks.

Historic heritage: In the 1820s, lime was excavated from parts of the nature reserve to support the construction of the town and penal colony of Port Macquarie. The parks also supported a timber industry for more than 170 years. There are likely to be artefacts and heritage material relating to these industries present in the parks.

Recreation and tourism: The parks provide a range of recreational opportunities including bushwalking, birdwatching, horse riding, cycling, abseiling (by permit only) and exploration of adjacent waterways.

2. Management context

2.1 Legislative and policy framework

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

Other legislation, strategies and international agreements may also apply to the management of the area. In particular, the NSW *Environmental Planning and Assessment Act 1979* may require environmental impact assessment 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* 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 National Parks and Wildlife Act. Once the Minister has adopted a plan, the plan must be carried out and no operations may be undertaken contrary to the plan in relation to the subject lands. This plan will also apply to any future additions to Queens Lake Nature Reserve and State Conservation Area. 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 National Parks and Wildlife Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

Under section 30J of the National Parks and Wildlife Act, nature reserves are managed to:

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

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

State conservation areas are reserved under the National Parks and Wildlife Act to protect and conserve areas that:

- contain significant or representative ecosystems, landforms or natural phenomena or places of cultural significance
- are capable of providing opportunities for sustainable visitor or tourist use and enjoyment, the sustainable use of buildings and structures, or research
- are capable of providing opportunities for uses permitted under other provisions of the Act.

Under section 30G of the National Parks and Wildlife Act state conservation areas are managed to:

- conserve biodiversity, maintain ecosystem functions, protect natural phenomena and maintain natural landscapes
- conserve places, objects and features of cultural value
- provide for the undertaking of uses permitted under other provisions of the National Parks and Wildlife Act (including uses permitted under section 47J such as mineral exploration and mining), having regard to the conservation of the natural and cultural values of the state conservation area
- provide for sustainable visitor or tourist use and enjoyment that is compatible with conservation of the area's natural and cultural values and with uses permitted in the area
- provide for sustainable use (including adaptive re-use) of any buildings or structures or modified natural areas having regard to conservation of the area's natural and cultural values and with other uses permitted in the area
- provide for appropriate research and monitoring.

Land is reserved as a state conservation area primarily where mineral values preclude reservation as another category. The National Parks and Wildlife Act requires a review of the classification of state conservation areas every five years in consultation with the Minister administering the *Mining Act 1992*. Reviews in 2008 and 2013 did not alter the status of Queens Lake State Conservation Area.

In the long term, subject to the outcomes of future reviews, Queens Lake State Conservation Area may become a national park due to its high recreation usage. Therefore, the management of the state conservation area will also be guided by the management principles for national parks (given in section 30E of the National Parks and Wildlife Act) as far as possible.

2.3 Specific management directions

The management challenge for the parks is to conserve and protect their diverse natural and cultural heritage values, while anticipating and managing increased demand for recreational activities in the parks due to the planned local population growth in the next few decades. In addition to the general principles for the management of nature reserves and state conservation areas (see Section 2.2), the following specific management directions apply to the parks:

- Protect and conserve these parks' significant vegetation types, particularly the poorly reserved forest ecosystems and threatened ecological communities, and the habitats of threatened species.
- Protect the aesthetic and landscape characteristics of these parks, in particular the escarpment in the vicinity of Jolly Nose Hill (also known as the Jolly Nose Escarpment), the shores of Queens Lake and its tributaries, and the broadly contiguous forest landscape as viewed from local vantage points.
- Manage recreational activities (such as cycling, abseiling and horse riding), to enhance visitor experience while minimising impacts on the parks' values and other users, and enforce regulations to control and limit unauthorised use.
- Reduce the fragmentation of the parks, issues of erosion and ongoing management liabilities through rationalisation of the road and trail network, including the closure and revegetation of trails that are not required for management purposes or approved recreational activities.

- Allow continued access to private property through the parks where no practical alternative exists.

Photo 1 **Uninterrupted views across Queens Lake from the nature reserve. John Spencer/DPIE.**

3. Values

This plan aims to conserve both the natural and cultural values of the parks. The location, landforms and plant and animal communities of an area have determined how it has been used and valued by 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 the plan clear and easy to use, various aspects of natural heritage, cultural heritage, threats and ongoing use are dealt with individually but their interrelationships are recognised.

3.1 Geology, landscape and catchments

The geology of the parks is predominantly derived from Triassic sandstones, siltstones, shales and lithic conglomerates of the Camden Haven group of sedimentary rock formations, some 210 to 250 million years old (Pratt 2010). These rock formations are exposed along Jolly Nose Hill at around 248 metres above sea level and underlie the western and northern parts of the parks (e.g. in the catchments of Waterloo and Bobs creeks and part of the Cowarra Creek catchment).

The low coastal plain and coastal swamps in the south-east of the nature reserve are characterised by younger Quaternary sediments and barrier dune systems. These were formed from sands and clays deposited between 1.5 million and 8000 years ago, by local alluvial processes of the Camden Haven River and the coastal migration of beach sands.

There are also areas of intrusions by much older material resulting in localised variations in erosion potential, topography and soil types that are reflected in differences in the composition, structure and productivity of vegetation communities (see Section 3.2). These intrusions include areas of:

- Permian serpentinite (metamorphosed oceanic igneous rock, around 250 million years old).
- Permian dolerites (igneous rocks having intruded between sedimentary layers, around 250 to 300 million years old, generally resulting in yellow clay soils).
- Carboniferous schists and phyllites (generally metamorphosed sedimentary rocks, formed under high heat and pressure, around 300 to 360 million years old).
- Silurian slates, cherts and tuffs (around 420 to 440 million years old).
- Cambrian serpentinite (metamorphosed oceanic igneous rock, around 530 million years old).

Some of these older geologies are very limited in extent. They and the plant communities they support are poorly represented in the NSW park system.

The soils of the area are dominated by moderately well-drained brown, yellow and red kurosols that have formed on the Triassic sandstones and mudstones. These are widespread on the low hills and rises of the parks. Footslopes and drainage depressions have soils that are imperfectly drained, such as grey kurosols that may be sodic or sodosols. Soils on the steeper hills of the Triassic conglomerates are characterised by a very high erosion hazard and include shallow tenosols and rudosols. Areas of deep, well-drained red ferrosols occur on metamorphosed rocks, predominantly within the state conservation area. Podosols and associated organosols have formed on the limited areas of Quaternary sands in the vicinity of Queens Lake. Limited areas of black and brown vertosols occur on the outcrops of serpentinite. Soils derived from serpentinite are noted for their various plant toxicities and plant species richness (see Section3.2).

Photo 2 **Queens Lake Nature Reserve helps protect the water quality of the lake. John Spencer/DPIE.**

The forested slopes and rocky conglomerate cliff faces of the escarpment surrounding Jolly Nose Hill are an attractive and well-recognised feature of the local landscape, contributing to the aesthetic character of the wider area and the backdrop to the coastal villages of Bonny Hills and Lake Cathie. This forested landscape is also a significant feature of the wider Camden Haven area, viewed from the popular tourist lookout at North Brother Mountain in Dooragan National Park.

The southern end of the nature reserve drains via Waterloo, Bobs and Herons creeks into Queens Lake, which is part of the Camden Haven estuary. The northern end of the nature reserve and the state conservation area drain into Cowarra Creek that flows into Lake Cathie. The nature reserve's minor creek systems drain directly east of the Jolly Nose Escarpment, and flow into the ephemeral coastal wetland systems of Duchess Gully which reaches the ocean at Rainbow Beach.

The water quality of Queens Lake is good, with much of the catchment being forested and largely unmodified, and the surrounding heath, swamp forest and wetlands being in good condition (AHD no date; Hastings Council 1999; HRC 2002). The nature reserve significantly contributes to the protection of Queens Lake's catchment. The consequent benefits to water quality are important to the health of the local environment, including the local commercial and recreational fishery and oyster industries. Continued protection of this catchment is, therefore, both environmentally and economically desirable.

Issues

- The geological landscape present in the parks is more complex and diverse than other coastal parks in the area. The parks, therefore, support a number of values that are not well represented in other local parks or are considered poorly reserved, including floristically diverse plant communities on landscapes derived from serpentinite, dolerite and phyllite metamorphic rocks (see Section 3.2).

- Acid sulfate soils are present in the low-lying coastal wetland areas of the nature reserve. If exposed, these may endanger water quality in Queens Lake and the Camden Haven estuary. There are also impacts on water quality in low-lying parts of the parks caused by stormwater drainage from neighbouring lands (see Section 4.4).
- Roading associated with past logging activity, including informal trails that were established only to provide short-term access to harvesting areas, has left an extensive network of trails in excess of what is required for NPWS management purposes (see Section 5.1). Their continued use is leading to localised areas of accelerated soil erosion and a decline in landscape and water catchment values. In particular, use of tracks and trails that follow fall lines down steep slopes is creating gully erosion. Use of tracks and trails that traverse low-lying areas of likely waterlogging or low wet-bearing strength soils in swamp and wetland environments may disturb acid sulfate soils.
- Powerlines supplying the telecommunication towers on Jolly Nose Hill in neighbouring Queens Lake State Forest traverse the nature reserve (see Figure 1 and Section 5.2). The clearing beneath the powerlines is a scar in an otherwise forested escarpment in the nature reserve. Use of this corridor by unauthorised vehicles damages stabilising vegetation and is exacerbating erosion along this corridor.
- An electrical substation at the eastern end of Houston Mitchell Drive lies on a small Crown reserve for public infrastructure. Although not within either of the parks, it is surrounded by Queens Lake State Conservation Area and is aesthetically linked to the main entry point to the parks.
- There are cultural heritage values associated with the parks' geology and landscape, including Aboriginal stone tool quarries, lime-burning resources and, potentially, Aboriginal mythological sites (see Section 3.4).

Desired outcomes

- The impact of soil erosion on the parks' values and their receiving waters is minimised.
- Poorly represented geological and soil landscapes and their associated ecosystems are protected.
- The aesthetic values of the parks' landscapes are protected.
- The water quality of the parks' creeks and receiving waterways remains high.

Management response

3.1.1 Undertake works in a manner that minimises erosion and water pollution. In particular, ensure that park roads and management trails shown on Figure 1 are maintained to minimise soil erosion. Stabilise, close and allow trails not shown on Figure 1 to revegetate.

3.1.2 Locate and design management infrastructure and visitor facilities to minimise their visual impact as viewed from locations within and outside the parks. This may be achieved, for example, by requiring the co-location of new infrastructure within existing easements.

3.1.3 Identify areas of accelerated soil erosion and implement stabilisation and rehabilitation measures in affected areas. In particular, install barriers to prevent recreational vehicle access to the corridor of the Jolly Nose Hill powerlines.

3.1.4 Liaise with adjacent landholders and utility providers to minimise the visual impacts of neighbouring developments.

3.1.5 Avoid use of tracks and trails that traverse wetlands or other low-lying areas that are likely to become waterlogged.

3.1.6 Work with adjacent landholders and Port Macquarie-Hastings Council to address any water quality issues arising from stormwater drainage from neighbouring lands or roads.

3.2 Native plants

The native plant communities in parts of the parks and surrounding district have been relatively well surveyed. See, for example, studies of the area east of the parks between North Haven and Limeburners Creek by Milledge (1979) and Griffith (1989, 1992) and the forest-type mapping carried out by the then NSW Forestry Commission. Many parts of the parks, however, have not been comprehensively surveyed.

The parks support a diverse range of plant communities, including 22 forest communities. The 40-hectare Diggers Hill Flora Reserve, in what is now the nature reserve, was reserved in 1978 to protect two of these communities: Grey Gum – Stringybark and the 'paperbark' type with prickly-leaved tea tree (*Melaleuca styphelioides*). Narrow-leaved red gum (*Eucalyptus seeana*) is found in the nature reserve, near the southern limit of its range (FCNSW 1989). The heath understorey in the former flora reserve is also interesting due to its structure and plant diversity (Williams 2000).

The parks are broadly dominated by three forest ecosystems: Dry Grassy Tallowwood – Grey Gum, Wet Foothills Blackbutt – Turpentine and Low Relief Coastal Blackbutt. The parks support four threatened ecological communities listed under the Biodiversity Conservation Act (see Table 1). There are also stands of escarpment red gum forest (109 hectares), which is a community that has been significantly cleared (NPWS 1999).

Photo 3 **The former Diggers Hill Flora Reserve, in what is now the nature reserve, was reserved in 1978 to protect a paperbark community containing prickly-leaved tea tree. Barry Collier/DPIE.**

Table 1 Threatened ecological communities known from the parks

Name	Status [1]		Area (ha)
	BC Act	EPBC Act	
Freshwater Wetlands on Coastal Floodplains	EEC		43
Lowland Rainforest [2]	EEC	CEEC	5
Swamp Oak Floodplain Forest	EEC		51
Swamp Sclerophyll Forest on Coastal Floodplains	EEC		242

1 BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act; EEC = endangered ecological community; CEEC = critically endangered ecological community.

2 Listed as Lowland Rainforest of Subtropical Australia under the Environment Protection and Biodiversity Conservation Act.

Other areas with potentially significant plant communities or species are associated with those areas with restricted geology, such as serpentinite, dolerite and phyllite. These areas have not been subject to the same level of survey and vegetation mapping as elsewhere in the parks.

No threatened plant species are currently known to occur in the parks. There are, however, at least 25 plant species considered to be rare, poorly known or regionally significant and several threatened species are predicted to occur (see Table 2).

Table 2 Significant plant species known or predicted to occur in the parks

Common name	Scientific name	Status [1]		Other significance, comments on habit/habitat
		BC Act	EPBC Act	
Known to occur in the parks				
Blue howittia	*Howittia trilocularis*			Near northern limit of coastal distribution. Medium shrub of well-drained gullies.
Downy mistletoe	*Notothixos incanus*			Near to southern limit. Compact mistletoe, common on *Melaleuca* spp.
Durringtonia	*Durringtonia paludosa*			Uncommon in NSW. Weak herb of coastal swamps.
Geebung	*Persoonia virgata*			Near to southern limit. Erect shrub of dry sclerophyll forest on siliceous sands.
Grasstree	*Xanthorrhoea malacophylla*			Type specimen collected in parks, limited distribution and habitat range. Tall slender grasstree of rainforest margins, usually on steep hillsides.
Grey ironbark	*Eucalyptus fergusonii* subsp. *fergusonii*			Poorly known in NSW. Medium to tall tree of wet sclerophyll forest or woodland on sandy soils.

Common name	Scientific name	Status [1]		Other significance, comments on habit/habitat
Large-fruited blackbutt	*Eucalyptus pyrocarpa*			Restricted, southern limit of distribution. Tall tree of wet or grassy coastal sclerophyll forest.
Milky mangrove [2]	*Excoecaria agallocha*			Camden Haven estuary is southern limit.
Narrow-leaved red gum	*Eucalyptus seeana*			Near southern limit of distribution. Tall red gum of sandy swampy soils.
Orange gum	*Eucalyptus bancroftii*			Near southern limit of distribution. Small to medium tree of woodlands on sandy soils in low swampy sites.
Tiny wattle	*Acacia baueri* subsp. *baueri*			Uncommon to rare in NSW. Small shrub of wet sandy heath.
Swamp banksia	*Banksia robur*			Occurs in disjunct population. Shrub of coastal wetlands.
Silky cryptandra	*Cryptandra propinqua*			Disjunct population. Much-branched heath shrub.
Tapering-leaved bottlebrush	*Melaleuca flammea* (syn. *Callistemon acuminatus)*			Rare in NSW. Small bottlebrush of rocky dry slopes.
Wattle mat-rush	*Lomandra filiformis* subsp. *coriacea*			Rare on NSW north coast. Fine mat-rush of shale or igneous soils.
Predicted to occur in the parks				
Big Nellie hakea	*Hakea archaeoides*	V	V	Medium shrub in wet forest slopes on Triassic conglomerate.
Grove's paperbark	*Melaleuca groveana*	V		Small tree of elevated/exposed heaths.
Milky silkpod	*Parsonsia dorrigoensis*	V	E	Slender climbing twiner.
Southern swamp orchid	*Phaius australis*	E	E	Large ground orchid of forested wetlands and rainforest.
White-flowered wax plant	*Cynanchum elegans*	E	E	Twining climber of rainforest and wet slopes.

Source: Information obtained from internal reports and data assessments.

1 BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act; E = endangered; V = vulnerable.

2 Protected under the Fisheries Management Act 1994.

Strategies for the recovery of threatened species, populations and ecological communities have been set out in a statewide *Biodiversity Conservation Program* (DPIE 2019a). 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 (DPIE 2019b). Actions to secure species include the appropriate management of fire and weed threats (see Sections 4.1 and 4.2) and improved understanding of species' distribution through targeted surveys.

From about the 1830s, the forests of the parks were harvested for timber and this supported the development of an important local industry. Harvesting intensified in the late 1800s and the 1900s. As a result, the majority of the forest today is in a young mature to mature growth stage (Jacobs 1955). A small number of sites in the latest additions to the parks have been harvested since 2000 and are in the very young age class.

