NSW National Parks and Wildlife Service

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park

Planning considerations

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Acknowledgement of Country

Aboriginal people have a long connection with the area now known as Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park. The parks play a fundamental role in the lives of local Aboriginal people, helping to maintain a link to the past, enabling continued connections to Country and contributing to the cultural identity of local Aboriginal people.

The parks are important to a number of Aboriginal language groups, in particular, the Dunghutti and Birpai Aboriginal peoples. Despite the impacts of colonisation and dispossession, this connection has endured. Aboriginal people maintain a vibrant and active association with the parks. Cultural knowledge about this place is held and safeguarded by Aboriginal people.

Aboriginal communities continue to have an association with and connection to the land. Aboriginal communities associate the land and its natural resources with the use and enjoyment of foods and medicines, caring for Country, passing on cultural knowledge, kinship systems and strengthening social bonds. Aboriginal heritage and connection to the natural environment are inseparable from each other and need to be managed in a holistic manner across the landscape.

Connections to Country and the significance of these parks to Aboriginal peoples — past, present and future — are respected by NPWS and acknowledged in this plan. NPWS supports and acknowledges the role of Aboriginal people in identifying traditional connections and custodians for this place.

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How to use this report

This planning considerations report outlines the matters considered in preparing the *Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park plan of management* (NPWS 2024), including the parks' key values, management principles and management considerations. Further information, including scientific names for common names of species, is provided in the appendices.

It is recommended that readers of this report also read the plan of management. The plan of management describes the desired outcomes for the parks' values, and the actions that the National Parks and Wildlife Service (NPWS) proposes to undertake to achieve these outcomes. It also sets out the recreational and commercial activities that are permitted in the park and any requirements to undertake these activities, including whether consent must be sought from NPWS to undertake them.

This planning considerations report contains the background information to support the plan and will be updated when appropriate, for example, if we have new information on:

- the values of the park (for example, new threatened species)
- management approaches (for example, new pest management techniques)
- new programs.

Changes will only be made to this report if they are consistent with the plan of management.

Acknowledgements

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park are in the traditional Country of the Dunghutti and Birpai Aboriginal peoples.

This report was prepared by staff of NPWS.

Contact us

For more information about this report or Goolawah National Park, Goolawah Regional Park or Limeburners Creek National Park, contact the NPWS Hastings-Macleay Area Office at npws.macleay@environment.nsw.gov.au, PO Box 5657 Port Macquarie NSW 2444 or by telephone on 02 6561 6700.

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park (collectively called the 'parks' in this report) are coastal parks located between Port Macquarie and Crescent Head on the Mid North Coast of New South Wales (Figure 1). The parks have been grouped in this plan due to their geographic connectivity and overlapping management issues.

The reserved area of each park is provided in Table 1.

Table 1 Reserved area of parks

Name of park	Area (ha)
Goolawah National Park	572.5
Goolawah Regional Park	65.7
Limeburners Creek National Park	10,144.6

The Goolawah parks

Prior to reservation under the *National Parks and Wildlife Act 1974*, most of Goolawah National Park and Goolawah Regional Park ('the Goolawah parks') were managed by the NSW Department of Lands as part of the Goolawah State Park. Goolawah State Park, established in 2007, formed part of a cluster of remnant Crown land parcels, known as the Maria River Regional Crown Reserve, which was managed for environmental protection and public recreation (DoL 2008).

In 2010, under the terms of the *Regional Forest Agreement for North East NSW* (NSW Government 2000), management of the state park was transferred to the National Parks and Wildlife Service (NPWS). The northern portion of the park became known as Goolawah National Park, and the southern portion as Goolawah Regional Park.

A number of additions to the Goolawah parks have occurred since reservation, namely:

- In June 2011, 12 ha of Crown land south of Crescent Head were added to Goolawah National Park. Land contained in this addition had been the subject of a residential development application, and more recently a native title claim.
- In November 2015, Delicate Nobby islands (approximately 26 ha) were added to Goolawah National Park. These islands were previously part of a Crown reserve.
- Also in November 2015, Racecourse Headland and the **intertidal zones** (approximately 8.7 ha) along Goolawah Beach in Goolawah National Park, and Delicate and Big Hill beaches in the regional park were added to NPWS estate.

Goolawah National Park is located immediately south of the township of Crescent Head, extending to the southern side of Racecourse Headland where it abuts Goolawah Regional Park. See Figure 2 – Map A. West of the park there is a mix of Crown land and freehold land, the latter used for grazing, small-scale tourism and residential purposes. The park

stretches 5 km along the coast and includes Racecourse Headland, Goolawah Lagoon, Delicate Nobby islands and the intertidal zone of Goolawah Beach.

Goolawah Regional Park lies between Goolawah National Park to the north and Limeburners Creek National Park to the south. See Figure 2 – Map B. The park occupies a narrow coastal strip, stretching 3 km between Racecourse Headland and Big Hill Point, including the intertidal zone of Delicate and Big Hill beaches. To the west, the regional park is generally bounded by Point Plomer Road, beyond which is mostly freehold land.

Limeburners Creek National Park

Limeburners Creek National Park was first gazetted in 1971 as Limeburners Creek Nature Reserve (6,880 ha) and managed for the conservation of flora and fauna. Future additions to the nature reserve included areas that had been used by generations of locals and visitors for camping, fishing, 4-wheel driving, swimming and surfing. Over time, facilities were provided by the local council and NPWS to cater for these uses. In October 2010, the NSW Parliament reserved Limeburners Creek Nature Reserve as a national park in recognition of the high recreational use of the area. Between 1972 and 1999 there were 10 further additions to the park totalling 2,093 ha.

In 2018, a further 920.91 ha were gazetted as additions to Limeburners Creek National Park, including 713.94 ha in the south-east of the park, 197.37 ha in the north-west of the park, and 9.6 ha of Crown roads. The Limeburners Creek Wilderness Area was declared in 2003, covering 8,360 ha (see Figure 1 and Section 1.4).

Limeburners Creek National Park is immediately south of Goolawah Regional Park. The main entrance to the park, at Big Hill, is 12 km south of Crescent Head. It incorporates most of the coastal strip between Big Hill Point and the community of North Shore, north of the Hastings River, and the inland country surrounding Saltwater Lake. The northern half of the intertidal zone of North Shore Beach is included in the national park (see Figure 1). The park includes Saltwater Lake itself, part of the bed of Limeburners Creek and several islands within the creek. Land surrounding Limeburners Creek National Park is largely zoned rural and land uses include tea-tree plantations, cattle grazing and small-scale agriculture. Small-scale tourism also occurs in the lands surrounding the park.

Lands subject to the plan

The reserved areas of the parks are subject to this plan. Generally, all 3 parks extend down to the mean low water mark. As such, the intertidal zone along this stretch of coast is mostly within the parks under NPWS management and is covered by this plan of management.

Exceptions occur around the headlands in Limeburners Creek National Park, where the boundary of the park extends to the mean high water mark. These stretches of intertidal zone are adjacent to the park and are managed by other land managers (NSW Crown Lands and Kempsey and Port Macquarie-Hastings councils).

In addition, the area subject to this plan also includes unreserved lands that are vested in the Minister under Part 11 of the National Parks and Wildlife Act. This Part 11 land includes the quarry in the north-west of Limeburners Creek National Park (shown as ‘NPWS acquired not gazetted’ on Figure 1).

As the parks include the coastline, intertidal areas, Saltwater Lake and Limeburners Creek estuary, the plan of management applies to these lands but does not prohibit any action authorised under the *Fisheries Management Act 1994*.

Part 11 lands do not form part of the reserved area of the park, but their management is subject to this plan and the National Parks and Wildlife Regulation 2019.

This plan of management does not cover the inholding at Point Plomer which is a Crown lease in perpetuity. See Figure 2 – Map C. This inholding includes several houses and cabins which are rented out as holiday accommodation (see Section 3).

Regional setting

Other NPWS parks in the area include Hat Head National Park (7,458 ha) north of Crescent Head, Sea Acres National Park (76 ha) within the town of Port Macquarie to the south, and Maria National Park (2,389 ha) to the north-west. There are also numerous state forests nearby, the closest of which is Maria River State Forest.

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park all lie in the NSW North Coast Bioregion, one of the most diverse bioregions in New South Wales (NPWS 2003). This bioregion is characterised by a subtropical climate, with a marked spring dry period, hot summers and a summer–autumn wet period.

The 3 parks are in the area covered by the Kempsey Local Aboriginal Land Council. Additionally, NPWS has worked with Birpai Local Aboriginal Land Council in relation to Limeburners Creek National Park due to their connection to the park. The parks all fall within the North Coast Local Land Services region. The Goolawah parks lie wholly within the geographical area of Kempsey Shire Council. Limeburners Creek National Park straddles Kempsey Shire Council and Port Macquarie-Hastings Council areas. Local government areas in the Mid North Coast of New South Wales are among the fastest growing areas in the state, resulting in increasing pressure on the parks to meet the recreational needs of both residents and visitors.