Despite the history of logging, a few areas contain old-growth forest and significant stands of trees in the over-mature growth stage. Although these stands comprise less than 10% of the parks, they provide important habitat for hollow-dependent native animals such as gliders and possums, micro-bats, cockatoos, parrots and large forest owls. Protection of the structural attributes that contribute to the habitat values of these areas, such as the retention of hollow-bearing trees, is important to these species (see Section 3.3).

Photo 4 **Tall grey gum forests are found in the Queens Lake parks. John Spencer/DPIE.**

Before the reservation of the parks under the National Parks and Wildlife Act, a number of plantations of coastal blackbutt (*Eucalyptus pilularis*) were established, as indicated on Figure 1. These included 52 hectares in the nature reserve (21 hectares of which were logged immediately before the area was reserved) and 32.5 hectares in the state conservation area. An assessment of plantation areas (NPWS 2010) concluded that only an area of 1.22 hectares in the state conservation area required active management, as it is unlikely to develop into a diversified native forest with time through natural processes. The other plantation areas in the state conservation area were assessed as revegetating naturally although some monitoring and weed control is required. The remaining area of plantation in the nature reserve was assessed as not requiring any active management, as it was surrounded by natural blackbutt forest and had few weeds present.

Issues

- There are areas within the parks where the plant community type has not been mapped and surveys for plant species have not been carried out. These include areas of lower

fertility soils and habitats such as swamps, rainforest and rock outcrops. Some of these areas are expected to have a concentration of rare or otherwise significant species.

- Some of the wet or moist forest ecosystems within the parks are highly susceptible to modification and damage due to influences such as inappropriate fire regimes (combinations of frequency, intensity and extent – see Section 4.2) and weed invasion (see Section 4.1).
- Old-growth forest areas and old tree hotspots are restricted in distribution and abundance and provide critical habitat resources for wildlife (see Section 3.3).
- A small area of plantation in the state conservation area requires active management to re-establish native vegetation. Other plantation areas should be monitored and may require weed control.

Desired outcomes

- Knowledge of significant plant species and communities is improved.
- Significant ecological communities and populations of significant plant species are appropriately managed and conserved.

Management response

3.2.1 Implement relevant actions in the *Biodiversity Conservation Program* for threatened species and ecological communities present in the parks.

3.2.2 Encourage or conduct targeted surveys for significant plant species predicted or known to occur in the parks and ensure records for significant species are kept up to date. Priorities for these surveys include rainforest, swamp and wet heath areas and the rock faces along the Jolly Nose Escarpment.

3.2.3 Encourage or undertake a comprehensive vegetation survey of the parks, with documentation to include collation and analysis of all previous survey data and to ensure records for significant species are kept up to date.

3.2.4 Where populations of significant species are located on the edges of roads and trails, establish a regime (e.g. installation of ‘green post’ markers) to protect them from damage during road maintenance and roadside weed spraying programs.

3.2.5 Avoid development of new facilities in the habitats of significant plant species or communities, especially in areas where the geology is serpentinite, dolerite or phyllite.

3.2.6 Avoid disturbance of old-growth trees in order to maintain habitat values.

3.2.7 Monitor former plantation areas and, where required, remove non-endemic species and weeds and encourage natural regeneration of a diversity of native species.

3.3 Native animals

Approximately 170 species of native animals have been recorded in the parks, including at least 19 threatened species. Based on nearby records and the availability of suitable habitat, several other threatened species are predicted to occur (see Table 3).

Table 3 Threatened animal species recorded or predicted to occur in the parks

Common name	Scientific name	Status [1]		Location [2]
		BC Act	EPBC Act	
Fish				
Purple spotted gudgeon [3]	*Mogurnda adspersa*			P
Frogs				
Green-thighed frog	*Litoria brevipalmata*	V		P
Stuttering frog	*Mixophyes balbus*	E	V	P
Wallum froglet	*Crinia tinnula*	V		P
Reptiles				
Stephens' banded snake	*Hoplocephalus stephensii*	V		P
Birds				
Australasian bittern	*Botaurus poiciloptilus*	E	E	P
Black-necked stork	*Ephippiorhynchus asiaticus*	E		P
Barking owl	*Ninox connivens*	V		P
Black bittern	*Ixobrychus flavicollis*	V		P
Bush stone-curlew	*Burhinus grallarius*	E		P
Eastern osprey	*Pandion cristatus*	V		NR
Eastern grass owl	*Tyto longimembris*	V		P
Glossy black-cockatoo	*Calyptorhynchus lathami*	V		NR, SCA
Little eagle	*Hieraaetus morphnoides*	V		P
Little lorikeet	*Glossopsitta pusilla*	V		NR, SCA
Masked owl	*Tyto novaehollandiae*	V		SCA
Pied oystercatcher	*Haematopus longirostris*	E		NR
Powerful owl	*Ninox strenua*	V		SCA
Regent honeyeater	*Anthochaera phrygia*	CE	CE	P
Rose-crowned fruit-dove	*Ptilinopus regina*	V		P
Sooty owl	*Tyto tenebricosa*	V		P
Square-tailed kite	*Lophoictinia isura*	V		NR, SCA
Swift parrot	*Lathamus discolor*	E	E	SCA
Varied sittella	*Daphoenositta chrysoptera*	V		SCA
Wompoo fruit-dove	*Ptilinopus magnificus*	V		P
Mammals (non-flying)				
Brush-tailed phascogale	*Phascogale tapoatafa*	V		NR, SCA
Common planigale	*Planigale maculata*	V		SCA
Eastern chestnut mouse	*Pseudomys gracilicaudatus*	V		NR
Eastern pygmy-possum	*Cercartetus nanus*	V		P
Koala	*Phascolarctos cinereus*		V	NR, SCA

Common name	Scientific name	Status [1]		Location [2]
Long-nosed potoroo	*Potorous tridactylus*	V	V	P
Spotted-tailed quoll	*Dasyurus maculatus*	V	E	NR, SCA
Greater glider	*Petauroides volans*		V	NR
Yellow-bellied glider	*Petaurus australis*	V		NR, SCA
Squirrel glider	*Petaurus norfolcensis*	V		SCA
Mammals (flying)				
Common blossom-bat	*Syconycteris australis*	V		P
Eastern bentwing-bat	*Miniopterus schreibersii oceanensis*	V		P
Eastern freetail-bat	*Mormopterus norfolkensis*	V		P
Greater broad-nosed bat	*Scoteanax rueppellii*	V		P
Grey-headed flying-fox	*Pteropus poliocephalus*	V	V	NR, SCA
Golden-tipped bat	*Kerivoula papuensis*	V		P
Large-eared pied bat	*Chalinolobus dwyeri*	V	V	P
Little bentwing-bat	*Miniopterus australis*	V		SCA
Southern myotis	*Myotis macropus*	V		P
Yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*	V		P

Source: DPIE 2019C.

1 BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act; E = endangered; CE = critically endangered; V = vulnerable.

2 NR = Queens Lake Nature Reserve; SCA = Queens Lake State Conservation Area; P = predicted to occur.

3 Listed as endangered under the NSW *Fisheries Management Act 1994*.

The diversity of plant communities in the parks provides a reliable source of nectar throughout the seasons. Therefore, the area supports strong populations of numerous nectar-dependent species, including honeyeaters, lorikeets, insects and flying-foxes. The area also supports populations of koalas and gliding possums plus a number of macropods, most commonly the swamp wallaby (*Wallabia bicolor*) and red-necked wallaby (*Macropus rufogriseus*). There is also a range of predatory species, including large forest owls and dasyurid marsupials (such as quolls, phascogales and antechinuses) in the parks (Preston 2004).

Milledge (1979) noted that over 50% of the forests in and surrounding the parks consisted of tree stands younger than 30 years old, and suggested that the dominance of young, even-aged stands of trees over large areas with few hollow-bearing habitat trees could lead to a reduction in species diversity and species abundance. Forty years after Milledge made this observation, several hollow-dependent birds, such as the glossy black-cockatoo and large forest owls, are found across much of the parks.

Other important habitat elements, particularly for the spotted-tailed quoll, include hollow fallen logs and small open areas such as rocky creeks or rock outcrops within largely undisturbed forest. Glossy black-cockatoos rely on areas where the mid-storey is dominated by forest oak (*Allocasuarina torulosa*) and black she-oak (*A. littoralis*). The patches of rainforest in the parks support seasonal populations of fruit-doves. Some artificial structures such as bridges also provide habitat for native animals, particularly micro-bats.

The parks, with their abundance of creeks and wetlands and relatively high rainfall, protect the habitat of 22 species of frog, including stream-dependent species like the barred river frogs and acid swamp and wetland specialists (Berrigan 2009).

Reptiles are less well documented. Although 28 species are known from the parks, it is likely that more are present, particularly cryptic species like geckos, blind snakes and the smaller skinks. Obscure species like the red-tailed calyptotis (*Calyptotis ruficauda*) and shadeskinks (*Saproscincus* spp.) are recorded, as is the southern angle-headed dragon (*Hypsilurus spinipes*).

The parks' complex diversity of habitats (including low coastal heath and adjacent estuaries, dry sclerophyll forest, woodland and rainforest) is reflected in a diverse birdlife: at least 120 bird species are recorded from the parks, with an additional 17 species likely to occur (Bischoff 2004). Birdwatching is a popular day use activity, with some localities in the parks renowned for sightings of unusual or cryptic species.

Photo 5 **Hollow logs provide important habitat for the threatened spotted-tailed quoll found in the Queens Lake parks. James Evans/DPIE.**

The parks form part of the Hastings-Macleay Key Biodiversity Area (KBA). KBAs are sites that contribute to the global persistence of biodiversity, including vital habitat for threatened plant and animal species in terrestrial, freshwater and marine ecosystems. They are considered 'Nature's Hotspots'. The Hastings-Macleay KBA combines ephemerally flooded lower floodplain wetlands with swamp forests used by swift parrots and regent honeyeaters. Swamp mahogany (*Eucalyptus robusta*) and forest red gums (*Eucalyptus tereticornis*) are the critical trees for these birds in this area, flowering in autumn and spring respectively. The main threats to this KBA include clearing and preventing drainage on acid sulfate soils and the subsequent leaching of acid into waterways (Birdlife International 2019).

Shorebird and wetland birds, such as the black-necked stork, eastern osprey and Australasian bittern, are dependent on the continued health of the catchment and estuary. Some are also dependent on forest resources for nesting and roosting habitat. Around 20

species of birds have specialised dietary preferences for seasonal nectar resources. As well as the 12 species of honeyeaters, this includes the endangered swift parrot. Further information is required to refine understanding of this species' seasonal dependency on flowering red gum and ironbark within the parks, particularly in the area along Houston Mitchell Drive.

Strategies for the recovery of threatened animal species and populations are set out in the statewide *Biodiversity Conservation Program*, with actions prioritised through the *Saving our Species* program. Individual recovery plans, considering species' requirements and management needs in more detail, have been approved under the Biodiversity Conservation Act for the koala, large forest owls and yellow-bellied glider. National recovery plans have been prepared for the swift parrot and regent honeyeater. The national recovery plan for the grey-headed flying-fox is currently in draft form.

Photo 6 **Swift parrots have been recorded in the state conservation area. Dave Watta/DPIE.**

Issues

- Records of the animals known to occur in the parks come from both surveys and opportunistic sightings. Some areas, however, have not been surveyed. These include habitats such as swamps, rainforest and rock outcrops and also areas that had not been targeted for timber harvesting since the 1980s.
- Threats to the parks' wildlife populations include loss of habitat due to weed invasion and inappropriate fire regimes, predation by feral species and isolation and fragmentation (see Sections 4.1, 4.2 and 4.4). Climate change is an emerging threat (see Section 4.3). Habitat elements may also be impacted by management activities related to the management of fire and weeds, or the establishment or maintenance of visitor facilities and roads.
- Areas of old-growth forest and other stands of old trees are restricted in distribution and abundance in the parks (see Section 3.3). As these areas contain critical habitat

resources for a wide range of native animals, their scarcity may be limiting populations of some species. Action is required to protect and enhance these values.

- Dingos (*Canis lupus dingo*) are considered to be part of the native fauna of New South Wales and their presence in the parks has been confirmed by genetic testing (M Dodkin 2014, pers. comm.). Consistent with the *NSW Wild Dog Management Strategy 2017–2021* (DoI 2017) regional pest management plans and wild dog management plans will focus on areas where the risk of negative impacts are greatest, rather than across the entire area of wild dog distribution. See also Section 4.1.
- The expansion of human settlement in the vicinity of the parks has resulted in conflicts between domestic animals and the parks' wildlife. Issues include predation of poultry by quolls, predation of birds and gliding possums by straying domestic cats, and harassment and hunting of wildlife by domestic dogs. These conflicts could be reduced through appropriate education, such as information on making poultry sheds more secure, the ecological value of snakes and micro-bats around dwellings, and the need to control dogs and cats and prevent them straying into the parks.

Desired outcomes

- Knowledge of the parks' significant animals and their habitat is improved.
- Negative impacts on threatened species are minimised.
- Structural diversity and habitat values are restored in areas subject to previous disturbance.

Management response

3.3.1 Implement relevant actions in the *Biodiversity Conservation Program* and recovery plans for threatened species and populations present in the parks.

3.3.2 Encourage or undertake additional surveys, particularly to fill knowledge gaps around poorly sampled habitats and to target threatened species predicted to occur in the parks and ensure records for significant species are kept up to date.

3.3.3 Encourage or undertake monitoring of significant animal species in representative locations and ensure records for significant species are kept up to date.

3.3.4 Trial and, where appropriate, implement measures to enhance the habitat values of the areas of plantation and young forest. This might include, for example, augmenting forest hollows through a program of placing nest boxes.

3.3.5 Continue to contribute to genetic sampling of wild dogs within the parks.

3.3.6 Educate the community about how to reduce conflict between pets and wildlife.

3.4 Aboriginal connections to Country and shared heritage

Aboriginal heritage is inseparable from Aboriginal connection to nature and Country, as 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 and water, passing on cultural knowledge, kinship systems and strengthening social bonds. Hence, Aboriginal heritage needs to be managed in an integrated manner across the landscape.

In the broader community, heritage places and landscapes are made up of stories and connections to the past and can also include natural resources, objects, customs and

traditions that individuals and communities have inherited and wish to conserve for current and future generations. They may have historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. NPWS conserves the significant heritage features of the parks and reserves that it manages.

The parks and surrounding landscape have an interesting and shared Aboriginal and historic heritage. The parks lie within the traditional Country of the Birpai People (Tindale 1940) and are one of the earliest areas settled by Europeans. Based on accounts of early explorers and settlers, it is apparent there was a vibrant population of Aboriginal people in the Camden Haven before and at the time of European settlement. However, accurate archaeological information on the Aboriginal settlement and occupation patterns in the Camden Haven area is very limited.

In 1818 John Oxley was the first European to explore the land in this part of New South Wales. His explorations in the area included a traverse around the northern and western shores of Queens Lake. His journal and accounts by those who followed include many specific anecdotes about Aboriginal lifestyles observed around the shores of Queens Lake. For example, he describes construction and use of canoes and bark huts. He observed the people hunting fish, shellfish and waterfowl, and using bark canoes, one of which was ‘sufficiently large to hold nine men, and resembled a boat’ (Oxley 1820, p.332). He noted ‘the natives seem very numerous, but are shy’ (Oxley 1820, p.333).

Between 1818 and 1822 Lieutenant Phillip Parker King confirmed these observations when surveying the east coast and provided more information about the bark huts. He noted that those in the Hastings and Camden Haven areas were more substantial than those he had seen further south. Paperbark sheets provided a waterproof covering over a frame made of boughs of oak (*Allocasuarina* spp.). They had domed roofs, an entry on the sheltered side (away from sea winds) and could hold 8–10 people (Rogers 1982).

In 1844, explorer and botanist Clement Hodgkinson also observed traditional Aboriginal people living on the eastern shores of Queens Lake. In a general comment on Aboriginal people of this part of the east coast obtaining food, he noted ‘a few minutes fishing would provide enough to feed the whole tribe’ (Hodgkinson 1845, p.223).

No detailed description of local Aboriginal peoples around Queens Lake was published after Hodgkinson’s report of 1845, and traditional lifestyles around the lake and adjoining forests had likely been completely disrupted by about 1870 when the intensification of both settlement and the timber industry occurred (Navin Officer 2004).

The penal colony at Port Macquarie was founded in April 1821 and, within a year, was occupied by 100 soldiers and 300 convicts. One of the attractions of the area was the difficulty of escape south to Newcastle and the apparent willingness of Aboriginal people to assist in the recovery of escapees. Escapees trying to skirt the lake before proceeding south were also intercepted at ‘soldier camps’ located adjacent to Queens Lake. It is possible that one of these camps was in the nature reserve in the vicinity of Herons Creek and that adjacent high ground was used as a lookout post from which campfires in the surrounding area could be spotted (CHHS 1997).

The reportedly extensive Aboriginal middens were identified soon after the founding of Port Macquarie as a potential source of lime that could be used (for mortar, render, plaster and whitewash) in the new buildings of the growing settlement. Shell material was excavated from the middens, sifted and then heated, either in kilns or in covered pits or heaps, to produce lime. The so-called ‘lime burners’ operated in the Camden Haven from early 1822 until the early 1830s, including along the northern shores of Queens Lake.

If lime-burning occurred in constructed kilns, no evidence has been found of this or other infrastructure. The lime-burning industry, however, significantly modified the landscape. It is also likely to have contributed to the displacement of the Aboriginal community from culturally important and resource-rich sites. By about 1832, the resource was all but

exhausted and many of the Aboriginal middens, and the archaeological and cultural heritage they contained, had been destroyed.

Despite these impacts, some Aboriginal sites remain in the area, and evidence of the once extensive middens, as well as artefact scatters, tool-making sites and scarred trees are recorded in the vicinity of the parks. A ceremonial ring and a burial site are also recorded. Four Aboriginal sites are recorded within the parks: a modified tree and three artefact scatters. Excavation of a midden at North Haven revealed deposits dominated by oysters, but also included whelk, cockle and pipi shells and the remains of fish and other animals. This indicates a diverse economy based on both fishing and hunting of terrestrial animals in the adjoining forests (Collins 1996, 1997; Silcox 1995).

While the NSW Government has legal responsibility for the protection of Aboriginal sites and places under the National Parks and Wildlife Act, it acknowledges the right of Aboriginal people to make decisions about their own heritage and to be involved in the management of their Country. Aboriginal communities will continue to be consulted and involved in managing Aboriginal sites, places and related issues and in promoting and presenting Aboriginal culture and history. The southern parts of the parks fall into the area covered by the Bunyah Local Aboriginal Land Council and the north-east part is covered by the Birpai Local Aboriginal Land Council. NPWS has a good working relationship with both land councils. Apart from the local Aboriginal land councils, there may also be other Aboriginal community organisations and individuals with an interest in the use and management of the parks. Aboriginal people will be encouraged to access the parks to undertake activities that support and maintain their connection with Country. Such activities should be ecologically sustainable, culturally appropriate and consistent with this plan of management.

In his 1818 passage through the area, John Oxley camped for a night somewhere near the current picnic area near the mouth of Waterloo Creek and had noted the ‘low forest hills’ (Oxley 1820, p.330) and the ‘excellent timber of all descriptions’ (Oxley 1820, p.332). This observation prompted further exploration of the area and led to these forests being among the first in the region to be commercially harvested for timber. From the early 1830s growing camps of timber-getters occupied much of the country around the shores of Queens Lake, alongside the then dwindling camps of lime burners.

Bullock teams would haul logs from the forests to the shores of the lake, as well as to Bobs and Herons creeks. The logs would be transported downstream by water, originally on paddled punts and later by steam droghers. By 1856 there was a steady stream of ships arriving in the Camden Haven to ferry away the cargo of cedar and other logs. By the 1880s there were numerous timber mills in nearby Laurieton.

A reserve on Bobs Creek for ‘wharf and public purposes’ was notified in 1880 and is now part of the nature reserve. The boat ramp at the outlet of Waterloo Creek is one of the few remaining sites where the heritage from the early timber industry can still be seen, although the site is likely to have been dramatically modified since its last use in that context. One early visitor to the area noted that ‘in the forests where the punts haul from, are trees 10ft in diameter and 250ft high’ (Fenning 1997), with mill logs being mainly blackbutt, tallowwood (*Eucalyptus microcorys*) and flooded gum (*E. grandis*).

In the late 1800s, to regulate the timber industry, the NSW Government dedicated much of the remaining forested Crown land in and around what is now the parks, initially as a series of forest reserves (commencing with Cowarra Forest Reserve in 1884) and then as state forest, including Burrawan State Forest in 1914 and Queens Lake State Forest in 1917. The then Forestry Commission excluded logging from the immediate lake edge. As a result, this area now supports some of the parks’ better examples of old-growth forest (see Section 3.2). Elsewhere, silvicultural techniques including ringbarking of less valuable timber species were applied to improve the commercial value of the forest. Various silvicultural practices continued until the reservation of the parks under the National Parks and Wildlife Act.

Interest in protecting the landscape, that in part includes the parks, originated in the 1980s. The NSW National Parks Association commissioned surveys of the plants and animals of the area (e.g. Phillips 1984) to inform the campaign. A proposal for the nature reserve was released in about 1990 (Lee, Dennis & Stewart c. 1990).

Photo 7 **Old jetty, Queens Lake Nature Reserve. John Spencer/DPIE.**

Issues

- Little information is recorded at this stage about traditional cultural values of the parks.
- Changing land uses since the 1820s have potentially resulted in the destruction, removal and masking of tangible links to the past, including sites that would have provided evidence of Aboriginal occupation, early European settlement and industry and the early history of the timber industry. Awareness of this heritage potential should be central to all future management of the area.
- There is, however, much that can be learned from available records without site-based evidence. Recognition and interpretation are potentially valid ways to respect and present the area's heritage (see Section 3.6). Historical documentation may also be used to help guide possible future survey effort.
- First-hand memories of the early forestry industry are becoming scarce and so the opportunity to collect oral histories of this previous land use is disappearing.

Desired outcomes

- Manage the parks to protect the biodiversity values and Aboriginal and non-Aboriginal cultural heritage values.
- Involve the Aboriginal community in efforts to conserve and protect the parks' cultural heritage and biodiversity values and incorporate Aboriginal knowledge, insights and values in these efforts.

- Understanding of the cultural values of the parks is improved.
- Significant Aboriginal cultural and historic heritage features are documented, assessed and protected as appropriate.

Management response

3.4.1 Continue to consult and involve the Bunyah and Birpai local Aboriginal land councils and other relevant Aboriginal community organisations and custodial families in the management of their Country, including the management of Aboriginal sites and places and cultural and natural values.

3.4.2 Undertake an archaeological survey and cultural assessment before all works with the potential to impact Aboriginal and historic sites or values.

3.4.3 Encourage further research into the Aboriginal and historic heritage values of the parks, including collection of oral histories.

3.4.4 Encourage or conduct targeted surveys for Aboriginal sites (including an analysis of landscapes likely to support sites) with priority given to sites where potential is high and/or recreational pressure may occur.

3.4.5 Record historic sites in the parks (particularly forestry sites, such as bridges, log ramps etc.) and assess their significance. Until the heritage value is assessed, undertake necessary stabilisation works. If a site is found to be significant, prepare and implement a conservation management plan or heritage action statement to guide future management.

3.4.6 Recognise and, where appropriate, interpret the parks' heritage in educational and interpretive material.

3.5 Visitor use

NPWS parks and reserves provide a range of nature-based visitor opportunities that complement the more developed and active recreation opportunities that are catered for in the surrounding state forest. NPWS aims to ensure that visitors enjoy, experience and appreciate the parks while their values are conserved and protected.

Overall, the parks generally experience relatively low levels of visitation, although this is expected to increase in the state conservation area with the population growth planned for nearby areas such as Rainbow Beach, Bonny Hills, Lake Cathie and Thrumster. Visitation in the past has mainly been low-impact, self-reliant, nature-based recreation activities, such as bushwalking and birdwatching. There is, however, a growing interest in other styles of more active recreation in the vicinity of the parks, across a range of tenures and a growing level of recreational interest in the north of the parks. The only visitor facility currently provided in the parks is Queens Lake Picnic Area near Waterloo Creek on the shores of Queens Lake (see Figure 1).

Visitor access

Public and forestry roads provide access to the boundaries of the parks. Access can be gained from the west via Bobs Creek Road and Blythes Road and from the north via Houston Mitchell Drive. The south-east section of the nature reserve at North Haven can be accessed via the southern end of Ocean Drive. Within the parks themselves, the principal park roads that provide public vehicle access are Waterloo Creek Road, Spring Creek Road and Queens Lake Road.

There is an extensive network of other roads and trails within the parks, originally constructed to allow timber extraction and plantation establishment. Figure 1 shows the network of park roads and management trails that will be maintained in the parks. The parks' road network provides vehicular access to the key visitor destinations and popular routes through the parks. In contrast, vehicle use of management trails is restricted to authorised users (see Section 5.1). Management trails are, however, available for non-vehicular based recreational pursuits such as bushwalking, cycling and, where designated, horse riding.

Camping

Given the proximity of the parks to the camping areas in Crowdy Bay National Park, as well as commercial caravan parks and other accommodation providers in Bonny Hills, Laurieton and Dunbogan, camping is not permitted in the parks.

Day use and picnicking

Day use areas, typically sites with picnic facilities, are often the main destination for many visitors to parks. The Queens Lake Picnic Area is located on the lake edge, just west of Waterloo Creek, in a relatively tranquil setting in a tall eucalypt forest at the foot of a low hill. It provides picturesque views and direct access to the lake but is not a key destination for swimming or water activities. It is accessible via Waterloo Creek Road and Queens Lake Road. These unsealed roads are suitable for two-wheel-drive vehicles except following prolonged periods of wet weather and can only cater for a low level of use. Originally developed when the area was state forest, it has a consistent but low level of use and appears to meet current requirements. The only facilities provided are tables and a toilet. There is no anticipated increase in visitor demand in the nature reserve as there are many visitor attractions nearby offering water recreation opportunities and spectacular scenery, including Lake Cathie and Perch Hole Day Use Area at Lake Innes Nature Reserve.

In addition to Queens Lake Picnic Area, a few other natural sites (without park furniture or facilities) around the lake and creek foreshores are used occasionally for picnicking or birdwatching. These natural sites can cope with only very low visitation levels and, at busy times, there have been significant impacts through inappropriate waste disposal, lighting of poorly contained fires, damage to vegetation and increased erosion of access tracks. There are, however, no plans for additional formalised visitor day use facilities within the southern section of the nature reserve due to its inability to cope with these impacts. Closing access to these sites may be necessary where damage continues to occur as a result of day use activities.

The significant recreational interest in the north of the parks may be enhanced and better regulated if one of a number of the existing informal 'day use hubs' were formalised. Currently, Hastings Birdwatchers promotes sites in Queens Lake Nature Reserve and Queens Lake State Forest as 'Birdwatching Spots' (Hastings Birdwatchers 2005). Mountain bike riders use a small number of separate 'meeting points' where they park cars, prepare equipment, meet friends and other riders and sometimes share a meal or refreshment before or after riding.

Photo 8 **Queens Lake Picnic Area in the nature reserve. John Spencer/DPIE.**

Bushwalking

Bushwalking is an activity consistently associated with NPWS managed lands. It allows visitors to be in close contact with the environment and can increase understanding and enjoyment of parks and the environment generally. Bushwalking has been historically popular locally in parts of the parks, particularly in proximity to rural residential areas in the vicinity of Jolly Nose Drive and Long Point Drive. There is only a low level of walking occurring in the state conservation area. While the parks do not contain dedicated walking tracks, the extensive legacy of ex-forestry trails in the parks provides many opportunities for walkers to explore the parks' landscapes over a range of terrains and lengths of walk.

Four-wheel drive and trail bike touring

The parks have an extensive network of roads and trails, a legacy from the time when they were state forest as this network was required for timber extraction and plantation establishment. This network also opened up the parks for visitation and contributed to the popularity of exploring the area by four-wheel-drive vehicles and trail bikes. This is a legitimate recreational use of the parks where it is undertaken using registered vehicles and licensed drivers/riders who stay on designated park roads. Figure 1 shows the park road network in the parks that will provide popular vehicle touring routes and access to key visitor destinations.

Cycling

Cyclists are currently the largest single user group visiting these parks. With significant population growth planned to occur to the east of the parks, the demand for cycling opportunities in the parks is predicted to increase. Cycling can be an environmentally

sustainable way of exploring the parks' road and trail network. In accordance with NPWS policy, cycling is generally permitted on park roads in state conservation areas and nature reserves. Cycling is also generally permitted on management trails in state conservation areas, but is only allowed on management trails in nature reserves where it will not degrade natural or cultural heritage values.

The provision of general cycling opportunities within the parks will be consistent with the 'shared cycle access' concept that has been used in the development of the Googik Heritage Track, which links Port Macquarie to Lake Cathie through Lake Innes Nature Reserve. Future potential plans for cycle routes in the surrounding district (for example, a link from Rainbow Beach in the east with Thrumster in the north-west) may incorporate roads or trails in the parks. Cycling along the network of park roads, all management trails in the state conservation area and the two designated management trails in the nature reserve shown on Figure 1 is an appropriate use. This use is not likely to negatively impact park values due to the suitable visibility, width, surface condition and gradient of this network and the low likelihood of conflicts with other track users. Those management trails available for cycling in the nature reserve are shown on Figure 1 and will be indicated by signage.

Photo 9 **Mountain biking is a growing interest in the state conservation area. Sam Dalton/Edge Experience.**

Mountain biking has grown in popularity (Kean 2011; Solomon 2011). As a sport, mountain biking has developed several disciplines, including cross-country, all-mountain, downhill, free-riding, dirt-jumping, pump and trials, some of which are based around technical structures or riding at higher speeds. Of these, cross-country and all-mountain experiences are more compatible with NPWS land management principles, requiring no additional infrastructure, and suited to fostering a public appreciation, understanding and enjoyment of a park's natural and cultural heritage (OEH 2011c).

The most popular areas for mountain biking in the parks are in Queens Lake State Conservation Area near Houston Mitchell Drive. The nature-based experience offered here complements the more developed mountain biking opportunities in the adjacent state forest. As well as park roads and management trails, use in the state conservation area also involves a network of informal single-tracks (which are narrow routes only wide enough to accommodate riders in single file).

These tracks have been broadly assessed and reviewed in consultation with members of the cycling community, with a focus on environmental sustainability, safety, experiential diversity and connectivity of routes across adjacent lands. NPWS proposes to formalise and upgrade some of the tracks for use by cyclists within clearly defined 'mountain bike zones' within the state conservation area (see Figure 2). These zones have been developed to avoid high conservation areas, including freshwater wetlands and swamp mahogany and red gum forests. Consideration was also given to park roads and management trails that are currently used by cyclists and horse riders.

Formalisation of these riding trails will be subject to a mountain biking strategy covering the zones in the state conservation area. The mountain biking strategy will be subject to relevant environmental and cultural assessments to ensure that impacts on park values, such as Aboriginal values and threatened species, are identified and avoided. It will also comply with any additional requirements related to cycling such as those identified in the NPWS cycling policy and the *Sustainable Mountain Biking Strategy* (OEH 2011c). This includes considering opportunities and demand for mountain biking across the region, including other land tenures, ecological sustainability and balancing competing visitor demands. Both the mountain biking strategy and the environmental assessment will be publicly exhibited. Following public exhibition, the mountain biking strategy can be implemented subject to consideration of the outcomes of public exhibition and any constraints and opportunities identified during the environmental impact assessment. The mountain biking strategy will be developed in conjunction with interested stakeholders and park neighbours.

NPWS also proposes to provide opportunities for additional mountain bike track features, subject to assessment and suitable design controls, in the mountain bike zones shown in Figure 2. The development of mountain bike features will be restricted to parts of the state conservation area that were subject to significant past disturbance, such as quarries and logged timber plantations, where the mountain bike features would be considered an adaptive re-use of an already highly modified landscape. Such features would not be suitable in the predominantly natural landscape setting elsewhere in the parks.

When considered in the context of adjacent lands (where, subject to permission or approval, mountain biking may also occur, including those disciplines less suited to NPWS land management principles), the parks will form part of an extensive network of diverse riding opportunities.

There is interest in the local community in the formation of a volunteer track maintenance and rehabilitation group to carry out ongoing maintenance on the track network and to assist in the closure and rehabilitation of those tracks deemed unnecessary or unsustainable. This interest stems from current users, many of whom do not hold affiliations or memberships with any single peak stakeholder group. It is therefore proposed to engage user and community interest through a so-called 'Friends Of' group, where volunteers can register with NPWS to be involved in ongoing maintenance and consultation. Primary governance

and design control will be retained by NPWS within a broad and inclusive consultative framework.

Licensed operators may provide commercially guided mountain bike tours in the parks, including on those tracks that are approved, subject to conditions that will help to regulate user numbers, avoid potential conflicts with other users, enhance opportunities for environmental awareness and education and minimise risks to the safety of inexperienced riders. Competitive mountain bike activities, such as racing, time trials or other competitive forms, are not permissible within the parks.

Horse riding

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 2012) provides a framework to improve riding opportunities in eight priority regions in New South Wales, including the NPWS Lower North Coast Region in which the parks are located. Horse riding opportunities in numerous parks in the region, including these parks, have been progressed in accordance with the *Lower North Coast Region Horse Riding Work Plan 2013* (OEH 2013b).

Consistent with this plan, horse riding will be allowed in the parks on designated sections of park road and management trails indicated in Figure 1. These are primarily in Queens Lake State Conservation Area where there is a small, long-standing and enthusiastic interest in horse riding. Current levels of horse riding are low, both in terms of intensity and frequency.