Photo 1 Beach fishing, Goolawah Regional Park. John Spencer/DCCEEW

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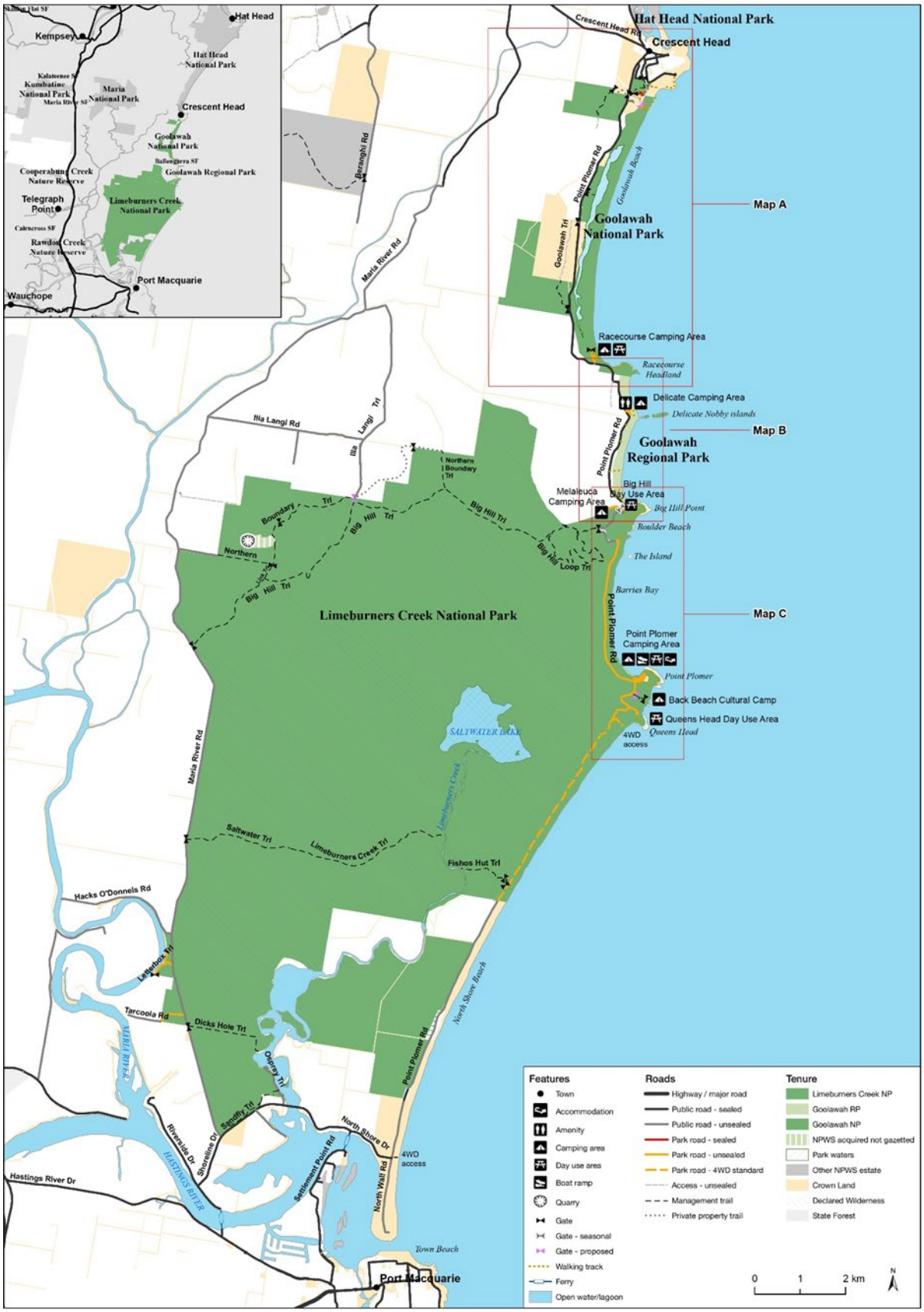

Figure 1 Map of Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park

Figure 2 Inset maps of Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park

1. Protecting the natural environment

1.1 Geology, landform and hydrology

The parks protect a range of coastal landforms that showcase past and current geological processes, including vegetated dunes, hinterland sandhills, an inter-barrier lagoon (Goolawah Lagoon), offshore islands (Delicate Nobby islands), small coves and headlands.

The **coastal margins** of the parks contain beaches, foredunes and hind dunes deposited on Quaternary (Holocene) sands (that is, less than 10,000 years ago) (Atkinson 1999). Beaches include relatively long and wide barrier beaches (for example, Goolawah Beach, Barries Bay Beach), and shorter beaches whose length is determined by surrounding headlands (for example, Delicate Beach).

Several small boulder beaches can also be found (for example, immediately north of Racecourse Headland).

Foredunes comprise sand ridges of moderate relief and often have an incipient dune to their seaward side. Hind dunes in many parts of the parks have been disturbed and reshaped by past sandmining activities (Atkinson 1999).

More stable hind dunes, which have generally not been affected by sandmining, are usually located at the southern ends of beaches and comprise deeper, unconsolidated dune sands. Low relief, low elevation back plains are often found to the landward side of hind dunes.

Beach and foredunes support essentially bare sands, either coarse, shelly beach sands or finer sands; and undisturbed hind dunes support fine sands to brownish-grey podzols.

All soils in the coastal margins of the parks are generally non-cohesive, have low available water-holding capacity and low fertility. As such, they are highly susceptible to coastal and wind erosion (Atkinson 1999).

The parks include long, exposed beaches of low gradient; shorter, rock-bound sandy beaches; and rock-dominated boulder beaches around headlands, which are only periodically covered in sand during prolonged periods of reduced wave action (for example, Big Hill).

Many beaches are associated with well-developed double bar systems that sometimes extend the entire length of the beach (for example, Goolawah Beach) and have persistent beach gutters, contributing to their suitability for activities such as beach fishing.

Beaches and dunes are complex physical and ecological systems providing habitat for invertebrates (for example, worms, clams, crustaceans), which support higher-order predators (such as shorebirds and fish) and contribute to nutrient recycling.

Beaches and dunes also offer protection from harsh storm events and wave activity and help protect coastal areas from the impacts of erosion.

Threats to beach and dune ecosystems in the parks arise from a range of stressors that span differing impacts, from global effects (for example, sea level rise) to more localised ones for example, past mining activity and destruction of dune vegetation).

Beaches are favourite recreation zones, but research has shown strong evidence that vehicles cause environmental damage to dunes and beaches.

Dune vegetation is highly sensitive to disturbance, and a single vehicle can result in lasting damage that is difficult to repair. As foredunes are the first line of defence against storms, vehicle-induced damage is likely to exacerbate erosion and shoreline retreat.

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Four-wheel drive vehicle use is one of the most environmentally damaging activities undertaken on sandy beaches and dunes and can dramatically alter the physical properties of coastlines (Davies et al. 2016).

A range of landscape features are found immediately inland of foredunes and hind dunes, including tidal flats and creeks, sand plains, swale swamps and flat coastal swamps. Broadly, these areas are extremely low relief and comprise Holocene peats and unconsolidated sands overlying Pleistocene barrier sands.

Soils are loamy coarse sands through to light clays, are generally waterlogged and strongly acid and have high organic matter and low fertility (Atkinson 1999).

Pleistocene sand plains are also found inland of foredunes and around swamp landscapes. These landscapes comprise a beach-ridge and swale system and deep, unconsolidated, aeolian (that is, windblown) sands and soils that are rapidly drained, highly erodible and of low fertility.

The **headlands** of Racecourse Headland, Big Hill Point, Point Plomer and Queens Head, Delicate Nobby islands and a small number of isolated hills (up to 40 m high) form the main relief within the parks.

Racecourse Headland, Delicate Nobby islands, Big Hill Point and Point Plomer are remnants of the Devonian (370–415 million years ago) Touchwood Formation (siltstone, sandstone and basaltic breccia).

Headlands were likely to have previously been offshore islands, linked by Quaternary sand barriers (Atkinson 1999). Headlands and associated rolling hills comprise conglomerates and lithic sandstones which produce relatively shallow stony soils, sandy loams or silty clay loams.

Low-lying coastal swamps in the parks are broadly interconnected to the Maria River catchment and Belmore River to the north and south respectively (Brady and Ekert no date). **Goolawah Lagoon** in Goolawah National Park occupies an inter-barrier depression between the Holocene outer-barrier and the Pleistocene inner-barrier.

The lagoon is long and narrow, and its extent fluctuates between 10 and 90 ha, depending on recent rainfall.