It is recognised that many riders enjoy horse riding in bushland. Horse riding, like all recreational activities, can have adverse impacts on park values if undertaken in inappropriate locations or without management arrangements in place. Due to safety reasons, horse riding is not allowed on any mountain bike single-use tracks and will not be permitted in any part of the North Haven section of the nature reserve, nor on Queens Lake Road near the lake.

To minimise the risk of increased usage pressure (due to either the number or frequency of rides) and of potential conflict with other users, commercial trail rides will not be permitted. Such opportunities are catered for on other tenures near the Queens Lake parks.

Photo 10 **A solo rider in the state conservation area. Sam Dalton/Edge Experience.**

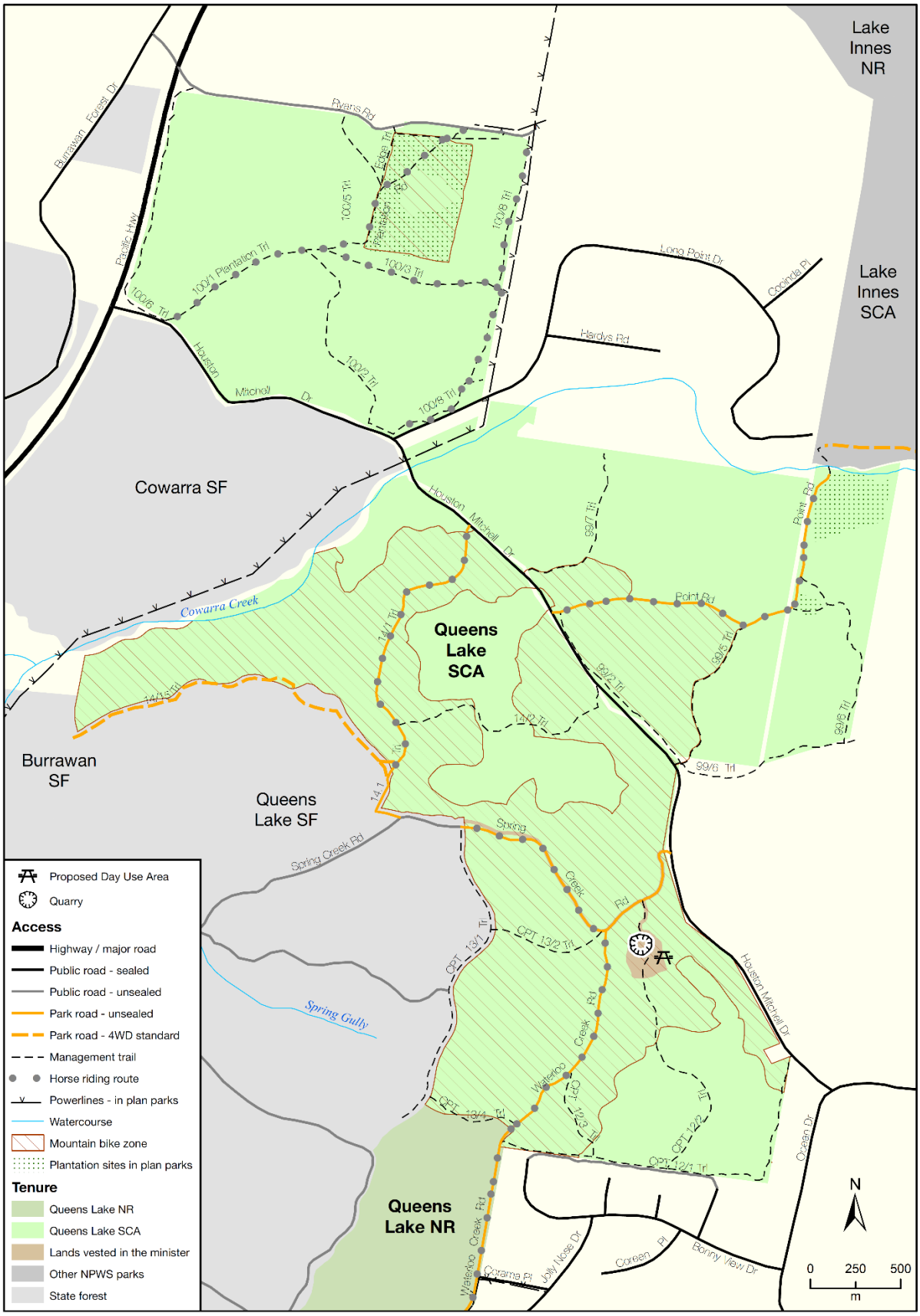

Figure 2 **Mountain bike zones in Queens Lake State Conservation Area**

Geocaching

Geocaching is an outdoor activity based on navigation and skills in using global positioning satellite (GPS) receivers, somewhat akin to a treasure hunt, which is currently popular in the region. It has the potential to increase visitation to parks and help raise awareness and appreciation of parks and their conservation. However, this activity may also potentially damage or disturb plants, animals, soils, rocks and Aboriginal sites, interfere with park infrastructure, conflict with other park users or concentrate visitation at sensitive sites.

The Geocaching NSW Code of Conduct includes adherence to all laws and rules of an area when placing or seeking a cache, including relevant policies applying to public land and minimisation of environmental impacts through following 'Leave No Trace' practices (Geocaching NSW 2014). The NPWS *Geocaching Policy* (DPIE 2019d) provides a framework for proactively managing geocaching within parks to protect natural and cultural values. Under this policy, geocaching is allowed only where it is consistent with the plan of management. Physical caches require prior written consent from NPWS and are prohibited in nature reserves.

Due to the educational merit of virtual caches (also known as 'EarthCaches'), EarthCaching will be given favourable consideration within the parks, although geocachers will still be required to liaise with NPWS to identify suitable sites.

Water-based recreation and fishing

With water frontage to Queens Lake and access to Herons, Bobs and Waterloo creeks, the nature reserve provides opportunities for visitors to access water-based recreational activities such as canoeing, small dinghy sailing, fishing and shoreline picnicking. These are ideal ways to explore the margins of the reserve and to observe wildlife.

The waterways adjoining the parks support both recreational and commercial fishing, and bait collection, including collection of green weed (*Enteromorpha intestinalis*, also called bait weed) for bait and use of traps to catch crabs. Target species include blue swimmer crab (*Portunus pelagicus*), mud crab (*Scylla serrata*), mullet (*Mugil cephalus*) and bream (*Acanthopagrus australis*). Licensing and management of recreational and commercial fishing are regulated under the *Fisheries Management Act 1994*. Commercial fishers who use Queens Lake access the lake from locations outside the reserve. Where access for commercial fishers is required through NPWS managed lands, vehicle-based permits can be issued in line with the Commercial Fishing Access Policy (OEH 2015).

There are two small informal launch points adjacent to the nature reserve in the bay either side of the mouth of Waterloo Creek. Both are only suited to launching small craft like canoes and small dinghies. The launch point on the western side of Waterloo Creek has potential heritage values in the context of its historic use as the point from which harvested logs were floated across Queens Lake to timber mills in Laurieton (see Section 3.4).

A small jetty adjacent to Queens Lake Picnic Area, built when the area was state forest, may also have heritage value. Usage is relatively low, but it draws attention and interest from visitors approaching from land or water.

Group and adventure activities

Under the National Parks and Wildlife Regulation, NPWS consent is required for 'large' non-commercial organised group activities or gatherings, and for competitive events, training exercises or adventure activities of any size. This recognises the fact that certain activities and large groups can have a significant impact on the parks, their wildlife, other users and park neighbours.

Abseiling is classed as an ‘adventure activity’ because it is a recreational pursuit that involves risking the safety of the person engaging in the activity or other persons. As such, it is prohibited under the National Parks and Wildlife Regulation without NPWS consent. A Scout group (1st Port Macquarie Sea Scouts) has been using three sites on the Jolly Nose Escarpment for abseiling since 1988, namely the ‘Steps and Stairs’ (a 4–5 metre drop used for beginners) and two adjacent 40-metre drops. This use pre-dates the reservation of Queens Lake Nature Reserve and continues. Access to these sites is, however, dependent on roads through neighbouring state forest and, as such, may be subject to additional approvals from the Forestry Corporation of NSW and its ongoing maintenance of these roads. No new public vehicle access to the sites will be provided through the parks.

As well as managing the safety risk associated with abseiling, there is a need to limit abseiling’s environmental impacts. Some sites along the Jolly Nose Escarpment show evidence of surface hardening at the assembly points at the tops of the cliffs, scarring of trees used for rope attachment, disturbance to vegetation on the cliff face, and trampling of vegetation and track creation below the cliffs for return access. Placement of any markers or other fixtures is subject to prior approval from NPWS.

Orienteering and rogaining are organised point-to-point style bush navigation activities with competitive or self-challenge elements. The scale of events ranges from small local activities to nationally recognised events involving many participants.

While high-level orienteering and rogaining competitions generally require locations with few or no existing tracks and trails to maximise the navigation challenge to participants, the parks’ extensive trail network provides an attractive ‘introductory level’ venue. Events need to be planned to limit the potential for impacts on the parks’ values and conflicts with other park users and require written consent from NPWS. Permissibility of these events will be assessed against the likelihood of unacceptable impacts on the parks’ natural and cultural values, other park users and infrastructure. Approval for competitive events will be limited to those which rely on the existing park road and management trail network and do not conflict with management activities or other user groups, and will be subject to conditions.

Car rallies are another type of competitive event held in the past in those parts of the parks that were state forest. Under NPWS policy, car rallies are not permitted in nature reserves. In state conservation areas, permission may be granted only for competitors to transit through the park in non-competitive stages to link with the competitive stages outside the park.

Limiting group sizes and imposing conditions on how certain activities are undertaken assists in mitigating potential impacts from large groups or organised activities. The definition of a large group varies according to the activity and its location. Consequently, those participating in activities with the potential for higher impacts will require consent for smaller group sizes than those participating in activities with lower impacts. Group size thresholds for non-commercial group activities in these parks are listed in Table 4. Under the National Parks and Wildlife Act, all commercial tourism operators require a licence to operate in a park, regardless of the size of their groups.

Table 4 Group size thresholds

Activity description	Group size requiring consent	Details/Comments
Vehicle-based touring	Convoys of more than five vehicles. Rallies of any size.	Applies to 2WD, 4WD and motorbikes. No competitive stages of car or motorbike rallies permitted. Transit stages of rallies permitted only in the state conservation area.
Horse riding	Groups of more than 10 horses.	Only on designated roads and trails as per Figure 1. No competitive or commercially guided horse riding.
Abseiling	All groups of any size.	Subject to consent, maximum permitted group size is 12, with a maximum of six visits per calendar year. Instructional groups to include no more than eight trainees, with at least one instructor for every four students.
Orienteering/ rogaining	Casual groups of more than five people. Organised events of any size.	Conditions restrict participants in large organised events to existing trails as per Figure 1. Those in smaller events may leave the trail network but must avoid walking in single file, to minimise creating new tracks.
Cycling	Groups of more than 12 riders.	Permitted on all park roads and on management trails and tracks as indicated by signage. No competitive cycling events permitted; transit stages may be permitted in the state conservation area.
Other permissible activities	Groups of more than 20 people.	Conditions may be applied to groups larger than 20 people to minimise impacts.

Issues

- The planned expansion of urban settlement in the vicinity of the parks is likely to create significant extra demand on recreational and open spaces in the surrounding area, including these parks and the potential for conflicts in recreational use.
- There is currently limited signage to assist visitors in navigating the road and trail network in the parks, or in understanding the parks' values or what uses are considered appropriate (see Section 3.6).
- Recreational use of the parks has evolved in a relatively unplanned fashion and in some cases this has led to environmental damage in the parks. For example, some issues associated with unregulated four-wheel drive touring and trail bike use include:
  - off-road use by vehicles
  - the use of unregistered trail bikes (sometimes by unlicensed riders)
  - overuse and erosion on challenging 'hill-climb' sites.
- These activities damage trail surfaces and vegetation, exacerbate the spread of weeds, increase erosion, reduce local water quality and compromise the efficacy and safety of trails used for emergency responses and the management of fire within the parks. The road and trail network will be rationalised for environmental protection to reduce the impacts and to ensure safe access for appropriate purposes (including pest and fire control) while reducing ongoing maintenance costs (see Sections 3.4 and 5.1).
- Other high-impact, unauthorised activities that occur in the parks include dog walking and unauthorised construction of new tracks for mountain bike use. These activities also impact the parks' values and the experiences of other park visitors and neighbours.

- Development of a mountain biking strategy for the state conservation area is warranted, given the increase in numbers using the parks for this activity. Minimising impacts may require site-specific controls or seasonal or spatial restrictions.
- NPWS will participate in planning a regional cycle trail system in consultation with relevant stakeholders, to improve connectivity with cycling opportunities on adjacent public lands.
- The ownership, liability and legal status of the jetty at Queens Lake Picnic Area and the canoe launch sites on either side of Waterloo Creek are unclear. As most of these structures extend below the mean high water mark, they are not within the nature reserve. These issues need to be resolved in consultation with the relevant waterway and land management agencies.
- Organised use of the abseiling sites on the Jolly Nose Escarpment in the nature reserve is recognised as a long-standing existing use at the time of reservation but it requires ongoing regulation and management.
- There is ongoing interest in using parts of the parks for large-scale competitive events involving running or cycling or car rallies. However, under NPWS policy, higher impact and competitive activities are not permissible in nature reserves. Some events may be permissible in the state conservation area, subject to conditions to mitigate impacts.

Desired outcomes

- Visitor opportunities encourage appreciation and awareness of park values and their conservation.
- Visitor use of the parks is appropriate and ecologically sustainable.
- The parks offer a diverse range of visitor uses while limiting potential user conflicts.
- Negative impacts of visitor use on park values is minimised.

Management response

3.5.1 Allow public vehicle access to park roads shown in Figure 1 but not on management trails. Roads in the parks may be closed following extended periods of wet weather to ensure public safety and protection of park values.

3.5.2 Rationalise the existing informal track network through closing or re-routing some tracks and ensure a diversity of walking opportunities across different landscapes is maintained when rationalising park roads and trails.

3.5.3 Monitor impacts of all visitor use activities, including horse riding and mountain bike riding. Where impacts are unacceptable, establish mechanisms to regulate access to acceptable sites and manage participant numbers and intensity, which may include seasonal or other closures.

3.5.4 Continue to manage and maintain the Queens Lake Picnic Area as the principal visitor location within the parks.

3.5.5 Encourage visitors in the Queens Lake Picnic Area to use fuel stoves.

3.5.6 Investigate demand for an additional day use node at Spring Creek Quarry or another location in the state conservation area close to the proposed cycle access and mountain bike zones. If suitable, based on demand, feasibility and environmental assessment, install facilities such as car parking, a shelter and picnic tables.

3.5.7 Prohibit camping and wood fires in the parks. Maintain regulatory information on entry signs to inform visitors of these prohibitions.

Cycling

3.5.8 Maintain and encourage cycling opportunities on park roads, on all management trails in the state conservation area, on designated management trails in the nature reserve (see Figure 1) and (subject to a mountain biking strategy) on authorised tracks within the planned mountain bike zones shown on Figure 2. Temporarily close tracks and trails to cycling during wet weather to minimise damage if required.

3.5.9 In conjunction with Port Macquarie-Hastings Council and other stakeholders, participate in the planning, assessment and development of a cycling route utilising the parks' existing road and trail network to link the Googik Heritage Track with planned cycle access opportunities within nearby urban growth areas.

3.5.10 Develop a mountain biking strategy for the state conservation area that will:

- Be subject to environmental, social and safety considerations, including the outcomes of environmental impact assessment.
- Provide for single-track mountain biking opportunities within the mountain bike zones (as shown in Figure 2) if they avoid features that present safety and erosion risks.
- Propose and develop track opportunities based on the assessment of demand, feasibility and environmental assessment.
- Locate opportunities for riding to minimise impacts on the park's natural and cultural values. This will necessitate rationalising the existing informal track network through closing or re-routing some tracks.
- Consider potential conflicts with other recreational users, including horse riding and bushwalking interests.
- Follow the international mountain biking association track standards in the design, construction and maintenance of tracks.
- A park-specific code of conduct for mountain bike riders will be developed and implemented; this will include a rule that cycling will only be permissible on those management trails and tracks which are signposted (i.e. A 'No Sign: No Ride' policy is to be adopted and enforced).
- Include assessment of the appropriateness of a day use area and mountain bike hub in the former Spring Creek Quarry with consideration given to incorporating mountain bike track features within the quarry site's rehabilitation.
- Identify those tracks that will be closed and rehabilitated (i.e. those not authorised by the mountain biking strategy).
- Be developed in conjunction with interested stakeholders, Regional Advisory Committee input and park neighbours.
- Both the mountain biking strategy and the environmental assessment will be publicly exhibited.

3.5.11 Install and maintain signs on those management trails and tracks where cycling is allowed. Adopt and enforce a strict 'No Sign: No Ride' policy.