The lagoon is classified as a semi-mature, inter-barrier lagoon, reflecting the degree to which infilling has occurred. Prior to sandmining restoration works about 40 years ago, Goolawah Lagoon was an intermittently closed and opening lake and lagoon (ICOLL).

These restoration works resulted in an almost permanent closing of the ICOLL, which caused it to change to a freshwater system. This has led to significant natural vegetation changes, loss of marine and waterbird habitat, increased sedimentation, nutrification, significant pest plant infestation and loss of recreational opportunities.

Box 1: Nationally important wetlands

Over 70% of the parks are identified under *State Environmental Planning Policy (Coastal Management) 2018,* incorporating a diverse range of wetlands. These include coastal and estuarine wetlands, intertidal marshes, intertidal forested wetlands and lagoons ranging from brackish, through saline to fresh water (Environment Australia 2001).

Limeburners Creek National Park contains a 9,100-ha wetland that is listed in *A directory of important wetlands in Australia* (Environment Australia 2001). Wetlands in Limeburners Creek National Park are listed because they represent good examples of each wetland type and play an important ecological role supporting threatened species (Environment Australia 2001).

Wetlands of recognised national significance provide suitable habitat for several obligate freshwater species, including the vulnerable comb-crested jacana, and are also likely to provide important foraging habitat for threatened micro-bats, for example, greater broad-nosed bat (Brady and Ekert no date).

Wetlands are dynamic living entities, and an important part of the natural environment. They are integral to landscape processes such as nutrient cycling, detention and slow release of flood water, and trapping of sediments. Wetlands also provide habitat for a wide range of animals and plants.

Healthy wetlands provide services to regional communities and industries, such as forming nurseries for fish and other freshwater and marine life, and are critical to Australia's commercial and recreational fishing industries. They also reduce the impacts of floods, absorb pollutants and improve water quality, and provide opportunities for nature appreciation and recreation.

Rivers and swamps also provide a cultural focus for many regional communities, including Aboriginal communities (Cth DCCEEW no date, a).

The main area of Limeburners Creek National Park and Saltwater Lake is drained by Limeburners Creek. Salinity and water levels in Saltwater Lake and surrounding wetlands are subject to tidal influences from the Hastings River. This system is normally saline but becomes fresh for long periods following heavy rains.

Adjacent to the northern boundary of Limeburners Creek National Park is an artificial drainage channel that drains the wetlands to the north. Previously constructed artificial drains and barrages through wetlands in Limeburners Creek National Park are reverting to more natural drainage lines.

The **Macleay Karst Arc** is the most significant deposit of limestone between Sydney and the Queensland border. The main deposit is part of the Kempsey Block of the New England Fold Belt and features arches, canyons, cliffs and caves. Limeburners National Park protects a smaller, locally significant limestone deposit outside of the main arc.

1.1.1 Management considerations and opportunities

The parks' geodiversity is impacted by past sandmining activities, natural processes and visitor use.

The landforms of the coastal margins of all 3 parks have been significantly affected by past sandmining. Coastal sands immediately to the south of Point Plomer were mined for rutile, zircon and other minerals during the 1970s.

The foredune section of Goolawah Beach (known locally as Back Beach), and the hind dune system behind Goolawah Lagoon were also extensively mined (Brady and Ekert no date). A quarry was established at Queens Head during the sandmining period to provide gravel for the mining road south to Port Macquarie. It has been disused for many years and is currently revegetating.

The integrity of coastal dunes in Limeburners Creek and Goolawah national parks is being impacted by beach driving activities. Regulations require beach drivers to stay below the high water mark, but many drivers disregard this regulation during high tide or to undertake illegal camping above the high tide mark in the dunes. These activities are accelerating the impacts of coastal erosion, leading to further shoreline recession during storm events.

The sandy nature of soils in the parks makes them prone to erosion, particularly where informal tracks have been created by pedestrians, 4-wheel drive vehicles and trail bikes.

Numerous tracks have been created along the frontal dunes of Goolawah Regional Park and into Goolawah Lagoon (Goolawah National Park), and in Limeburners Creek National Park. See Section 3 for consideration of these activities and impacts.

Water quality and pest plant impacts in Goolawah Lagoon have been exacerbated by the almost permanent closure of this lagoon to the sea following sandmining in the area (see Section 1.5). Water quality in Goolawah Lagoon is also negatively impacted by run-off from Point Plomer Road.

During the 2021 floods, Goolawah Lagoon temporarily reopened. Future management of the entrance will be considered as part of council's coastal management plan process. This will consider how the system naturally operates and how any changes may impact the composition of flora and fauna in and around the lagoon, particularly threatened species.

Further research is required to better understand the presence of native flora and fauna in and around the lagoon and to determine the potential impacts any proposed hydrological changes may have on threatened species.

The parks are likely to be subject to an increasing frequency and severity of storm events, changes in wave activity and the effects of king tides due to climate change. Such activity can result in severe coastal erosion and the loss of foreshore areas (see Section 1.7).

Karst landscapes require protection from unauthorised recreational use, and inappropriate management activities such as fire and pest plant control works. These activities may damage cave formations and disturb native fauna, cave ecosystems and invertebrates.

A separate management plan for the Macleay Karst Area, including Limeburners Creek National Park, has been prepared to guide management of karst landscapes (OEH 2013).

1.2 Native plants

Box 2: Significant corridors

The parks form part of a significant biogeographic complex of coastal reserves located between the Manning and Macleay rivers and are important remnants of threatened ecosystems that have mostly been cleared along the east coast of Australia.

The parks represent the starting point of a significant, subregional vegetation and wildlife corridor that runs east–west and protects a major forested landscape system stretching from wilderness on the coast, through Maria River and Kumbatine to Gondwana World Heritage rainforests on the Great Escarpment (for example, Willi Willi and Werrikimbe national parks). Such connectivity supports essential ecological processes, including seasonal and altitudinal migration of fauna.

It is also likely to be essential to the resilience and evolutionary potential of species and ecosystems under climate and other environmental change scenarios.

The parks also contribute to a north–south largely interconnected mosaic of coastal vegetation communities between Hat Head and Port Macquarie, sustaining viable populations of several threatened flora and fauna, including migratory species that are protected under international agreements.

1.2.1 Native vegetation of the Goolawah parks

A number of flora surveys have been conducted within the Goolawah parks and over 333 species of native plants have so far been identified (Ingersoll and Redpath 2002; Kendall and Kendall 2005; NSW BioNet Atlas, sourced August 2020).

The *Vegetation classification for the Northern Rivers Catchment Management Area of NSW* (OEH 2012a) provides a comprehensive regional vegetation classification based on previous studies.

The Goolawah parks contain 8 broad vegetation classes (see OEH 2012a and Appendix C for a full description): maritime grasslands, coastal swamp forest, freshwater wetland, wallum sand heath, coastal dune dry sclerophyll forest, North Coast dry sclerophyll forest, North Coast wet sclerophyll forest and littoral rainforest.

Maritime grasslands include kangaroo grasslands found on headlands and beach spinifex strandline grasslands along the seaward side of foredunes. Coastal swamp forests include 3 different broad-leaved paperbark communities found in the parks' swampy and poorly drained areas.

Goolawah Lagoon is currently an extensive coastal freshwater lagoon that would have supported one or more freshwater wetland communities after sandmining restoration resulted in almost permanent closure. However, heavy infestations of water hyacinth and salvinia have degraded the lagoon to such an extent that it is now difficult to determine the wetland communities that would have occurred within the lagoon.

Coastal heath swamps are found on clays and clayey sands in the western portion of Goolawah National Park, and wallum sand heaths (dominated by coast wattle) are generally heavily influenced by past sandmining activities.

Coastal dune dry sclerophyll forests dominated by pink bloodwood and coast banksia are found on the parks' sandy dunes and coastal plains, and a patch of dry sclerophyll forest is located on the headland immediately south of Crescent Head.

North coast wet sclerophyll forest is confined to a narrow drainage depression in Goolawah National Park west of Point Plomer Road.

There are 2 distinct littoral rainforest communities in the parks. One is dominated by coast banksia and tuckeroo and can be found in the more protected foredune areas in Goolawah National Park. The other, more diverse community is found on Racecourse Headland.

Vegetation communities in the parks have very different requirements with respect to fire, yet knowledge about the ecological requirements of species and communities with respect to fire is limited.

Fire may also threaten significant plant species and communities and may favour the accelerated spread and establishment of pest plants (for example, lantana). See Sections 1.5 and 1.6.

1.2.2 Native vegetation of Limeburners Creek National Park

The terrestrial flora of the older reserved portion of Limeburners Creek National Park is relatively well documented (McGillvray, in NSW Government 1968). A wide range of coastal vegetation communities are found in the park (see Appendix C), and over 469 species of native plants have so far been recorded.

Approximately 70% of the park is swamp, supporting areas of sclerophyll forest and woodland dominated by broad-leaved paperbark and swamp oak; swamp shrubland dominated by heath banksia; and wet heath dominated by grass trees, tea-tree or fern-leaved banksia and sedges.

Vegetation communities adjacent to Saltwater Lake, in the middle of Limeburners Creek National Park, have been extensively surveyed.

Pure stands of broad-leaved paperbark can be found on the western edge of the lake, and patches of grey mangrove, milky mangrove and swamp oak occur on the southern side.

Generally, the western side of Limeburners Creek National Park, where eucalypt species dominate, is drier than the central and eastern sections of the park (NPWS 1998).

The vegetation on Big Hill Point, Point Plomer and Queens Head consists mainly of black she-oak, coast banksia, broad-leaved paperbark, swamp oak, littoral rainforest species and kangaroo grass.

Dunal areas support small areas of paperbark, but are generally dominated by coast banksia, coastal tea-tree, coast wattle and beach spinifex (Griffith and Wilson 1995).

Saltmarsh communities are found in the lower elevation areas of Limeburners Creek National Park and support beaded samphire, marine couch, bare twig rush and salt marsh rush (Griffith and Wilson 1995).

Small patches of subtropical cabbage palm rainforest dominated by bangalow palm are found west of North Shore Beach and Queens Head in Limeburners Creek National Park.

The 2018 addition to the south-east of the park supports a variety of coastal vegetation types, including littoral rainforest, lowland rainforest, subtropical coastal floodplain forest, swamp sclerophyll forest, wet and dry sclerophyll forest, wet heath, mangroves, sedgeland and saltmarsh.

The distribution of these communities is determined by substrate type, degree and depth of waterlogging and proximity to the saline influences of Limeburners Creek. Several threatened ecological communities are known from this area, including Littoral Rainforest, Lowland Rainforest, Subtropical Coastal Floodplain Forest, Coastal Saltmarsh, Swamp Sclerophyll Forest on Coastal Floodplains, and Swamp Oak Forest.

Seasonal flowering species such as the broad-leaved paperbark and swamp mahogany represent an important food source for the grey-headed flying-fox and common blossom-bat. Tree hollows provide vital roosting sites for several micro-bat species, for example, the little bentwing-bat.

Coastal heath communities protected by the parks form part of a discontinuous system of heathlands occurring along the NSW coast and so represent critical resources for migratory birds such as the critically endangered regent honeyeater.

Littoral rainforest remnants also provide suitable habitat for threatened species, including obligate rainforest species such as the rose-crowned fruit-dove and wompoo fruit-dove. These rainforest remnants are particularly important during the spring coastal migration when birds can feed on the fruits of rainforest species such as bangalow palm and native figs.

1.2.3 Threatened ecological communities

What is a threatened ecological community?

An ecological community is a naturally occurring group of native plants, animals and other organisms that interact in a unique habitat.

An ecological community is considered threatened when it is at risk of extinction. This could be due to a number of factors, including:

- a change in community structure or composition due to, for example, a species becoming extinct
- disruption of ecological processes as a result of disturbance
- invasion by exotic species such as pest plants and feral animals
- habitat degradation or fragmentation due to, for example, clearing for development.

Threatened ecological communities are listed as vulnerable, endangered or critically endangered under the *Biodiversity Conservation Act 2016*.

Threatened ecological communities within the parks provide vital habitat for threatened fauna. For example, Swamp Sclerophyll Forests on Coastal Floodplains Endangered Ecological Community supports listed species such as the eastern osprey, Australasian bittern, southern myotis and wallum froglet.

The parks contain 8 threatened ecological communities as outlined in Table 2 and detailed in Appendix D.

Table 2 Threatened ecological communities in the parks

Community name (short BC Act title)	Community name (EPBC Act)	Status BC Act	Status EPBC Act	GNP	GRP	LCNP
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	E	V	Y	Y	Y
Freshwater Wetlands on Coastal Floodplains		E		Y	Y	Y
Littoral Rainforest	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	E	CE	Y	Y	Y
Lowland Rainforest	Lowland Rainforest of Subtropical Australia	E	CE	Y	Y	Y
Subtropical Coastal Floodplain Forest		E		Y	Y	Y
Swamp Oak Floodplain Forest	Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and SE Qld	E	E	Y	Y	Y
Swamp Sclerophyll Forest on Coastal Floodplains		E		Y	Y	Y
Themeda Grassland on Seacliffs and Coastal Headlands		E		Y	Y	Y

Table notes

Status: BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act 1999; E = endangered; CE = critically endangered; V = vulnerable; Y = present in park.

Park: GNP = Goolawah National Park; GRP = Goolawah Regional Park; LCNP = Limeburners Creek National Park.

Littoral Rainforest endangered ecological community is considered very rare and generally occurs only as small stands. The largest known stand in New South Wales is 136 ha. Littoral rainforests have a restricted distribution and are also listed as critically endangered at the national level.

Within Limeburners Creek National Park, littoral rainforest is found on the northern and southern slopes of Big Hill Point, between Plomer Headland and Queens Head, and in the hind dunes of Barries Bay.

Pockets of littoral rainforest are found south of Goolawah Lagoon and around Racecourse Headland. This endangered community includes coast banksia – tuckeroo closed forest/shrubland, and yellow tulipwood – yellow wood – red olive berry – brown pine littoral rainforest communities (OEH 2012a).Littoral rainforest is threatened by pest plants, particularly lantana, bitou bush and coastal morning glory.

Other threats include clearing, grazing and physical disturbance of the understorey (for example, through firewood collection, the activity of introduced animals); fire incursion, particularly along remnant boundaries; and a range of disturbances associated with visitation

(for example, compaction, informal track development, and the introduction of pathogens) (NSW SC 2004a).

Lowland Rainforest endangered ecological community in New South Wales is comparable to the nationally listed critically endangered Lowland Rainforest of Subtropical Rainforest. It is found in small areas in Limeburners Creek National Park. Threats to this community include clearing and fragmentation, pest plant invasion, fire, myrtle rust, grazing, climate change, reduced pollination and lack of seed, human disturbance and invasion by non-native escaped garden plants (NSW SC 2011).

Subtropical Coastal Floodplain Forest endangered ecological community is found on periodically inundated alluvial flats, drainage lines and river terraces in all 3 parks. It is threatened by invasion of pest plants, rising sea level associated with climate change, livestock incursion, human disturbance including clearing, altered fire and hydrological regimes, activation of acid sulfate soils and myrtle rust (NSW SC 2004b).

Themeda Grasslands on Seacliffs and Coastal Headlands endangered ecological community has a highly restricted geographic distribution within New South Wales, comprising small, but widely scattered patches. It is found on headlands within the parks (for example, Racecourse Headland, Big Hill Point and Queens Head) as well as on Delicate Nobby islands. This endangered community is included in the maritime grassland community (OEH 2012a). Within protected areas the community is threatened by invasion by shrubs, and introduced grasses and herbs, including bitou bush and lantana, kikuyu and beach pennywort. In certain locations within these parks (for example, Queens Head), there is evidence that in the absence of fire the community may become colonised with successional species, including coast banksia, swamp oak and coast wattle. The community may also be threatened by erosion occurring through the development and use of footpaths and informal footpads, and by the use of off-road vehicles.

Swamp Oak Floodplain Forest endangered ecological community occurs on wet flats of coastal floodplains and around the margins of coastal lakes. The community generally has a dense tree canopy of swamp oak and may intergrade with other threatened floodplain communities. Frequent burning of this community may reduce the diversity of woody plants that are present. Other threats to the community within protected areas include grazing and trampling by stock and feral animals (for example, pigs) and climate change (through impacts on hydrology and fire regimes).

Swamp Sclerophyll Forest on Coastal Floodplains endangered ecological community generally occurs on waterlogged or periodically inundated alluvial flats, often below 20 m elevation (NSW SC 2005). Only small areas of this community are contained in existing protected areas.

Within the parks covered by this plan, the community is likely to include a range of vegetation associations, such as swamp mahogany – swamp sclerophyll forest, broad-leaved paperbark – swamp mahogany – swamp sclerophyll forest, and heath banksia vegetation types. Within protected areas the community is threatened by hydrological changes that may be initiated either within or outside park boundaries, pest plant invasion, grazing, trampling and other soil disturbance, either by domestic livestock or feral animals, including pigs (NSW SC 2005).

1.2.4 Threatened and significant plants

The parks are known to support at least 9 plant species that are listed under the Biodiversity Conservation Act, *Environment Protection and Biodiversity Conservation Act 1999* or both (see Table 3). In addition, a number of plant species in the parks are significant because they occur outside their previously documented range or are at the distributional limit of their known range.

Such occurrences are likely to be particularly significant to the ability of species to respond to climate change. The dwarf heath casuarina is considered to be nationally endangered and has been recorded within Limeburners Creek National Park.