3.5.12 Work with the local cycling community and stakeholder groups to support volunteer participation in planning and to assist with maintenance and rehabilitation works as part of a 'Friends Of'' group.

Horse riding

3.5.13 Allow horse riding on those roads and trails as identified in Figure 1. Additional infrastructure will not be provided.

3.5.14 Maintain communication with local horse riding groups to encourage their participation in regular weed control, clean-ups and other activities in the parks.

Geocaching

3.5.15 Prohibit the placing of physical caches in the nature reserve. Permit promotion of EarthCaches at approved sites that do not compromise the conservation of the park's values.

3.5.16 Permit physical caches in the state conservation area subject to NPWS approval and conditions that will include that caches are small and discrete, located in an approved site and not buried or hidden using any burrows, hollows or other wildlife habitat features.

Water-based recreation

3.5.17 Work with the relevant waterway and land management authorities to confirm the status of the jetty at Queens Lake Picnic Area and ensure maintenance occurs to address any safety risks associated with the structure.

3.5.18 Maintain access to the small-boat launching points on either side of Waterloo Creek. Close informal trails to discourage launching of vessels at other sites within and adjacent to the nature reserve.

3.5.19 Subject to the agreement of the relevant waterway and/or land management authority, upgrade the canoe launch points to maintain user safety.

Group, adventure and commercial activities

3.5.20 Require all non-commercial group activities larger than the group size limit given in Table 4 to obtain prior written consent. Consent may be subject to conditions to minimise impacts on park values and other visitors.

3.5.21 Prohibit organised competitions in the nature reserve. Non-competitive transit stages of competitive events may be permitted in the state conservation area on a case-by-case basis following consideration of potential social and environmental impacts. Consent will be subject to conditions to minimise impacts on park values and other visitors and will include a requirement to restrict activities to the existing trail network.

3.5.22 Permit abseiling, subject to NPWS consent, only by groups associated with the existing use of the 1st Port Macquarie Scout Group or related commercial licensees at the three sites on the Jolly Nose Escarpment, subject to maintenance of appropriate accreditations and insurances and a maximum group size as outlined in Table 4.

3.5.23 Document the approved sites for abseiling in a site plan to be attached to any consents or licences.

3.5.24 Do not provide facilities for car parking, toilets or picnicking within the parks at abseiling sites and prohibit placement of markers or fixtures without consent.

3.6 Information, engagement and education

Visitor information, engagement and education is an important aspect of park management because it enhances visitor experience and understanding while promoting appropriate use.

Information provision assists the protection of natural and cultural heritage, promotes support for conservation and increases the enjoyment and satisfaction of visitors. Community involvement through volunteering, including being involved in management

activities and data collection in citizen science projects, provides opportunities for people to be a part of the management of a park and to develop a sense of ownership and commitment to its protection and conservation.

There is currently little information available to the general public and visitors to the parks regarding the parks' values and NPWS management programs, or to assist visitors in navigating through the parks' network of roads and trails. Additional signage will be required on those management trails and tracks available for mountain biking to allow implementation of the 'No Sign: No Ride' policy.

Interpretive and promotional themes particularly relevant to the parks include the diversity of native plants and animals, Aboriginal cultural heritage and values, links to the convict era, the early lime-burning history and the parks' forestry history (see Sections 3.2, 3.3 and 3.4).

Low-key interpretive facilities would be appropriate at key visitor access locations such as Queens Lake Picnic Area and at the proposed day use site in the state conservation area. Small trackside signs may also be appropriate at the boat ramp on the western side of Waterloo Bay where logs were floated for transport down to timber mills in Laurieton (see Section 3.4) or in interpretive bays in the mountain bike zones (see Section 3.5). In addition, improved mapping may be made available such as through signposting and map displays.

There is interest in the local community in assisting with park management activities. NSW national parks benefit enormously from the help of volunteers in the community and this provides a great way for visitors and recreational users to connect with their environment, meet new people and experience some of NSW's finest natural locations.

Issues

- There is currently limited signage to assist visitors in navigating the road and trail network in the parks. There is also little information available to visitors to aid in their understanding of the parks' values and appropriate recreational uses.
- There are opportunities to increase understanding and appreciation of the parks' values and to increase community involvement in park management, including local stakeholder groups and visiting schools.

Desired outcomes

- Visitors are aware of recreation opportunities and can easily find their way to park facilities.
- There is widespread community understanding and appreciation of the parks' natural and cultural values.
- The parks' potential as a useful educational resource for local schools and community organisations is realised.

Management response

3.6.1 Improve signposting of the parks' roads and trails.

3.6.2 Provide interpretive, safety, visitor orientation and minimal impact use information at visitor sites as appropriate.

3.6.3 Engage with local school communities to highlight opportunities for learning and participating in park management where this meets school interests and objectives.

3.6.4 Work with the local community and stakeholder groups to support volunteer participation in park management activities, such as monitoring and data collection, bush regeneration, clean-up days and maintenance works.

4. Threats

4.1 Pests

Pest species are plants, animals and pathogens that have negative environmental, economic and social impacts. They are most commonly introduced species. Pests can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values.

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and pest animals. These requirements apply equally to public and privately owned land. Under this framework, Local Land Services (LLS) has prepared regional strategic weed management plans and regional strategic pest animal management plans for each of its 11 regions, including the North Coast Region (North Coast LLS 2017, 2018).

The LLS plans identify priority weeds and pest animals in each of the regions, plus the appropriate management response for the region (i.e. prevention/alert, eradication, containment or asset protection).

NPWS prepares regional pest management strategies that identify the operations and control actions undertaken by NPWS to meet the priorities from regional strategic pest and weed management plans. This also includes other important programs such as the *Biodiversity Conservation Program* (see Sections 3.2 and 3.3). The overriding objective of the NPWS regional pest management strategies is to minimise adverse impacts of introduced species on biodiversity and other park and community values while complying with legislative responsibilities. These strategies are regularly updated. Reactive programs may also be undertaken in cooperation with neighbouring land managers in response to emerging issues.

Pest species that are also key threatening processes may be managed under the *Biodiversity Conservation Program* where it includes key threatening processes strategies. The *Saving our Species* program has developed targeted strategies for managing key threatening processes using the best available information to minimise current and future impacts of key threatening processes on priority biodiversity values, including threatened species and ecological integrity.

Major pests of concern in the parks are listed in Table 5. These are currently targeted in priority regional pest programs. However, priorities may change over time as pests are brought under control, or as new threats emerge.

The parks may be susceptible to a wide range of pest species impacts due to their high perimeter-to-area ratio, the extensive network of ex-forestry trails and long history of forestry-related disturbance and dumping of garden waste.

Table 5 Significant pest species recorded in the parks

Common name	Scientific name	Comment
Weeds		
Bitou bush [1 2 3]	*Chrysanthemoides monilifera* subsp. *rotundata*	Localised control along lake edges occurs to reduce impacts on significant vegetation.
Crofton weed [4]	*Ageratina adenophora*	Control occurs within existing bush regeneration programs and at visitor nodes.

Common name	Scientific name	Comment
Invasive grasses, e.g. Vasey grass [2] giant Parramatta grass [2]	*Paspalum urvillei, Sporobolus fertilis*	Particular issue for roadside spread and contamination of passing vehicles. Control occurs within existing bush regeneration programs, on roadsides and at visitor nodes.
Lantana [1 2 3 4]	*Lantana camara*	Priorities for control: in swamp sclerophyll forest and other threatened ecological communities; where threatened species are at risk; within existing bush regeneration sites.
Mother of millions [2]	*Bryophyllum* sp.	Localised infestation at Spring Creek Quarry.
Pine wildings	*Pinus* spp.	Isolated in extent and distribution; originating from sources outside the parks.
Pest animals		
European honeybee [2]	*Apis mellifera*	Control if posing a risk to the public at visitation nodes.
Wild dog [2 4]	*Canis lupus* subsp.	Control as required to minimise risk of harm to people and livestock, and unsustainable predation on wildlife.
Goat [2 4]	*Capra hircus*	Reactive control of escaped domestic animals.
Wild deer [2 4]	*family Cervidae*	Experimentation with various control techniques required.
Feral cat [2 4]	*Felis catus*	Control aims to protect ground-nesting or -roosting birds, and arboreal mammals such as gliders.
Plague minnow [2]	*Gambusia holbrooki*	Monitor fire dams and perennial creeks.
Feral rodents [2]	*Rattus* sp. & *Mus musculus*	Monitor for new outbreaks or impacts on specific threatened species and habitat features.
Common (Indian) myna [4]	*Sturnus tristis*	Monitor for new outbreaks or impacts on threatened species and habitat features.
Red fox [2 4]	*Vulpes vulpes*	Control aims to protect ground-nesting or -roosting birds and/or critical weight range mammals.

1 Weed of National Significance (Australian Government no date).

2 Listed as a key threatening process under the Biodiversity Conservation Act.

3 State-level priority weeds (North Coast LLS 2017).

4 Regional level priority weed or pest animal (North Coast LLS 2017, 2018).

Pest plants, in particular the state-priority weeds (bitou bush and lantana), have been identified as impacting habitat structure and composition and some vulnerable plant communities in the parks (see Section 3.2). While no sites in the parks are identified as

priority sites for the control of these species in the relevant threat abatement plans (DEC 2006; Biosecurity Queensland 2010), targeted ground spraying of both species commenced in 2009 at sites selected based on a preliminary assessment of ecological priority. In addition, community-based weed control programs using bush regeneration techniques have run intermittently since about 2002 and provided control at additional sites.

Bitou bush occurs at low density at sites scattered across the parks, primarily along areas close to the lake and estuarine creeks. It appears from the pattern of occurrence and distribution that a number of native and feral animals may spread the seed of bitou bush. Continued invasion by bitou bush threatens the old-growth forest habitats along the shores of Queens Lake, with a risk of changing understorey structure and species composition, compromising natural seedling recruitment and of changing the habitat characteristics upon which a number of animals depend (see Section 3.2).

Lantana is a vigorous invader of disturbed areas and is also spread mainly by birds. It often forms dense thickets and the associated structural changes are likely to impact foraging success and mobility of several animal species. Within the parks, lantana appears to be present in two growth forms or habitats:

- In wet eucalypt forest types on moderately productive soils, particularly in areas with a history of disturbance by forestry activities, lantana can form aggressive dense thickets that take over entire sites and smother the understorey. Several sites with these characteristics lie along the eastern fall of the Jolly Nose Escarpment and in the valley around Waterloo Creek, coinciding with known habitat for large forest owls and gliders, including the yellow-bellied glider and greater glider.
- In drier forests on lower productivity soils, lantana appears as scattered clumps of isolated plants. These clumps do not appear to have sufficient foliage density to completely smother other species or climb surrounding vegetation. These locations coincide with habitats also likely to support significant animals such as brush-tailed phascogales, squirrel gliders and micro-bats.

Foxes suppress native animal populations, particularly medium-sized, ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. They have also been implicated in the spread of a number of weed species such as bitou bush. They are known to prey on domestic stock, including lambs and poultry. Predation by foxes is a key threatening process under the Biodiversity Conservation Act (NSW SC 1998) and Environment Protection and Biodiversity Conservation Act (DoE 2009). Foxes are being controlled at priority sites across New South Wales to protect biodiversity under an approved threat abatement plan (OEH 2011b). While foxes are known to occur in the parks and across much of the local landscape, no sites in the parks are identified as priorities for control under the fox threat abatement plan.

Wild dogs are known to occur within the parks. Wild dogs impact livestock and may also have significant impacts on the distribution and abundance of native wildlife. As discussed in Section 3.3, however, it is believed that some wild dogs in the parks are genetically similar to dingos. Within the parks and adjoining forests, wild dog populations appear to be relatively low with a fairly stable permanent presence. To date, impacts on neighbours from wild dogs seem to be limited. The Biosecurity Act introduced the general biosecurity duty which requires all landowners to control wild dogs to the extent necessary to minimise the risk of negative impacts on their lands or that of their neighbours (DoI 2017). Wild dog control will focus on preventing impacts on neighbouring agricultural enterprises. NPWS responds to reports with localised trapping using soft-jawed leg-hold traps and impacts generally abate following removal of several dogs. The ongoing risk to neighbours' livestock appears to be low and effectively managed in this reactive fashion.

Wild deer, believed to be predominantly rusa deer (*Cervus timorensis*) but potentially also fallow deer (*Dama dama*) and red deer (*C. elaphus*), are regularly reported along the Pacific

and Oxley highways and occasionally seen along Houston Mitchell Drive, which bisects the parks. It is estimated that several hundred wild deer are dispersed across the NSW Mid North Coast, with populations increasing (NPWS 2006). Wild deer can have major impacts by competing with native species for forage, changing the structure and composition of plant communities by selective over-grazing of preferred species and ringbarking young trees and causing soil erosion through repeated use of pathways (NSW SC 2004). High densities of wild deer have been found to reduce the diversity and abundance of the understorey in rainforest by as much as 70% (DEC 2005a). Given the proximity of major arterial roads in the area where wild deer have been observed, wild deer in the parks also present a risk to public safety.

Wild or feral populations of the **European honeybee** are known to occur extensively in the parks. There are no licensed apiary sites in the parks. Competition from feral honeybees is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2002). Occupation of tree hollows by feral honeybees reduces the number of hollows available for native animals, particularly in those areas of young forest with reduced hollow availability (see Sections 3.2 and 3.3). Threatened animals known from the parks likely to be affected by competition from honeybees for hollows include the brush-tailed phascogale, squirrel glider, yellow-bellied glider, powerful owl, sooty owl, masked owl, glossy black-cockatoo and micro-bats (NSW SC 2002).

Myrtle rust is a plant disease caused by the exotic fungus *Uredo rangelii*. First detected on the NSW Central Coast in 2010, it is widely distributed in the district surrounding the parks, including nearby Bonny Hills. Myrtle rust infects young actively growing shoots, leaves and flower buds of plants in the Myrtaceae family (which includes eucalypts and many other species in open forests and rainforests). It may cause significant mortality among younger plants, reducing recruitment to adult populations. It is spread via spores carried by wind, animals and human activity. The introduction and establishment of myrtle rust is included in a key threatening process under the Biodiversity Conservation Act (NSW SC 2011). A statewide management plan (OEH 2011a) outlines measures to respond to outbreaks in NPWS parks.

Desired outcomes

- Negative impacts of pest plant and animal species on park values are minimised.
- Pest plants and animals are controlled in accordance with statutory obligations.

Management response

4.1.1 Manage pest species in line with pest management strategies relevant to the parks.

4.1.2 Undertake pest control in cooperation with relevant local land management agencies and local council.

4.1.3 Seek the cooperation of stakeholders (e.g. mountain bike riders and horse riders) in implementing pest control programs and, where necessary, discuss and design suitable facilities (such as sediment and weed propagule traps on single-use tracks) to help limit the spread of pest species as a result of visitor use.

Wild dogs

4.1.4 Control wild dogs to address issues, in cooperation with neighbours and the relevant local land management agency.

4.1.5 Continue to assist the relevant local land management agency in the preparation and implementation of strategic wild dog management plans for the wider area.

Wild deer

4.1.6 Maintain ongoing support for and cooperation with the Mid North Coast Feral Deer Working Group, as part of a landscape approach to monitoring the extent and intensity of the wild deer problem in the area.

4.1.7 Facilitate and participate in deer control programs in cooperation with neighbours.

Myrtle rust

4.1.8 Manage myrtle rust in the parks in accordance with the Management Plan for Myrtle Rust on the National Parks Estate.

4.1.9 Monitor the extent and intensity of myrtle rust in the parks.

4.2 Fire

The primary objectives of NPWS fire management are to protect life, property, 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 2013a).

Fire is a natural feature of many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can also lead to loss of particular plant and animal species and communities. High frequency fire resulting in the disruption of life cycle processes in plants and animals, and loss of vegetation structure and composition, has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b).

The fire history of the parks is reasonably well documented since 1999. Before then, fire history has been collated from records of wildfire events and some control burns, plus what can be inferred from the likely use of fire as part of a wider scheme to enhance timber stand productivity and community safety in those areas that were previously state forest. Based on this information and the observations of previous studies in the area (e.g. Lee, Dennis & Stewart c. 1990; Milledge 1979; NPWS 1994), it is likely the historical fire regime has been too frequent from a biodiversity perspective.

A fire management strategy has been prepared to guide management of planned and unplanned fires in the parks (DEC 2005b). This strategy is updated from time to time. It outlines key assets within and adjoining the parks, including sites of natural and cultural heritage value, fire management zones and fire control advantages such as management trails and water supply points. It also contains fire regime guidelines for the conservation of the parks' plant communities.

Under this strategy, most of the parks are designated as land management zones in which the objective is to conserve biodiversity and protect cultural heritage. The priority of fire management in these zones will be to maintain and enhance species and structural diversity within the plant communities. This will be achieved by ensuring that a high proportion of a given habitat type is not burnt in any single year and that appropriate intervals between fires are maintained. The road and trail network that will be maintained allows for prescribed burns to achieve a mosaic of burnt and unburnt country.