Nodding raspwort, the small shrub *Symphionema paludosa*, scented marsdenia, rough-barked apple and bloodroot are found at the northern limit of their distribution within the park.

The shrub *Eriocaulon australe,* sedge *Cyperus stradbrokensis*, swamp box, and the shrub *Ochrosperma citriodorum* are found at the southern limit of their distribution within the park (NPWS 1998).

Further comprehensive survey work is required to confirm the presence of additional threatened and significant plant species in the parks and to guide management.

The diversity of plant species and communities found within the parks provide vital food, shelter and breeding habitat for threatened wildlife, further adding to the very high local and regional conservation significance of the parks.

At a broad scale, the parks also significantly contribute to habitat connectivity. They provide regional and subregional corridors that facilitate both the north–south and east–west movement of several threatened species, including the swift parrot and rose-crowned fruit-dove (Brady and Ekert no date). Linkages of suitable habitat at a regional level are also likely to be important to the koala (Brady and Ekert no date).

Table 3 Threatened plant species found within or near the parks

Common name	Scientific name	Status BC Act	Status EPBC Act	GNP	GRP	LCNP
Austral toadflax	*Thesium australe*	V	V	Y		
Dwarf heath casuarina	*Allocasuarina defungens*	E	E	Y [1]		Y
Flat fork fern	*Psilotum complanatum*	E				Y
Juncus sp.	*Maundia triglochinoides*	V		Y		
Milky silkpod	*Parsonsia dorrigoensis*	V	E	Y[1]		Y
Native guava	*Rhodomyrtus psidioides*	E		Y		Y
Sand spurge	*Chamaesyce psammogeton*	E		Y		
Scented acronychia	*Acronychia littoralis*	E	E	Y[1]		
White-flowered wax plant	*Cynanchum elegans*	E	E	Y	Y	Y

Table notes

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

Park: GNP = Goolawah National Park; GRP = Goolawah Regional Park; LCNP = Limeburners Creek National Park' Y = present in park; Y [1]= found within 10 km of park boundary.

1.2.5 Management considerations and opportunities

Strategies for the recovery of threatened species, populations and ecological communities have been set out in the NSW Biodiversity Conservation Program.

Actions listed in each of these strategies are prioritised and implemented through the Saving our Species program, which aims to maximise the number of threatened species that are secured in the wild in New South Wales for 100 years.

All the threatened ecological communities and plant species listed in Table 2 and 3 have Saving our Species strategies for their management. The parks are key Saving our Species program management sites for Themeda Grassland and Littoral Rainforest threatened ecological communities.

Many recovery plans for NSW threatened species have previously been prepared and may still provide useful information, but they no longer determine the actions required for the conservation of threatened species in New South Wales.

The Australian Government prepares recovery plans for nationally listed threatened species under the Environment Protection and Biodiversity Conservation Act. These plans do apply to nationally listed threatened species occurring in the park.

Fine-scale vegetation mapping has not been completed across the parks, limiting our understanding of the location and condition of threatened species and ecological communities.

Only preliminary investigations have been undertaken in the 720-ha addition to Limeburners Creek National Park.

Managing the interface between Themeda Grassland and Littoral Rainforest threatened ecological communities requires competing management responses where they occur adjacent to each other because these communities have differing ecological requirements with respect to fire and management of the overstorey.

The boundaries/edges of grassland and rainforest in the park will be managed on a case-by-case basis.

Vegetation communities in the parks are susceptible to several threats that have the potential to operate at the landscape level. These include climate change and its associated influence on hydrological processes (including erosion and sedimentation), fire and the introduction and rapid spread of pest plants and pathogens (such as myrtle rust and the root-rot fungus phytophthora). See Sections 1.5 and 1.6.

Hazard reduction burning can impact the parks' biodiversity values if plant communities are not burnt at the right fire frequency or intervals required for their survival. The Enhanced Bushfire Management Program needs to consider the important biodiversity values of the parks, particularly threatened ecosystems and habitat for threatened fauna.

Vegetation communities are also being impacted by several site-specific factors, including impacts from pigs, impacts from dust from Point Plomer Road, illegal track creation, pest plant incursion, past mining activities (for example, at Queens Head), and impacts associated with visitation (for example, firewood collection, erosion, introduction of pathogens). See Sections 1.5, 1.6 and 3.

The linear nature of the Goolawah parks and their proximity to urban areas make them particularly susceptible to edge effects such as invasion by pest plants (including escaped garden plants and dumped garden wastes) and incursion of feral animals. See Section 1.5.

Frontal dune vegetation in the parks is susceptible to damage from 4-wheel drive vehicles and trail bikes venturing off established access tracks and/or away from the intertidal zones of the beach (see Section 3).

Minor, localised erosion has occurred around the edges of steeper sections of the headland walking tracks. Tracks in some locations are difficult to traverse due to erosion; and multiple routes have formed around obstacles. There is also a proliferation of informal footpaths in some locations which has led to localised erosion and encroachment of tracks into native vegetation.

Transport of introduced grass seeds via uncontrolled pedestrian movements is a threat to the Themeda grassland community in headland areas. There is a need to rationalise beach access tracks to reduce impacts and ongoing maintenance costs.

Wetlands are valued as significant parts of NSW landscapes. Their conservation and management are most appropriately considered at the catchment scale. Limeburners Creek National Park wetland currently has limited disturbance due to its protection as a national park and wilderness area.

Pest plant species are most prevalent in previously disturbed sites. The main pest plant species include lantana and bitou bush. Feral pigs are also periodically impacting on the wetlands in some areas.

The low-lying inundated nature of Limeburners Creek National Park, dense vegetation and extensive wetland areas makes access difficult, and the park is therefore unsuitable for most recreational activities.

The limited management trails also go through sensitive threatened ecological communities and wet areas, which make them susceptible to impacts from recreational use.

Box 3: Fire in the parks

All 3 parks have threatened ecological communities which require specific fire requirements to protect their values. Fire should be excluded from the Coastal Saltmarsh, Littoral Rainforest and Lowland Rainforest threatened ecological communities due to the limited ability for these vegetation communities to recover (NPWS 2004).

The Themeda Grassland, Subtropical Coastal Floodplain Forest, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest on Coastal Floodplains threatened ecological communities are impacted by altered fire regimes.

Low frequency fire can cause canopy closure which shades out ground layer flora communities and fauna habitat. Too-frequent fire can simplify ground layer vegetation through loss of flora species. By contrast, carefully managed fire can also provide an opportunity to combat pest plants and feral animals if enough resources are available.

Limeburners Creek National Park has been subject to extensive fires in the past, partly due to the large areas of fire-adapted vegetation types (for example, heath and dry sclerophyll forest) and lack of access for firebreaks through low-lying wet areas. Inappropriate fire regimes, arson and illegal campfires are threats to the park's natural and cultural values. High-frequency fires are listed as a key threatening process in New South Wales (NSW SC 2000a).

1.3 Native animals

The diversity of plant communities found in the parks supports a significant range of native animals, including numerous threatened, migratory and/or range-restricted species. More than 320 species of native fauna have been recorded in the parks, including 50 threatened species and 23 species of migratory birds protected by international agreements (see

Appendix E). The parks support particularly diverse assemblages of birds, bats and frogs and regionally important koala habitat.

Delicate Nobby islands protect the northernmost colony of little penguins on the Australian east coast. Survey effort is required to determine the status of this colony.

A total of 73 threatened fauna and migratory bird species have been recorded in the parks, including 49 birds, 15 mammals, 2 invertebrates, 2 frogs and 2 reptiles. Appendix E lists threatened animal species, migratory birds, their status and which park(s) they occur in. The following section provides details for those species, or groups of species, for which the parks are particularly important.

1.3.1 Mammals

The parks contain an estimated 53 species of mammals. The large mammalian fauna is dominated by macropods, including the red-necked wallaby, swamp wallaby and eastern grey kangaroo.

Both the northern brown bandicoot and long-nosed bandicoot occur in the parks, along with several carnivorous marsupials (for example, antechinus and brush-tailed phascogale), rodents (for example, bush and swamp rats) and arboreal mammals (possums and gliders).

Arboreal mammals are generally under-represented in the mammalian fauna, particularly in the Goolawah parks, which may reflect relatively low numbers of hollow-bearing trees (Ingersoll and Redpath 2002).

The **spotted-tail quoll** has been recorded in Limeburners Creek National Park in a range of habitat types, including heathland, sedgeland, shrubland, forest and woodland. The majority of den sites were recorded in areas of open eucalypt forest in hollow logs or hollows in live or dead standing trees (Andrews 2005). The range of the spotted-tailed quoll has contracted considerably since European settlement, and this species is listed as vulnerable in New South Wales and endangered nationally. Fragmentation and degradation of habitat, and competition with introduced predators such as cats and foxes pose the biggest threats to quolls in this area.

The parks provide regionally important habitat for the **koala**, supporting several primary browse tree species, including tallowwood, swamp mahogany, scribbly gum and forest red gum (Kendall and Kendall 2006). Old man banksia may also be a favoured browse tree for koalas, particularly in the Goolawah parks (Kendall and Kendall 2006).

Regionally, koala populations are likely to be affected by habitat fragmentation, predation by introduced carnivores and high-intensity wildfires. Within the parks, injury or direct mortality due to vehicle collisions is a concern due to Point Plomer Road fragmenting suitable koala habitat, an issue likely to be exacerbated as the road is sealed and vehicle speeds likely increase.

The parks are particularly important for **bats**, with 19 species recorded. Most micro-bats in the parks are tree-roosting species, for example, Gould's wattled bat and Gould's long-eared bat. Several typically cave-roosting species have also been observed, for example, eastern horseshoe bat and eastern cave bat. Karst features in Limeburners Creek National Park are intermittently used by roosting bats, which may be vulnerable to predation by introduced animals, particularly foxes, cats and black rats.

The insectivorous micro-bats found in the parks occupy a range of habitats, including rainforest, wet eucalypt forests, paperbark swamps, dense coastal forests and banksia scrub. Several larger, fruit- and nectar-feeding bats have also been recorded, including little red flying-fox, grey-headed flying-fox and common blossom-bat.

A total of 8 threatened bats are found in the parks. The little bentwing-bat and eastern bentwing-bat are both listed as vulnerable in New South Wales and have been recorded in

all 3 parks. One roost of an estimated 500 little bentwing-bats was recorded in Limeburners Creek National Park in the late 1990s. The eastern cave bat has been recorded in the Goolawah parks and is generally found in dry open forest and woodland, although occasionally occupies wet eucalypt forest and rainforest. Within the parks these 3 species are threatened by predation by foxes and feral cats around winter roost sites, and by the use of insecticides which may diminish local populations of insect prey.

The eastern long-eared bat is known from the Goolawah parks. This threatened species commonly inhabits lowland subtropical rainforest and wet and swamp eucalypt forest. Roost sites are often tree hollows or the foliage of rainforest species, including large palms. Within the parks, the species is threatened by pesticide use, the loss of roost trees and degradation of habitat by invasive coastal pest plants, such as bitou bush.

The common blossom-bat is likely to occupy remnants of littoral rainforest within the parks but will forage on nectar and pollen from flowers in nearby heathland and paperbark swamps. The species can be affected by pest plants such as bitou bush, where infestations suppress the regeneration of key food trees such as coast banksia.

Other threatened bats in the parks include the vulnerable grey-headed flying-fox, which fulfils an important ecological function as a pollinator and seed disperser, particularly for rainforest and paperbark forest species. Limeburners Creek National Park is thought to support maternal breeding camps for the species (NPWS 2001), while more generally, the extensive stands of broad-leaved paperbark provide important habitat.

1.3.2 Dingoes

Dingoes were introduced into Australia from Asia around 4,000 years ago and established across the mainland and on many offshore islands. Since the arrival of the First Fleet in 1788, dingoes have hybridised with domestic and feral dogs. Dingoes and dingo–dog hybrids (collectively known as wild dogs) are still widespread across New South Wales, retain a high level of dingo genetics, and continue to fulfill the ecological role of the dingo.

Dingoes also have cultural significance for some Aboriginal people, and visitors also sometimes have an expectation of being able to see ‘dingoes’ in the wild when visiting these parks. However, dingoes and other wild dogs (including those with a high level of dingo genetics) can pose a threat to livestock and public safety and need to be managed accordingly.

The *NSW Wild dog management strategy 2017–2021* (DPI 2017) promotes a balance between managing wild dogs in areas where they have negative impacts and preserving the ecological role of dingoes. The conservation of dingoes is listed as one of the goals of the strategy. It is achieved via the development of regional wild dog management plans which focus control on areas where the risk of negative impacts are greatest, and not undertaking control in other parts of the landscape with a low risk of negative impacts from wild dogs, to preserve the natural ecological role of the dingo (North Coast LLS 2018). NPWS aims to minimise the risk of wild dogs causing damage while allowing for the conservation of dingoes where there is a low risk of negative impacts.

1.3.3 Birds

The parks support a diverse avifauna, with over 200 diurnal bird and 8 nocturnal species recorded, including a large number of threatened species (Appendix E). Honeyeaters are highly represented, as are smaller passerines (for example, thornbills, scrubwrens, and fairy wrens), monarch flycatchers, whistlers, robins, fantails and near passerines (pigeons and doves).

Due to the range of wetland, intertidal and coastal habitats, the parks support a large variety of aquatic birds, including migratory and resident shorebirds (plovers, sandpipers and

oystercatchers), seabirds (terns and gulls) and waterbirds (waterfowl, ibis, pelicans and herons). Waterbirds as a group have declined significantly across New South Wales in recent years, and these parks are likely to provide essential refugia, particularly during drier periods. The endangered black-necked stork is the only species of stork found in Australia and is recorded in the parks, along with the vulnerable brolga. Other threatened aquatic birds that have been recorded for the parks include the white-bellied sea-eagle and eastern osprey. The parks also provide important habitat for many other birds of prey, with a total of 10 species of raptor being recorded in the parks. These spectacular birds favour coastal areas, especially the mouths of large rivers, lagoons and lakes, and rely on threatened ecological communities, including Swamp Sclerophyll Forests on Coastal Floodplains.

The critically endangered regent honeyeater is known to occur in these parks (NSW BioNet Atlas records, accessed August 2012; Brady and Ekert no date). Certain vegetation communities protected by the parks (for example, flowering coastal swamp mahogany) are likely to provide essential winter foraging resources for non-breeding regent honeyeaters, which, as a semi-nomadic species, rely on key 'stepping stones' of productive habitat to maintain annual movements (NSW SC 2010a). Another significant threatened bird species is eastern ground parrot, which has been recorded in Limeburners Creek National Park.

Box 4: Migratory and resident shorebirds

The parks provide important habitat for resident and migratory shorebirds, 23 of which are listed under international conservation agreements (Appendix E). Many shorebirds migrate long distances each year, departing from their breeding grounds in the Artic and Alaska in July and arriving at their non-breeding wintering sites in Australasia in October, before returning north in March. Australia plays an important role in international cooperation to conserve migratory shorebirds in the East Asian – Australasian Flyway (DoE 2015).

The parks' creeks, lakes, wetlands and coastline form part of the Hastings-Macleay Important Bird Area, an internationally significant area providing foraging, roosting and potential nesting resources for many threatened shorebird species. The beaches and rock shelf areas provide foraging and breeding habitat for resident shorebirds such as the sooty oystercatcher and pied oystercatcher (of which fewer than 200 breeding pairs are estimated to occur in New South Wales). Intertidal zones and estuaries are particularly important foraging habitats, while the backs of beaches and sandbanks are important for breeding, particularly for the endangered little tern.

The International Union for Conservation of Nature's Red List Index has identified shorebirds and seabirds to be in urgent need of conservation action in Australia, with their numbers seriously declining over the past 3 decades. This decline in shorebird numbers also appears to be occurring at the local level (Insight Ecology 2017).

Birds that nest and forage on beaches are highly threatened due to their key habitats being those highly favoured by people for recreation and due to the overlap in the timing of the breeding season (typically spring and summer months) with the peak of beach use.

Beach-nesting shorebirds face a range of threats, frequent disturbance by domestic dogs can reduce breeding and impact upon egg survival. Other threats directly relevant to the parks are crushing of the nests and chicks (for example, by vehicles, people, horses), disturbance from people (leading to lethal exposure of eggs or chicks, starvation of chicks, or undefended eggs or chicks being predated) and habitat loss (e.g. pest plant infestations, sea level rise). Introduced predators can also have an impact on breeding success by resident shorebirds (Maguire 2018).

Eight species of nocturnal birds are known from the parks, including the tawny frogmouth Australian owlet-nightjar and the nankeen night heron. Five species of owl are found in Limeburners Creek National Park and one species, the southern boobook, is also found in the Goolawah parks.

Three threatened owl species — powerful owl, masked owl and eastern grass owl — have so far been recorded in Limeburners Creek National Park. The large forest owls (powerful and masked owls) occupy a range of habitats, including dry eucalypt forests and woodlands, tall open wet forest and rainforest.

The grass owl inhabits swampy heath. Within protected areas, owl populations can be negatively affected by habitat disturbance, predation of fledglings and frequent fires. Fires can reduce prey populations (for example, for the powerful owl) and on-ground roosting and nesting habitat (for example, for the eastern grass owl).

Delicate Nobby islands protect the most northerly colony of little penguins on the Australian east coast. The islands are also a breeding site for wedge-tailed shearwater.