The strategy also identifies some parts of the parks as strategic fire advantage zones. These are used to reduce fire intensity across larger areas and assist in limiting the spread of wildfire to and from neighbouring lands and within the parks.

Asset protection zones are used to reduce the risk of bushfire to community assets in or adjacent to the parks. The only asset protection zone in the parks is part of a licensed clearing that pre-dated NPWS management of the south-east portion of the nature reserve, which protects a church on the northern edge of North Haven.

To reduce the ignition of unplanned bushfires, prior NPWS approval is needed for all fires in the parks.

NPWS maintains cooperative arrangements with surrounding landowners and the Rural Fire Service and is actively involved with the local bush fire management committee. 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 bush fire management committee.

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 parks is minimised.
- Fire regimes in the bulk of the parks are appropriate for the conservation of native plant and animal communities.

Management response

4.2.1 Implement the fire management strategy for the parks. Regularly review the strategy and update it as required.

4.2.2 Continue to be involved in the local bush fire management committee and maintain cooperative arrangements with local brigades, other fire authorities and surrounding landowners with regard to fuel management and fire suppression.

4.2.3 Monitor the ability of significant plant species and communities to recover between fires and review regimes where relevant.

4.2.4 Consider implementing pest animal control programs following any extensive wildfire events (greater than 100 hectares) to minimise the impacts of feral predators and over-grazing by feral herbivores.

4.3 Climate change

Human-induced climate change is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000a) and the associated loss of habitat is listed under the Environment Protection and Biodiversity Conservation Act (TSSC 2001).

The latest information on projected changes to climate are from the NSW and ACT Regional Climate Modelling (NARClim) project (OEH 2014). The climate projections for 2020–39 are described as ‘near future’; and projections for 2060–79 are described as ‘far future’. The snapshot shown in Table 6 is for the North Coast Region which includes the parks.

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 North Coast Region and result in an earlier start to the bushfire season (DECCW 2010). Higher rainfall and rainfall intensity in the region in spring and autumn are likely to increase runoff at these times of year which, in turn, is likely to increase the incidence of sheet and rill erosion on steeper slopes and of riverine and regional flooding (DECCW 2010).

Table 6 North Coast Region climate change snapshot

Projected temperature changes	
Maximum temperatures are projected to **increase** in the near future by 0.4–1.0°C	Maximum temperatures are projected to **increase** in the far future by 1.5–2.4°C
Minimum temperatures are projected to **increase** in the near future by 0.5–1.0°C	Minimum temperatures are projected to **increase** in the far future by 1.6–2.5°C
The number of hot days will **increase**	The number of cold nights will **decrease**
Projected rainfall changes	
Rainfall is projected to **decrease** in winter	Rainfall is projected to **increase** in spring and autumn
Projected Forest Fire Danger Index changes	
Average fire weather is projected to **increase** during summer and spring	Severe fire weather days are projected to **increase** in summer and spring

Source: OEH 2014.

Climate change may significantly affect biodiversity by changing the size of populations and the distribution of native species and by 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.

Highly cleared and fragmented ecosystems are likely to be at greater risk than more intact ecosystems (see Section 4.4). In these areas in particular warmer temperatures are likely to worsen weed infestations. Weeds, such as lantana, can replace native species as a major food source for seed dispersers such as fruit-eating birds, thereby facilitating further invasion of those weeds (see Section 4.1).

The potential impact of climate change on the parks' plant and animal communities is difficult to predict with any accuracy since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from feral animals. If fire extent increases under future conditions of increased fire danger, fire-sensitive ecosystems such as rainforest could be substantially changed.

The parks include significant areas of land below five metres above sea level. These will be susceptible to inundation due to the compounding impacts of storm surges associated with more frequent storm events and sea level rise. This is likely to result in the conversion of low-lying freshwater wetlands into estuarine systems.

The parks, however, do include sections (particularly along the Jolly Nose Escarpment) with a significant altitudinal range. This may provide some of the parks' plant and animal communities the opportunity to migrate upwards to escape climate change impacts. In addition, programs to reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires and pollution, will help reduce the severity of the effects of climate change.

Desired outcome

- The effects of climate change on natural systems are moderated where possible.

Management response

4.3.1 Continue existing fire, pest and weed management programs to increase the parks' ability to cope with future disturbances, including climate change.

4.4 Isolation and fragmentation

The parks, together with nearby Lake Innes Nature Reserve and State Conservation Area, form part of a vegetated corridor of public lands that is used for both north-south and east-west wildlife movements (Scotts 2003). Some neighbouring areas, however, have been cleared for rural residential or agricultural activities and others support highly modified native forests or plantations. This reduces connectivity of wildlife habitat across the landscape.

As many species have home ranges that extend beyond the parks, long-term conservation of the parks' natural values depends on the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands. The genetic vigour of isolated populations of species may decline if the current levels of connectivity are reduced. In particular, the connectivity of coastal wetlands and low coastal blackbutt forests from North Haven around Queens Lake may be critical to movement of wildlife and ecosystem resilience to changes in climate and sea levels (see Section 4.3).

The coastal villages of North Haven and Bonny Hills, together with associated residential areas such as Bonny View Estate, also place pressure on the parks through a range of factors, including stormwater drainage, predation or roaming by pets (see Section 4.1), unauthorised recreational activities (see Section 3.5), plant theft, encroachments and rubbish dumping. Cooperative arrangements with neighbours are important for the management of access, fire, weeds, domestic pets and pest animals.

Photo 11 **Queens Lake with the town of Camden Haven in the distance. John Lugg/DPIE.**

The parks' network of roads and trails also fragments connectivity of wildlife habitat within the parks. This will be reduced through the rationalisation of the roads and trails to only those necessary for visitor access and park management (see Sections 3.5 and 5.1). NPWS will aim to reduce the ongoing impacts of the roads and trails by minimising the amount of clearing along maintained roads and trails and targeting the control of weeds in these corridors (see Section 4.1).

Houston Mitchell Drive is a council-managed road bisecting Queens Lake State Conservation Area that provides access from the Pacific Highway to Bonny Hills and nearby urban growth areas. Port Macquarie-Hastings Council has upgraded this road to improve its safety and accommodate the planned increase in use. NPWS will continue to work with council to assess and mitigate potential impacts associated with this road. Options include retaining canopy connectivity as much as possible, installing artificial wildlife links, ensuring ongoing public access to key visitor entry points into the park, improving drainage and weed control and controlling access into the management trail network.

Desired outcomes

- The negative impacts of isolation and fragmentation are avoided where possible.
- The integrity of the parks' boundaries is maintained.
- Corridor values are enhanced.

Management response

4.4.1 Maintain cooperative arrangements with nearby landholders regarding access, fire and pest species management.

4.4.2 Encourage protection and enhancement of native vegetation on public and private lands in the vicinity of the parks, particularly in identified key habitats and wildlife corridors.

4.4.3 Continue to work with local council regarding the management of Houston Mitchell Drive to reduce the road's impacts on the parks' values and NPWS management of the parks.

5. Management operations and other uses

5.1 Management facilities and access

Most management facilities in the parks are a legacy of past forestry operations. They include the network of roads, management trails, former trails and snig tracks, as well as dams, loading ramps, a quarry and other small gravel pits. Where these are not required for NPWS management purposes they will be allowed to decay and revegetate naturally, unless works are required for safety or environmental reasons or where some sustainable and appropriate alternative use may be considered.

Access roads

Rationalising the road and trail network within the parks is a key objective of this plan. Figure 1 identifies which roads are suited to continued public vehicle use and access to visitation nodes. It also identifies which management trails will be retained primarily for NPWS management or other authorised purposes, including bushwalking and (on identified trails) cycling and horse riding. Trails retained for NPWS management or other authorised purposes will be renamed from previous numbered trails to reflect local geographical or biological features and provide for an appropriate NPWS identity. All other trails will be closed and allowed to revegetate, although some may be temporarily reopened during emergencies.

Dams and loading ramps

Dams present in the parks are generally of small volume and used to store water for fire management purposes. Most are encumbered by regrowth vegetation. Those identified and marked on the fire management strategy (DEC 2005b) will be maintained.

Loading ramps were constructed at various locations throughout the parks when they were state forests to assist in the transport of equipment used for road building and timber harvesting. Generally built of logs, most are in an advanced state of decay. Some are being maintained where they can assist in loading light plant (such as ride-on mowers and tractors) on and off transport vehicles.

Quarry

Spring Creek Quarry, located on 12.2 Trail, is the only functional quarry within the parks. It has a limited supply of good quality road gravel, which is used for the maintenance of the roads and trails within and adjacent to the parks. The land on which the quarry lies is not reserved as part of the surrounding state conservation area but rather has been retained as Crown land that is vested in the Minister for the Environment under Part 11 of the National Parks and Wildlife Act (see Figure 1).

The exclusion of this quarry from the area reserved as Queens Lake State Conservation Area was to ensure the continuation of existing access arrangements and to allow it to be managed primarily for extraction rather than nature conservation purposes. It is being managed according to the *Mines Inspection General Rule 2000* and relevant NPWS policies and guidelines. NPWS is responsible for the ongoing management of this quarry.

When the resource in the quarry is exhausted, the quarry will be closed, made safe and, subject to safety considerations, may be rehabilitated. Once extractive uses cease, the area may be reserved and added to the surrounding state conservation area.

Sections of the quarry may already be suitable for closure, rehabilitation and/or re-use for other purposes. Subject to an approved mountain biking strategy, the closed quarry may be redeveloped as a day use area or mountain bike hub to support recreation in this section of the state conservation area (see Section 3.5).

The parks also include several small inactive gravel quarries, such as on Point Road (west of its intersection with 99.6 Trail) and on Waterloo Creek Road (east of its intersection with 5.1 Trail). These quarries may contain a valuable gravel resource for maintaining roads and trails in the parks and may be reopened in the future to provide road base material as required. Several small unviable gravel pits are slowly being revegetated by natural processes.

Desired outcome

- Facilities and access have minimal impact on the parks and enhance management opportunities and efficiency.

Management response

5.1.1 Maintain the park road and management trail network as shown on Figure 1. Install gates and/or signs to prevent unauthorised public vehicle access to management trails where required.

5.1.2 Re-name trails to reflect local geographical or biological features or other appropriate local references.

5.1.3 Retain those dams that hold water and provide a strategic advantage for fire management purposes. Periodically maintain these to ensure access for vehicles and security of water supply.

5.1.4 Maintain loading ramps that may provide a management advantage for transport and loading of small plant and machinery where appropriate.

5.1.5 Implement the quarry management plan for Spring Creek Quarry to utilise the stockpiled gravel and extract further gravel from within the existing footprint, to supply material for essential maintenance of roads within or accessing the parks.

5.1.6 Close the Spring Creek Quarry when the gravel resource is exhausted (potentially in stages), make safe and investigate rehabilitation and re-use options including a mountain bike track hub and day use area.

5.1.7 When extraction from Spring Creek Quarry ceases, seek reservation of the quarry area as an addition to the adjoining state conservation area.

5.1.8 Register the Point Road and Waterloo Creek Road quarries with the relevant regulatory authority, prepare a quarry safety management plan and, when required, open them as a source of gravel for maintaining the roads and trails within and accessing the parks.

5.2 Non-NPWS uses and operations

Private, forestry and existing use access

The area covered by this plan includes several ‘ministerial roads’ held under Part 11 of the National Parks and Wildlife Act. To ensure the continuation of access arrangements that existed at the time of reservation, these were not included in the reserved area of the parks. The specific purpose of each ministerial road is given in Table 7. Where a road’s purpose is

solely for access for the relevant forestry management authority, it does not need to include access by the public. While ministerial roads do not form part of the reserved area of the parks, their use and management are subject to the provisions of this plan and the National Parks and Wildlife Regulation.

Table 7 Ministerial roads covered by this plan

Road/trail name	Surrounding park	Length in park	Access type	Purpose [1]
12.2 Trail (north of quarry)	Queens Lake SCA	0.2 km	Management trail	Quarry access/ Access for FCNSW
Spring Creek Road (northern end)	Queens Lake SCA	1.6 km	Park road	Quarry access/ Access for FCNSW
Spring Creek Road (southern end)	Queens Lake NR	2.5 km	Park road	Access for FCNSW/ private property access
Waterloo Creek Road	Queens Lake NR	0.2 km	Park road	Access for FCNSW/ private property access
Yellow Creek Road	Queens Lake NR	1.3 km	Neighbour access trail	Private property access

[1] 'Access for FCNSW' includes staff of the Forestry Corporation of NSW or those authorised by the Forestry Corporation of NSW for management/harvesting purposes on nearby areas of state forest.

The following four routes through the parks provide the only practical access to private properties neighbouring the parks:

- Yellow Gully Trail and 7.1 Trail, combined with the southern end of Spring Creek Road and Waterloo Creek Road
- the northern end of Bobs Creek Fire Trail and Waterloo Creek Road
- 3 Point Trail, plus the eastern part of 3.1 Trail and Waterloo Creek Road
- McGilvray Road and Waterloo Creek Road.

Of these, only the sections that include Waterloo Creek Road and Spring Creek Road coincide with a corridor of ministerial roads. In addition to formally retaining ministerial roads as Crown land, however, the various pieces of legislation that reserved the majority of the parks also provided for the general protection of private property access rights. This means that any former forestry roads that provided the only practical means of access to private property at the time of reservation cannot be closed while that property remains in private ownership. Any modification or upgrade of the trail, however, would be considered an activity and would only be permitted under the terms of a formal access agreement such as a licence. Some of the roads and trails currently accessing private property are maintained primarily for accessing private property and NPWS management purposes and are not intended for public access to the parks. During the life of this plan, such trails (shown as neighbour access trails on Figure 1) may become management trails should they no longer be required for private property access.

Private property access through the nature reserve via McGilvray Road is considered a temporary arrangement only. It arose following the failure of a development west of Bonny Hills. As part of its approval, part of McGilvray Road had been closed on condition that access for several private properties located between the development and the nature reserve would be re-established on completion of the development, as well as emergency and management access to the nature reserve. Affected neighbours and NPWS are working with local council to ensure primary access for these properties is no longer required through the nature reserve. As these neighbours had a practical and legal access at the time of the

reservation of the nature reserve, NPWS provides access by arrangement. There is no legal obligation upon NPWS to provide this access.

Western Shore Trail also provides private property access through the nature reserve west of Bobs Creek. As its alignment coincides with a public road reserve, it is not subject to this plan and is not managed by NPWS. Department of Industry – Lands is responsible for the management of this road. NPWS currently maintains the road but only to a standard sufficient for adjoining reserve management purposes.

Some management trails, such as 99.7 Trail, provide secondary access to private property that is used only at times of flood when the principal access is temporarily unavailable. This use is subject to NPWS consent.

Under the *National Parks and Wildlife Regulation 2019* (NPW Regulation), a person needs consent from NPWS to drive a vehicle on roads, tracks or areas in a park that are not otherwise open to the public. Two businesses use Queens Lake Road and part of Bobs Creek Fire Trail in the nature reserve to access the foreshores of Bobs Creek, primarily for the collection of green weed to sell as bait. As this use pre-dates the reservation of Queens Lake Nature Reserve, access continues to be granted via consent under the NPWS Regulation.

Existing and proposed utilities

Due in part to the local geography and topography, the provision of essential services and infrastructure in the surrounding district is significantly constrained. NPWS acknowledges that some of these will need to be accommodated within the parks to meet community needs. NPWS has a process for reviewing infrastructure proposals carefully to ensure no alternative locations are possible. NPWS will require that such infrastructure is legal (i.e. covered by an appropriate authorisation under the National Parks and Wildlife Act) and is constructed and maintained to ensure that potential impacts are minimised if they cannot be avoided.

Transmission lines

The parks are crossed by several powerlines and associated access trails (see Figure 1). These lines pre-date reservation of the parks and include:

- a high-voltage (132-kilovolt) transmission line managed by TransGrid that skirts the north-west boundary of the nature reserve and crosses part of the state conservation area
- a low-voltage powerline managed by Essential Energy alongside part of Waterloo Creek Road and through the eastern part of the nature reserve, providing power to the telecommunications towers on Jolly Nose Hill in Queens Lake State Forest.

Of these, only the high-voltage line through the state conservation area is covered by a formal easement. In accordance with the *Electricity Supply Act 1995*, however, a network operator can continue to operate and use these existing powerlines, although the operator must comply with the National Parks and Wildlife Act and Regulation when maintaining or replacing the lines and may require NPWS consent for certain works.

Transmission lines and associated management activities 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. For TransGrid lines, these impacts are minimised through a statewide agreement with NPWS that provides guidelines for TransGrid's inspection and maintenance of existing transmission lines and infrastructure, including vegetation management. No similar access or maintenance agreement currently exists with Essential Energy. The clearing and vehicle trail associated with the powerline to Jolly Nose

Hill have significant environmental and visual impacts. Unauthorised recreational vehicle use of the trail is causing serious erosion problems (see Section 3.5).