1.3.4 Frogs

Over 20 species of native frog have been recorded in the 3 parks, including tree- and ground-dwelling species. The frog fauna of Limeburners Creek National Park appears more diverse than that of the Goolawah parks, however, this may reflect the size and diversity of wetland habitats in Limeburners Creek as well as sampling effort.

Frogs occupy a range of habitats in the parks, including woodlands, rainforests, heathlands, lagoons and flooded grassy areas. Some species can also be found within the drier sand dune habitats (Ingersoll and Redpath 2002).

The parks provide important breeding habitat for frogs, particularly in ponds, soaks and lagoon margins. Large stands of melaleuca, with their associated thick leaf litter, are particularly suitable frog habitat within the parks. Limeburners Creek National Park is recognised as a centre of endemism for wallum frogs, including the wallum (or tinkling) froglet and populations of Bibron’s toadlet and Freycinet’s frog (NPWS 2001).

The vulnerable wallum froglet is known from Limeburners Creek and Goolawah National Park, with suitable habitat in both Goolawah parks (Ingersoll and Redpath 2002). The species is a specialist of acid paperbark swamps and sedge swamps and is susceptible to degradation of wetland habitats.

Preferred habitat for the endangered green and golden bell frog is found in the Goolawah parks, although the species has so far only been reported from Limeburners Creek National Park. Surveys in the parks are required to determine its distribution, including Goolawah Lagoon. The species currently occurs only in separated and isolated populations in New South Wales.

Tadpoles can be impacted by the introduced mosquito fish, which is known to occur in Limeburners Creek National Park and may occur in the Goolawah parks.

1.3.5 Reptiles

As many as 24 species of native reptile may be present in the parks, including several lizards (skinks, dragons and goannas), and snakes (including pythons and elapids, that is, venomous front-fanged snakes). At least 3 marine turtle species are likely to forage in the coastal waters adjoining the parks: green turtles, loggerhead turtles and leatherback turtles. In recent years turtle breeding events have been recorded on Big Hill Beach and on the southern end of North Shore Beach and in Hat Head National Park to the north.

Leatherback and loggerhead turtles are both listed as endangered in New South Wales and nationally, and green turtles are listed as vulnerable. Anecdotal reports suggest an increase in the occurrence of marine turtles in waters adjacent to the parks and further north (for example, Hat Head National Park), presumably in response to increasing sea surface temperatures.

Turtle nesting in the parks is threatened by recreational disturbance (for example, 4-wheel drive vehicles, people, dogs) impacting turtle nests by trampling, crushing or vandalism. Other threats include:

- lack of knowledge of important habitat areas (including nesting beaches) and threats in New South Wales to inform management
- increases in temperatures, sea level and extreme weather events from climate change impacting the species' distribution and breeding success
- artificial light impacting hatchling behaviour and survival
- predation of nests by foxes, cats, pigs or dogs.

1.3.6 Hollow-dependent fauna species

Trees containing hollows have a limited occurrence throughout the parks and as such represent a limited resource for hollow-dependent fauna such as the threatened brush-tailed phascogale, squirrel glider and glossy black-cockatoo. Hollow-bearing trees predominantly occur at Big Hill Point, Killuke Mountain and in the western part of Limeburners Creek National Park. Too-frequent fires have impacted on the number of hollow-bearing trees and logs in the parks, and are an ongoing threat to hollow-dependent fauna including the spotted-tail quoll.

1.3.7 Invertebrates

The invertebrate fauna of the parks is not well known.

Australian fritillary is an endangered butterfly (also listed as critically endangered nationally) which is restricted to a few widely separated localities between Gympie in Queensland and Port Macquarie. It is found in coastal open, swampy and wetland habitats; and native violet, is the caterpillar's preferred food plant. Many former sites have been destroyed by clearing, drainage works and development.

The fritillary is also threatened by burning of coastal wetland habitats and over-collection of adults by butterfly enthusiasts. Native violet is susceptible to pest plant invasion and is delicate and potentially sensitive to trampling. There is a well-known site just to the south of Limeburners Creek National Park on private property. There is a record of the species from 2015.

The giant dragonfly has been recorded in Limeburners Creek National Park; this endangered dragonfly is the third largest in Australia. It is found along the NSW east coast and lives in permanent swamps with bogs and some free water and open vegetation. The larval period for this dragonfly is up to 10 years, making it vulnerable to changes in hydrology, climate change, inappropriate fire regimes, pest plant invasion, stock incursions and pesticide use.

1.3.8 Management considerations and opportunities

Strategies for the recovery of threatened species have been set out in the NSW Biodiversity Conservation Program Actions listed in each of these strategies are prioritised and implemented through the *Saving our Species* program, which aims to maximise the number of threatened species that are secured in the wild in New South Wales for 100 years.

Targeted strategies for managing several species found in the parks have been developed under the Saving our Species program, including the Australian fritillary and giant dragonfly.

Many recovery plans for NSW threatened species have previously been prepared and may still provide useful information, but they no longer determine the actions required for the conservation of threatened species in the parks. NSW recovery plans have been developed or drafted for the koala, little tern, green and golden bell frog and the large forest owls.

The Australian Government prepares recovery plans for nationally listed threatened species under the Environment Protection and Biodiversity Conservation Act. These plans apply to nationally listed threatened species occurring in the park, including the swift parrot.

Native fauna and their habitats are being impacted by a range of threats, such as introduced animals (for example, foxes, cats, wild dogs preying on native wildlife, cattle trampling habitat), pest plants (for example, aquatic pest plants in Goolawah Lagoon), climate change (particularly for wetland specialists) and fragmentation. See Sections 1.5, 1.6, 1.7 and 1.8.

Effective programs to control the impacts of pest plants and feral animals on native wildlife and their habitats require significant partnerships (for example, with volunteer groups, neighbours and other agencies) and consolidation of current efforts. A range of feral animals and pest plants may impact biological values on Delicate Nobby islands, including feral animals and bitou bush.

Domestic dogs can disturb native wildlife and have the potential to injure or kill native animals, particularly on beaches and around camping areas. Dingoes and other wild dogs can also become habituated to human beings and need to be managed in high visitor use areas in the parks (see Section 1.5).

Targeted surveys are required for threatened fauna, and other fauna of significance (for example, migratory species or those at a distributional limit within the park) to guide management. Little is known of the effect of fire on threatened fauna and their key habitats. The habitat requirements of seasonal migrants (including bats, honeyeaters and migratory shorebirds) also need to be better understood so essential resources are protected. The current status of the endangered Australian fritillary and giant dragonfly in Limeburners Creek National Park and little penguins on Delicate Nobby islands needs to be clarified. Surveys of species in and around Goolawah Lagoon are also required to guide management decisions.

Kempsey Shire Council carries out a shorebird monitoring program at sites across the shire, including Goolawah Beach (Goolawah National Park), Big Hill Point to Delicate Nobby (Goolawah Regional Park), Barries Bay north and south (Limeburners Creek National Park) and Back Beach, south of Point Plomer (Limeburners Creek National Park).

Delicate Nobby has some of the highest levels of human activity across the study area and has low numbers of shorebirds. Off-leash dogs and a high-frequency of people walking were recorded at this site. Dogs off-leash were also recorded on Goolawah Beach in Goolawah National Park (Sandpiper Ecology 2019).

Beach traffic in the intertidal zone can substantially change the physical conditions of sandy beaches, displacing up to a tenth of the available faunal habitat in a day. Four-wheel drive vehicles can crush invertebrates (such as pipis and crabs) which are food sources for birds and fishes. Fewer of these species will be found on beaches where 4-wheel drive vehicles are present. Evidence shows that bird numbers recover quickly once vehicles have been excluded from beaches (Schlacher 2008).

The movement of recreational 4-wheel drive vehicles on beaches causes disturbance and/or injury to resident and migratory shorebirds, nesting turtle species, and on invertebrate prey populations occupying sandy beach habitats.

Beach driving poses a major threat to beach-nesting shorebirds and turtles, particularly over the nesting period from August to March. Nests are established on the sand above the mean high water mark and are impossible to see from a car. This results in eggs and chicks being crushed and killed by vehicles. Additionally, the wheel tracks created by vehicles on beaches can trap turtle hatchlings, preventing them from making their journey to the ocean.

Beach driving also has devastating impacts on tiny animals that live among the grains of sand, including pipis and molluscs. These are often relied upon for ecosystem functionality as they provide a source of food for many shorebird species.

Future management of the parks needs to consider the implications of a likely increase in use of the parks by marine turtles. This may include targeted fox and wild dog control and protection of nesting sites.

An opportunity exists for NPWS to continue working with councils to manage the intertidal zone across the parks through compliance and education programs. These programs could focus on minimising impacts to marine turtle nesting sites caused by 4-wheel drive vehicles, visitors and domestic dogs.