Essential Energy has expressed an interest in developing an additional 33-kilovolt powerline from a new substation on Houston Mitchell Drive, located adjacent to and east of Queens Lake State Conservation Area. One potential option for the route of this new powerline includes areas with threatened ecological communities and threatened species.

Water main

Before reservation of the parks, the then Forestry Commission of NSW granted an easement to Port Macquarie-Hastings Council to allow for future development of the Southern Arm Trunk Main, as part of the water supply augmentation plans for the local government area (Hess & Balandin 2007). This 10-metre wide easement lies south of Houston Mitchell Drive but council has agreed to consider the feasibility of locating the water main closer to the road to minimise the impacts on park values.

Telecommunications lines

Telstra owns and manages a telecommunications line buried parallel to Houston Mitchel Drive. The line is more than 30 years old and no known easement relates to its existence, use or ongoing maintenance. Telstra has indicated the line is nearing the end of its operational lifespan and may need to be entirely replaced (M Thompson [Telstra] 2012, pers. comm.). Ideally, any significant upgrade of the line would be consolidated with other new utilities into a single corridor, subject to environmental assessment, approval and agreement processes.

Mining and exploration

As described in Section 2.2, the tenure of state conservation areas allows for uses permitted under section 47J of the National Parks and Wildlife Act, including exploration for and production of minerals and petroleum.

Mining and petroleum activities, including mineral exploration and mine site rehabilitation, are regulated by the NSW Government. NPWS works with the resource regulatory authority to ensure that exploration and production proposals in state conservation areas comply with all statutory requirements, including any necessary environmental impact assessments and approvals. This cooperative approach is outlined in a memorandum of understanding agreed by the agencies.

There is a history of mineral exploration licences over much of the parks, with at least four companies holding interests since the 1970s. There is a current exploration licence that applies to a broad regional area including Queens Lake State Conservation Area. The areas of laterite associated with serpentinite geology, considered highly prospective for nickel, cobalt and scandium, were targeted for most exploration interest. Numerous test bores were dug in what is now the state conservation area, adjoining state forest and nearby Lake Innes State Conservation Area in the late 1990s. These tests found deposits of some rare minerals at economic grades (i.e. viable quality for processing) but in insufficient quantities to make extraction economically feasible.

While exploration licences and assessment leases may be granted within state conservation areas without the concurrence of the Minister administering the National Parks and Wildlife Act, the Minister’s approval must be obtained before any rights under that lease or licence can be exercised.

Desired outcomes

- Private property access rights continue and have minimal impact on park values.
- Non-NPWS uses have minimal impact on natural and cultural values.

Management response

5.2.1 Allow domestic animals to be transported in vehicles to neighbouring properties through the parks using public roads, ministerial roads and neighbour access trails (and the shortest access route to these trails using park roads), as long as the vehicle does not stop and the animal is kept within the vehicle.

5.2.2 Should a neighbour access trail no longer provide the only practical means of access to private property, either close it or manage it as a management trail.

5.2.3 Liaise with Port Macquarie-Hastings Council to ensure re-establishment and maintenance of the McGilvray Road right of way between the nature reserve and Bonny Hills, for management and emergency access to the reserve, as well as private property access.

5.2.4 Ensure construction and maintenance of the Southern Arm Trunk Main are conducted in a manner consistent with the existing easement agreement and conditions attached to the relevant approvals.

5.2.5 Ensure that approvals for any future proposals for new or replacement infrastructure in the parks only occur following a thorough assessment of environmental impacts and include measures to minimise potential impacts on the parks. Strongly encourage co-location and rationalisation of infrastructure within existing easements.

5.2.6 Continue to liaise with TransGrid regarding access and maintenance needs in the parks in accordance with the agreement.

5.2.7 Formalise an agreement with Essential Energy for the maintenance of the powerlines servicing the Jolly Nose Hill towers. As part of these negotiations, NPWS may seek to have the powerlines placed underground and pursue revegetation of the current wide canopy gap.

5.2.8 While the powerlines to Jolly Nose Hill are located above-ground, impose and monitor compliance with specific conditions to halt erosion and prevent public access to the steep ridge trail at the southern end of the lines.

5.2.9 Ensure that applications for mining or mineral exploration in the state conservation area are subject to environmental assessment in accordance with the current or a future memorandum of understanding between NPWS and the resource regulatory authority.

6. Implementation

This plan of management establishes a scheme of operations for Queens Lake Nature Reserve and Queens Lake State Conservation Area.

Identified activities for implementation are listed in Table 8. Relative 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 the plan but 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 either Queens Lake Nature Reserve or Queens Lake State Conservation Area, until amended or replaced in accordance with the National Parks and Wildlife Act.

Table 8 List of management responses

Management response	Priority
3.1 Geology, landscape and catchments	
3.1.1 Undertake works in a manner that minimises erosion and water pollution. In particular, ensure that park roads and management trails shown on Figure 1 are maintained to minimise soil erosion. Stabilise, close and allow trails not shown on Figure 1 to revegetate.	Ongoing
3.1.2 Locate and design management infrastructure and visitor facilities to minimise their visual impact as viewed from locations within and outside the parks. This may be achieved, for example, by requiring the co-location of new infrastructure within existing easements.	Ongoing
3.1.3 Identify areas of accelerated soil erosion and implement stabilisation and rehabilitation measures in affected areas. In particular, install barriers to prevent recreational vehicle access to the corridor of the Jolly Nose Hill powerlines.	High
3.1.4 Liaise with adjacent landholders and utility providers to minimise the visual impacts of neighbouring developments.	Ongoing
3.1.5 Avoid use of tracks and trails that traverse wetlands or other low-lying areas that are likely be become waterlogged.	Ongoing
3.1.6 Work with adjacent landholders and Port Macquarie-Hastings Council to address any water quality issues arising from stormwater drainage from neighbouring lands or roads.	Ongoing
3.2 Native plants	
3.2.1 Implement relevant actions in the *Biodiversity Conservation Program* for threatened species and ecological communities present in the parks.	High
3.2.2 Encourage or conduct targeted surveys for significant plant species predicted or known to occur in the parks and ensure records for significant species are kept up to date. Priorities for these surveys include rainforest, swamp and wet heath areas and the rock faces along the Jolly Nose Escarpment.	Medium

Management response	Priority
3.2.3 Encourage or undertake a comprehensive vegetation survey of the parks, with documentation to include a collation and analysis of all previous survey data and to ensure records for significant species are kept up to date.	Medium
3.2.4 Where populations of significant species are located on the edges of roads and trails, establish a regime (e.g. installation of 'green post' markers) to protect them from damage during road maintenance and roadside weed spraying programs.	Ongoing
3.2.5 Avoid development of new facilities in the habitats of significant plant species or communities, especially in areas where the geology is serpentinite, dolerite or phyllite.	Ongoing
3.2.6 Avoid disturbance of old-growth trees in order to maintain habitat values.	Ongoing
3.2.7 Monitor former plantation areas and, where required, remove non-endemic species and weeds and encourage natural regeneration of a diversity of native species.	Medium
3.3 Native animals	
3.3.1 Implement relevant actions in the *Biodiversity Conservation Program* and recovery plans for threatened species and populations present in the parks.	High
3.3.2 Encourage or undertake additional surveys, particularly to fill knowledge gaps around poorly sampled habitats and to target threatened species predicted to occur in the parks and ensure records for significant species are kept up to date.	Medium
3.3.3 Encourage or undertake monitoring of significant animal species in representative locations and ensure records for significant species are kept up to date.	Low
3.3.4 Trial and, where appropriate, implement measures to enhance the habitat values of the areas of plantation and young forest. This might include, for example, augmenting forest hollows through a program of placing nest boxes.	Low
3.3.5 Continue to contribute to genetic sampling of wild dogs within the parks.	Ongoing
3.3.6 Educate the community about how to reduce conflict between pets and wildlife.	Low
3.4 Aboriginal and historic heritage	
3.4.1 Continue to consult and involve the Bunyah and Birpai local Aboriginal land councils and other relevant Aboriginal community organisations and custodial families in the management of their Country, including the management of Aboriginal sites and places, and cultural and natural values.	Ongoing
3.4.2 Undertake an archaeological survey and cultural assessment before all works with the potential to impact Aboriginal and historic sites or values.	Ongoing
3.4.3 Encourage further research into the Aboriginal and historic heritage values of the parks, including collection of oral histories.	High
3.4.4 Encourage or conduct targeted surveys for Aboriginal sites (including an analysis of landscapes likely to support sites) with priority given to sites where potential is high and/or recreational pressure may occur.	Medium
3.4.5 Record historic sites in the parks (particularly forestry sites, such as bridges, log ramps etc.) and assess their significance. Until the heritage value is assessed, undertake necessary stabilisation works. If a site is found to be significant, prepare and implement a conservation management plan or heritage action statement to guide future management.	Medium
3.4.6 Recognise and, where appropriate, interpret the parks' heritage in educational and interpretive material.	Low
3.5 Visitor use	
3.5.1 Allow public vehicle access to park roads shown in Figure 1 but not on management trails. Roads in the parks may be closed following extended periods of wet weather to ensure public safety and protection of park values.	Ongoing

Management response	Priority
3.5.2 Rationalise the existing informal track network through closing or re-routing some tracks and ensure a diversity of walking opportunities across different landscapes is maintained when rationalising park roads and trails.	Ongoing
3.5.3 Monitor impacts of all visitor use activities, including horse riding and mountain bike riding. Where impacts are unacceptable, establish mechanisms to regulate access to acceptable sites and manage participant numbers and intensity, which may include seasonal or other closures.	Ongoing
3.5.4 Continue to manage and maintain the Queens Lake Picnic Area as the principal visitor location within the parks.	Ongoing
3.5.5 Encourage visitors in the Queens Lake Picnic Area to use fuel stoves.	Medium
3.5.6 Investigate demand for an additional day use node at Spring Creek Quarry or another location in the state conservation area close to the proposed cycle access and mountain bike zones. If suitable, based on demand, feasibility and environmental assessment, install facilities such as car parking, a shelter and picnic tables.	Medium
3.5.7 Prohibit camping and wood fires in the parks. Maintain regulatory information on entry signs to inform visitors of these prohibitions.	Ongoing
3.5.8 Maintain and encourage cycling opportunities on park roads, on management trails in the state conservation area, on designated management trails in the nature reserve (see Figure 1), and (subject to a mountain biking strategy) on authorised tracks within the planned mountain bike zones shown in Figure 2. Temporarily close tracks and trails to cycling during wet weather to minimise damage if required.	Ongoing
3.5.9 In conjunction with Port Macquarie-Hastings Council and other stakeholders, participate in the planning, assessment and development of a cycling route utilising the parks' existing road and trail network to link the Googik Heritage Track with planned cycle access opportunities within nearby urban growth areas.	Medium
3.5.10 Develop a mountain biking strategy for the state conservation area that will: o Be subject to environmental, social and safety considerations, including the outcomes of environmental impact assessment. o Provide for single-track mountain biking opportunities within the mountain bike zones (as shown in Figure 2) if they avoid features that present safety and erosion risks. o Propose and develop track opportunities based on the assessment of demand, feasibility and environmental assessment. o Locate opportunities for riding to minimise impacts on the park's natural and cultural values. This will necessitate rationalising the existing informal track network through closing or re-routing some tracks. o Consider potential conflicts with other recreational users, including horse riding and bushwalking interests. o Follow the international mountain biking association track standards in the design, construction and maintenance of tracks. o A park-specific code of conduct for mountain bike riders will be developed and implemented; this will include a rule that cycling will only be permissible on those management trails and single-tracks which are signposted (i.e. A 'No Sign: No Ride' policy is to be adopted and enforced). o Include assessment of the appropriateness of a day use area and mountain bike hub in the former Spring Creek Quarry with consideration given to incorporating mountain bike track features within the quarry site's rehabilitation. o Identify those tracks that will be maintained or closed and rehabilitated (i.e. those not authorised by the mountain biking strategy). o Be developed in conjunction with interested stakeholders, Regional Advisory Committee input and park neighbours. o Both the mountain biking strategy and the environmental assessment will be publicly exhibited.	High

Management response	Priority
3.5.11 Install and maintain signs on those management trails and tracks where cycling is allowed. Adopt and enforce a strict 'No Sign: No Ride' policy.	High
3.5.12 Work with the local cycling community and stakeholder groups to support volunteer participation in planning and to assist with maintenance and rehabilitation works as part of a 'Friends Of'' group.	Ongoing
3.5.13 Allow horse riding on those roads and trails as identified in Figure 1. Additional infrastructure will not be provided.	Ongoing
3.5.14 Maintain communication with local horse riding groups to encourage their participation in regular weed control, clean-ups and other activities in the parks.	Ongoing
3.5.15 Prohibit the placing of physical caches in the nature reserve. Permit promotion of EarthCaches at approved sites that do not compromise the conservation of the park's values.	Ongoing
3.5.16 Permit physical caches in the state conservation area subject to NPWS approval and conditions that will include that caches are small and discrete, located in an approved site and not buried or hidden using any burrows, hollows or other wildlife habitat features.	Ongoing
3.5.17 Work with relevant waterway and land management authorities to confirm the status of the jetty at Queens Lake Picnic Area and ensure maintenance occurs to address any safety risks associated with the structure.	High
3.5.18 Maintain access to the small-boat launching points on either side of Waterloo Creek. Close informal trails to discourage launching of vessels at other sites within and adjacent to the nature reserve.	Ongoing
3.5.19 Subject to the agreement of the relevant waterway and/or land management authority, upgrade the canoe launch points to maintain user safety.	Low
3.5.20 Require all non-commercial group activities larger than the group size limit given in Table 4 to obtain prior written consent. Consent may be subject to conditions to minimise impacts on park values and other visitors.	Ongoing
3.5.21 Prohibit organised competitions in the nature reserve. Non-competitive transit stages of competitive events may be permitted in the state conservation area on a case-by-case basis following consideration of potential social and environmental impacts. Consent will be subject to conditions to minimise impacts on park values and other visitors and will include a requirement to restrict activities to the existing trail network.	Ongoing
3.5.22 Permit abseiling, subject to NPWS consent, only by groups associated with the existing interest of the 1st Port Macquarie Scout Group or related commercial licensees at the three sites on the Jolly Nose Escarpment, subject to maintenance of appropriate accreditations and insurances and a maximum group size as outlined in Table 4.	Ongoing
3.5.23 Document the approved sites for abseiling in a site plan to be attached to any consents or licences.	High
3.5.24 Do not provide facilities for car parking, toilets or picnicking within the parks at abseiling sites and prohibit placement of markers or fixtures without consent.	Ongoing
3.6 Information, engagement and education	
3.6.1 Improve signposting of the parks' roads and trails.	High
3.6.2 Provide interpretive, safety, visitor orientation and minimal impact use information at visitor sites as appropriate.	Medium
3.6.3 Engage with local school communities to highlight opportunities for learning and participating in park management where this meets school interests and objectives.	Low

Management response	Priority
3.6.4 Work with the local community and stakeholder groups to support volunteer participation in park management activities, such as monitoring and data collection, bush regeneration, clean-up days and maintenance works.	Medium
4.1 Pests	
4.1.1 Manage pest species in line with pest management strategies relevant to the parks.	High
4.1.2 Undertake pest control in cooperation with relevant local land management agencies and local council.	Ongoing
4.1.3 Seek the cooperation of stakeholders (e.g. mountain bike riders and horse riders) in implementing pest control programs and, where necessary, discuss and design suitable facilities (such as sediment and weed propagule traps on single-use tracks) to help limit the spread of pest species as a result of visitor use.	Medium
4.1.4 Control wild dogs to address issues, in cooperation with neighbours and the relevant local land management agency.	Ongoing
4.1.5 Continue to assist the relevant local land management agency in the preparation and implementation of strategic wild dog management plans for the wider area.	Ongoing
4.1.6 Maintain ongoing support for and cooperation with the Mid North Coast Feral Deer Working Group, as part of a landscape approach to monitoring the extent and intensity of the wild deer problem in the area.	Ongoing
4.1.7 Facilitate and participate in deer control programs in cooperation with neighbours.	Ongoing
4.1.8 Manage myrtle rust in the parks in accordance with the *Management Plan for Myrtle Rust on the National Parks Estate*.	Ongoing
4.1.9 Monitor the extent and intensity of myrtle rust in the parks.	Ongoing
4.2 Fire	
4.2.1 Implement the fire management strategy for the parks. Regularly review the strategy and update it as required.	High
4.2.2 Continue to be involved in the local bush fire management committee and maintain cooperative arrangements with local brigades, other fire authorities and surrounding landowners with regard to fuel management and fire suppression.	Ongoing
4.2.3 Monitor the ability of significant plant species and communities to recover between fires and review regimes where relevant.	Medium
4.2.4 Consider implementing pest animal control programs following any extensive wildfire events (greater than 100 hectares) to minimise the impacts of feral predators and over-grazing by feral herbivores.	Low
4.3 Climate change	
4.3.1 Continue existing fire, pest and weed management programs to increase the parks' ability to cope with future disturbances, including climate change.	Ongoing
4.4 Isolation and fragmentation	
4.4.1 Maintain cooperative arrangements with nearby landholders regarding access, fire and pest species management.	Ongoing
4.4.2 Encourage protection and enhancement of native vegetation on public and private lands in the vicinity of the parks, particularly in identified key habitats and wildlife corridors.	Medium
4.4.3 Continue to work with local council regarding the management of Houston Mitchell Drive to reduce the road's impacts on the parks' values and NPWS management of the parks.	High

Management response	Priority
5.1 Management facilities and access	
5.1.1 Maintain the park road and management trail network as shown on Figure 1. Install gates and/or signs to prevent unauthorised public vehicle access to management trails where required.	Ongoing
5.1.2 Re-name trails to reflect local geographical or biological features or other appropriate local references.	Low
5.1.3 Retain those dams that hold water and provide a strategic advantage for fire management purposes. Periodically maintain these to ensure access for vehicles and security of water supply.	Ongoing
5.1.4 Maintain loading ramps that may provide a management advantage for transport and loading of small plant and machinery where appropriate.	Ongoing
5.1.5 Implement the quarry management plan for Spring Creek Quarry to utilise the stockpiled gravel and extract further gravel from within the existing footprint, to supply material for essential maintenance of roads within or accessing the parks.	Ongoing
5.1.6 Close the Spring Creek Quarry when the gravel resource is exhausted (potentially in stages), make safe and investigate rehabilitation and re-use options including a mountain bike track hub and day use area.	Medium
5.1.7 When extraction from Spring Creek Quarry ceases, seek reservation of the quarry area as an addition to the adjoining state conservation area.	Ongoing
5.1.8 Register the Point Road and Waterloo Creek Road quarries with the relevant regulatory authority, prepare a quarry safety management plan and, when required, open them as a source of gravel for maintaining the roads and trails within and accessing the parks.	Ongoing
5.2 Non-NPWS uses and operations	
5.2.1 Allow domestic animals to be transported in vehicles to neighbouring properties through the parks using public roads, ministerial roads and neighbour access trails (and the shortest access route to these trails using park roads), as long as the vehicle does not stop and the animal is kept within the vehicle.	Ongoing
5.2.2 Should a neighbour access trail no longer provide the only practical means of access to private property, either close it or manage it as a management trail.	Low
5.2.3 Liaise with Port Macquarie-Hastings Council to ensure re-establishment and maintenance of the McGilvray Road right of way between the nature reserve and Bonny Hills, for management and emergency access to the reserve, as well as private property access.	High
5.2.4 Ensure construction and maintenance of the Southern Arm Trunk Main are conducted in a manner consistent with the existing easement agreement and conditions attached to the relevant approvals.	Ongoing
5.2.5 Ensure that approvals for any future proposals for new or replacement infrastructure in the parks only occur following a thorough assessment of environmental impacts and include measures to minimise potential impacts on the parks. Strongly encourage co-location and rationalisation of infrastructure within existing easements.	Ongoing
5.2.6 Continue to liaise with TransGrid regarding access and maintenance needs in the parks in accordance with the agreement.	Ongoing
5.2.7 Formalise an agreement with Essential Energy for the maintenance of the powerlines servicing the Jolly Nose Hill towers. As part of these negotiations, NPWS may seek to have the powerlines placed underground and pursue revegetation of the current wide canopy gap.	Medium

Management response	Priority
5.2.8 While the powerlines to Jolly Nose Hill are located above-ground, impose and monitor compliance with specific conditions to halt erosion and prevent public access to the steep ridge trail at the southern end of the lines.	Ongoing
5.2.9 Ensure that applications for mining or mineral exploration in the state conservation area are subject to environmental assessment in accordance with the current or a future memorandum of understanding between NPWS and the resource regulatory authority.	Ongoing

References

AHD no date, *Indicative Place: Queens Lake Area, Kew Rd, Laurieton, NSW, Australia,* Australian Heritage Database, accessed 25 February 2013, www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=18459.

Australian Government no date, *Weeds of National Significance*, www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html.

Berrigan J 2009, Ecological Survey and Statutory Assessments of Proposed Constructed Wetland and Filling, and Concept Plan on Part Lot 123 DP 1106943, & Lot 5 DP 25886, Ocean Drive, Lake Cathie, report by Darkheart Eco-Consultancy.

Biosecurity Queensland 2010, *Plan to Protect Environmental Assets from Lantana*, prepared on behalf of the National Lantana Management Group, Department of Employment, Economic Development and Innovation, Yeerongpilly, Queensland.

Birdlife International 2019, *Hastings-Macleay International Bird Area Fact Sheet,* Birdlife International, http://datazone.birdlife.org/site/factsheet/hastings-macleay-iba-australia/text.

Bischoff A 2004, Queens Lake State Conservation Area – Bird survey, report for NSW National Parks & Wildlife Service, Hastings Area, Port Macquarie.

CHHS 1997, *Early History of Camden Haven*, Camden Haven Historical Society & LJ Lane Print, Laurieton Bay, Laurieton.

Collins J 1996, Proposed Camden Haven High School North Haven, NSW Mid North Coast: Archaeological site assessment, report prepared for the Education Branch Schools Section of the NSW Department of Public Works and Services.

Collins J 1997, Proposed Camden Haven High School 'Site 1' Ocean Drive East of Kew NSW Mid-North Coast: Archaeological site assessment, report prepared for the Education Branch Schools Section of the NSW Department of Public Works and Services.

DEC 2005a, Deer Management Plan 2005–2008 for Royal National Park and Reserves in the Sydney South Region, NSW National Parks and Wildlife Service in conjunction with the Royal National Park Deer Working Group.

DEC 2005b, *Queens Lake Nature Reserve and State Conservation Area Fire Management Strategy (Type 2)*, prepared by the NSW National Parks and Wildlife Service, Mid North Coast Region, Port Macquarie, Department of Environment and Conservation, www.environment.nsw.gov.au/resources/parks/queensLakeFms.pdf.

DEC 2006, *NSW Threat Abatement Plan – Invasion of native plant communities by* Chrysanthemoides monilifera *(bitou bush and boneseed)*, Department of Environment and Conservation (NSW), Hurstville, www.environment.nsw.gov.au/resources/pestsweeds/BitouTAPText.pdf.

DECCW 2010, *NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales*, Department of Environment, Climate Change and Water NSW, Sydney, www.environment.nsw.gov.au/climatechange/20100171ClmtChngNSW.htm.

DoE 2009, *Listed Key Threatening Processes*, Department of the Environment, Canberra, www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl.

DoI 2017, *NSW Wild Dog Management Strategy, 2017–2021*, State of New South Wales through Department of Industry, www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/445234/NSW-Wild-Dog-Management-Strategy-2017-2021.pdf.

DPIE 2019a, *Biodiversity Conservation Program*, Department of Planning, Industry and Environment, www.environment.nsw.gov.au/threatenedspecies/pas.htm.

DPIE 2019b, *Saving our Species*, Department of Planning, Industry and Environment, Sydney, www.environment.nsw.gov.au/savingourspecies/about.htm.

DPIE 2019c, *NSW BioNet Atlas*, State of NSW, Sydney, www.bionet.nsw.gov.au/.

DPIE 2019d, *Geocaching Policy*, Department of Planning, Industry and Environment, www.environment.nsw.gov.au/policies/geocaching.htm.

FCNSW 1989, *Forest Preservation in State Forests of New South Wales*, Research Note No.47, 2nd ed, Forestry Commission of New South Wales, Sydney.

Fenning C 1997, Echoes of the Axe: The stories of the people who made the timber industry on the Mid North Coast of New South Wales, Impulse Printing, Brisbane.

Geocaching NSW 2014, *Aims and Rules: Geocaching NSW Code of Conduct*, Geocaching NSW Inc., www.geocachingnsw.asn.au/index.php/geonsw/policies/86-geocaching-nsw-code-of-conduct.html.

Griffith SJ 1989, Heathlands and Related Plant Communities in the Port Macquarie District, unpublished report to the NSW National Parks and Wildlife Service, Port Macquarie.

Griffith SJ 1992, Vegetation of Crowdy Bay National Park, unpublished report to Northern Region, NSW National Parks and Wildlife Service, Grafton.

Hastings Birdwatchers 2005, *Birdwatching Spots around Port Macquarie & Hastings Region*, Hastings Birdwatchers, Port Macquarie, www.hastingsbirdwatchers.org.au/hbbirdspot.pdf.

Hastings Council 1999, Camden Haven Estuary Processes Study, prepared by Patterson Britton & Partners for Hastings Municipal Council, Port Macquarie.

HRC 2002, Independent Public Inquiry into Coastal Lakes: Final report, Healthy Rivers Commission of NSW, Sydney.

Hess L & Balandin M 2007, Hastings District Water Supply Augmentation Southern Arm Trunk Main, Second Addendum to Review of Environmental Factors for Port Macquarie-Hastings Council, report no. DC06204, Report by NSW Water Solutions, Department of Commerce.

Hodgkinson C 1845, Australia, from Port Macquarie to Moreton Bay; with descriptions of the natives, their manners and customs, the geology, natural productions, fertility, and resources of that region; first explored and surveyed by order of the Colonial Government, T & W Boone, London, http://en.wikisource.org/wiki/Australia,_from_Port_Macquarie_to_Moreton_Bay.

Jacobs MR 1955, *Growth Habits of the Eucalypts*, Forestry and Timber Bureau, Department of Interior, Canberra.

Kean S 2011, Bike Riding in National Parks, Nature NSW: The Journal of the National Parks Association of NSW, vol. 55, no. 5.

Lee I, Dennis F & Stewart D c. 1990, Proposal for Queens Lake Nature Reserve, a publication of the National Parks Association of NSW, Mid North Coast Branch, based on studies and field investigations undertaken by Isabelle Lee.

Milledge D 1979, The Camden Haven Wildlife Refuge Study: Final report, Australian Museum, Sydney.

Navin Officer 2004, *Pacific Highway Upgrade Moorland to Herons Creek EIS Working Paper: Cultural heritage assessment,* a report to Ove Arup and Partners by Navin Officer Heritage Consultants Pty Ltd, Kingston, ACT, accessed 5 October 2016 at: www.arup.com.au/moorland/docs/EIS/WP05a_Cultural_Heritage.pdf.

North Coast LLS 2017, *North Coast Regional Strategic Weed Management Plan 2017–2022*, North Coast Local Land Services, http://northcoast.lls.nsw.gov.au/__data/assets/pdf_file/0006/722760/north-coast-regional-weed-management-plan.pdf.

North Coast LLS 2017, *North Coast Regional Strategic Pest Animal Management Plan 2018–2023*, North Coast Local Land Services, www.lls.nsw.gov.au/__data/assets/pdf_file/0020/820802/north-coast-regional-pest-plan.pdf.

NPWS 1994, New Area Investigation – Queens Lake Nature Reserve, internal report by Port Macquarie District, Northern Region, NSW National Parks and Wildlife Service.

NPWS 1999, *Forest Ecosystem Classification and Mapping for the Upper and Lower North East CRA Regions*, a project undertaken for the Joint Commonwealth NSW Regional Forest Agreement Steering Committee as part of the NSW Comprehensive Regional Assessments by the Northern Zone, NSW National Parks and Wildlife Service, Coffs Harbour, www.agriculture.gov.au/SiteCollectionDocuments/rfa/regions/nsw-north-east/enviroment/nsw_ne_na35eh.pdf.

NPWS 2006, Wild Deer Pest Management Strategy, unpublished report by Mid North Coast Region, NSW National Parks and Wildlife Service, Port Macquarie.

NPWS 2010, Management Options for Plantations on NPWS Estate in Northern NSW, unpublished report by Coastal Branch, NSW National Parks and Wildlife Service, Coffs Harbour.

NSW SC 1998, Final Determination to List Predation by the European Red Fox Vulpes vulpes (Linnaeus 1758) as a Key Threatening Process on Schedule 3 of the TSC Act, NSW Scientific Committee, www.environment.nsw.gov.au/determinations/EuropeanRedFoxKTPListing.htm.

NSW SC 2000a, *Final Determination to List Anthropogenic Climate Change as a Key Threatening Process on Schedule 3 of the TSC Act*, NSW Scientific Committee, www.environment.nsw.gov.au/threatenedspecies/HumanClimateChangeKTPListing.htm.

NSW SC 2000b, *Final Determination to List the Ecological Consequences of High Frequency Fires as a Key Threatening Process under the TSC Act*, NSW Scientific Committee, www.environment.nsw.gov.au/threatenedspecies/EcologicalConsequencesFiresKTPListing.htm.

NSW SC 2002, *Competition from Feral Honeybees – Key threatening process listing,* final determination by the NSW Scientific Committee, www.environment.nsw.gov.au/determinations/FeralHoneybeesKTPListing.htm.

NSW SC 2004, Final Determination to List Herbivory and Environmental Degradation Caused by Feral Deer as a Key Threatening Process on Schedule 3 of the TSC Act, NSW Scientific Committee, www.environment.nsw.gov.au/determinations/FeralDeerKtp.htm.

NSW SC 2011, Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales Pathogenic on Plants of the Family Myrtaceae – Key threatening process listing, final determination by the NSW Scientific Committee, www.environment.nsw.gov.au/determinations/exoticrustfungiFD.htm.

OEH 2011a, *Management Plan for Myrtle Rust on the National Parks Estate*, State of NSW, Sydney, www.environment.nsw.gov.au/resources/pestsweeds/110683myrtlerustmp.pdf.

OEH 2011b, *NSW Threat Abatement Plan for Predation by the Red Fox (*Vulpes vulpes*),* State of NSW, Sydney, www.environment.nsw.gov.au/resources/pestsweeds/110791FoxTAP2010.pdf.

OEH 2011c, Sustainable Mountain Biking Strategy, State of NSW, Sydney,

https://www.environment.nsw.gov.au/research-and-publications/publications-search/sustainable-mountain-biking-strategy.

OEH 2012, *Strategic Directions for Horse Riding in NSW National Parks*, State of NSW, Sydney, www.environment.nsw.gov.au/policies/HorseRideStrat.htm.

OEH 2013a, *Living with Fire in NSW National Parks: A strategy for managing bushfires in national parks and reserves 2012–2021*, revised edition, State of NSW, Sydney, www.environment.nsw.gov.au/resources/firemanagement/120690LiveFire.pdf.

OEH 2013b, *Lower North Coast Region Horse Riding Work Plan*, prepared for the Lower North Coast Region, NSW National Parks and Wildlife Service, State of NSW.

OEH 2014, *North Coast: Climate change snapshot*, State of NSW, Sydney, www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/North-Coast-Climate-Change-Downloads.

OEH 2015, *Commercial Fishing Access Policy*, State of NSW, Sydney, https://www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/park-policies/commercial-fishing-access.

Oxley J 1820, Journals of Two Expeditions into the Interior of New South Wales, Undertaken by order of the British Government in the Years 1817–1818, prepared from the print edition published by John Murray, London 1820, accessed 25 February 2013 from: http://purl.library.usyd.edu.au/setis/id/p00066.

Phillips S 1984, A Herpetological Survey of Part Parish Queens Lake, County of Macquarie, New South Wales, unpublished Report to National Parks Association of NSW.

Pratt GW 2010, A revised Triassic stratigraphy for the Lorne Basin, NSW, *Quarterly Notes*, vol. 134, pp. 1–35.

Preston M 2004, Queens Lake SCA (Bonny View Study Area) Vertebrate Fauna Survey, unpublished report to the Hastings Area, NSW National Parks and Wildlife Service, Department of Environment and Conservation.

Rogers F 1982, *Port Macquarie: A History to 1850,* Hastings District Historical Society, Port Macquarie.

Scotts D 2003, Key Habitats and Corridors for Forest Fauna: A landscape framework for conservation in north-east New South Wales, Occasional Paper 32, NSW National Parks and Wildlife Service, Hurstville.

Silcox R 1995, Archaeological Survey for a Plan of Management: Queens Lake Foreshore Reserve, Camden Haven, Mid-North Coast, NSW, unpublished report to Pacrim Environmental Pty Ltd.

Solomon C 2011, View from the bike, Nature NSW: Journal of the National Parks Association of NSW, vol. 55, no. 5.

Thackway R & Cresswell I 1995, An Interim Biogeographic Regionalisation for Australia: A Framework for Establishing the National System of Reserves, Version 4.0, Australian Nature Conservation Agency, Canberra.

Tindale N 1940, Results of the Harvard-Adelaide Universities Anthropological Expedition, 1938–1939: Distribution of Australian Aboriginal Tribes: a field survey, *Transactions of the Royal Society of South Australia*, vol. 64(1), pp. 140–231.

TSSC 2001, *Commonwealth Listing Advice on Loss of Terrestrial Climatic Habitat Caused by Anthropogenic Emissions of Greenhouse Gases*, Threatened Species Scientific Committee, www.environment.gov.au/cgi-bin/sprat/public/publicshowkeythreat.pl?id=7.

Williams J 2000, Flora and Fauna Report for Queens Lake Nature Reserve, unpublished report prepared by State Forests for NSW National Parks and Wildlife Service.