The illegal collection of firewood around camping areas degrades habitat and biodiversity values, while bringing firewood into a park can introduce feral animals and diseases. Removal of dead wood and trees is listed as a key threatening process in New South Wales (NSW SC 2003a).

Many ground-dwelling animals and threatened species use tree hollows for nesting. Dead hollow-bearing trees and woody debris provide important habitat for invertebrates and many native animals, including reptiles and bats. When fallen trees and deadwood are removed it destroys their habitat.

Hollow-bearing trees are a limited resource in the parks and the loss of such trees is recognised as a key threatening process in New South Wales.

Within the parks, injury or direct mortality of koalas and other fauna due to road strike is a concern, particularly along sealed sections of road such as Point Plomer Road and Maria River Road.

1.4 Wilderness

Wilderness areas are managed under the NSW *Wilderness Act 1987* to retain a substantially unmodified, natural state and to provide opportunities for solitude and self-reliant recreation. Wilderness areas are large areas of land that, together with their native plant and animal communities, are in an essentially natural state or are capable of being restored to such a state.

Wilderness areas support ecosystems relatively undisturbed by contemporary human activity and, as such, have high environmental quality. In addition, because they are relatively free of the sounds, smells and sights of modern society, wilderness areas also have high recreational value, providing a sense of naturalness and remoteness where people can experience self-reliance, adventure, challenge and exploration. Wilderness is also valued by many people as a source of physical, mental and spiritual rejuvenation which can inspire human expression, through visual arts, literature, music and photography.

Following nominations from the Colong Foundation for Wilderness in 1998 and the North East Forest Alliance in 1999, the Limeburners Creek Wilderness Area was formally declared in March 2003. The declared Limeburners Creek Wilderness Area covers an area of 8,360 ha, equivalent to 88% of Limeburners Creek National Park (see Figure 1). It is one of the few coastal areas in northern New South Wales of sufficient size and naturalness to qualify as wilderness.

It covers a large expanse of coastal vegetation west of Point Plomer Road; Saltwater Lake and surrounding hinterland areas; and the bed, estuarine communities and islands of Limeburners Creek (NPWS 2001). Limeburners wilderness protects a habitat corridor of regional significance and represents a refuge and 'source' area for biodiversity in the region (NPWS 2001).

Current recreational activities in the Limeburners Creek Wilderness Area include walking and nature appreciation. Levels of use are relatively low because much of the area is swampy, and tracks and trails are often inundated.

1.4.1 Management considerations and opportunities

Wilderness areas will be managed to maintain their largely unmodified state, remain self-perpetuating natural systems and provide opportunities for self-reliant recreation. Recreational use of the wilderness area is constrained by the sensitive nature of management trails and surrounding wetland vegetation.

There is a need to communicate the values of wilderness to park visitors and the broader community to increase their appreciation of these areas and to ensure that visitors are aware of wilderness boundaries and the management of recreation in wilderness areas.

Past sandmining has caused disturbance close to the coast, in the form of pest plant infestations. Feral animals, invasive pest plants and inappropriate fire regimes have the potential to impact wilderness values. Management of natural and cultural heritage, introduced species and fire is carried out in wilderness areas in the same manner as other parts of the parks system, with special attention to minimising impacts on wilderness values.

1.5 Pest plants and feral animals

Pest species are plants, animals and pathogens that have negative environmental, economic and social impacts, and are most commonly introduced species. Pests can have impacts across the range of park values, including biodiversity, cultural heritage, catchment and scenic values, with several listed as key threatening processes.

1.5.1 Pest plants

The most significant introduced plant species for the parks and those listed as key threatening processes are detailed in Appendix F. Many of these pest plants are a threat to habitat values as well as threatened plants, animals and ecological communities. Pest plants can alter ecosystems by shading or smothering native plants, shading streams and waterways, altering hydrology and increasing the fuel load for bushfires. This can have profound effects on the structure of terrestrial and aquatic vegetation communities and the species that depend on them. In addition, pest plant infestations can reduce the aesthetic appeal of the natural environment for public recreation and appreciation and impact on public safety.

These impacts are particularly evident in the parks where there are large areas of coastal pest plants. Pest plant invasion due to disturbance caused by sandmining is a significant and ongoing issue for these parks. Invasion by **bitou bush** leads to a decline in the species diversity of affected plant communities and the fauna that depend on them. All 3 parks contain vegetation communities susceptible to bitou bush invasion (that is, foredunes, hind dunes, headlands, open coastal forests and littoral rainforest) (DEC 2006). Threatened fauna in the parks potentially affected by bitou bush infestation include the little tern and little bentwing-bat.

Box 5: Bitou bush and lantana – priority control

Bitou bush and lantana are listed as Commonwealth Weeds of National Significance. Invasion by bitou bush and lantana leads to a decline in the species diversity of affected plant communities and the animals that depend on them. Both pest plants are listed as a key threatening process under the Biodiversity Conservation Act. They readily invade a wide variety of disturbed and undisturbed coastal plant communities, out-competing native vegetation.

A national *Plan to protect environmental assets from lantana* (Biosecurity Queensland 2010) has been developed, which establishes national conservation priorities for the control of lantana. It identifies the research, management and other actions needed to ensure the long-term survival of native species and ecological communities affected by the invasion of lantana.

In the parks, bitou bush and lantana are particularly impacting remnant stands of Littoral Rainforest and Themeda Grasslands threatened ecological communities. Management of bitou bush and lantana in the parks will be guided by the relevant key threatening process strategies.

Limeburners Creek National Park is identified in the bitou bush threat abatement plan as a priority control site in New South Wales (DEC 2006). Treatment of isolated infestations and infestations around camping areas and other visitor areas will remain a priority in all 3 parks. Opportunities for control may also present themselves following extensive fire in the parks.

Heavy infestations of water hyacinth and salvinia are found in Goolawah Lagoon. These aquatic pest plants significantly disrupt the lagoon ecosystem, impacting native aquatic plants and animals, decreasing water quality, and reducing the aesthetic and recreational values of the lagoon. They are both state-level priority weeds throughout New South Wales (North Coast LLS 2017), and both are listed as Weeds of National Significance.

A number of pest plant species currently occur in the parks in relatively low densities, but have high potential for further spread. These include groundsel bush, winter senna and Coolatai grass (*Hyparrhenia hirta*) See Appendix F.

1.5.2 Feral animals

Introduced animals are of concern because they have the potential to negatively affect native animal communities through competition for resources, predation, disturbance and transmission of diseases, and can also impact native vegetation.

The most significant feral animal species in the parks are feral pigs, deer, red foxes, rabbits, feral honeybees and feral cats. Feral animals recorded in the parks and those listed as key threatening processes are detailed in Appendix F.

Foxes are a significant feral animal species and are widespread in the parks, including in habitats such as littoral rainforest that do not generally support this species. Predation by the fox is listed as a key threatening process under the Biodiversity Conservation Act and the Environment Protection and Biodiversity Conservation Act. The fox is a known predator of a wide variety of mammal, bird and reptile species.

Predation of native wildlife by cats is listed in New South Wales as a key threatening process under the Biodiversity Conservation Act. Cats have a significant impact on the environment through predation of birds, reptiles, amphibians and small mammals; and are an ongoing issue, particularly in urban and peri-urban areas.

Feral pigs currently occur in low numbers in the wetter areas of Limeburners Creek National Park and Goolawah National Park. The impact of feral pigs on conservation values is substantial because they forage, wallow and dig in wetland areas; and cause major disturbance and damage to soils, roots, sensitive ground flora and wetland environments.

The term 'wild dog' refers to all free-living dogs in New South Wales, including dingoes, feral dogs and their hybrids. Most wild dogs in New South Wales are hybrids with a relatively high level (>50%) of dingo genetics (Stephens et al. 2015; Cairns et al. 2021).

Wild dogs can have significant impacts on livestock, especially sheep. Therefore, under the general biosecurity duty of the *Biosecurity Act 2015*, the occupier of lands (both private and public) is required to take all practical measures to minimise the risk of any negative impacts of wild dogs on their land or neighbouring lands. Wild dogs are listed as priority feral animal species in the regional strategic pest animal management plan (North Coast LLS 2018).

The general biosecurity duty for wild dogs is directly informed by the *NSW Wild dog management strategy 2017–2021* (DPI 2017). This strategy promotes a balance between managing wild dogs in areas where they have negative impacts and preserving the ecological role of dingoes.

The conservation of dingoes is listed as one of the goals of the strategy. It is achieved via the development of regional wild dog management plans which focus control on areas where the risk of negative impacts are greatest, and not undertaking control in other parts of the landscape with a low risk of negative impacts from wild dogs, to preserve the natural ecological role of the dingo.

Wild dogs can be drawn to camping areas and individual animals may become habituated to humans. This can result in wild dogs altering their normal behaviour, with the potential for aggressive interactions with people and domestic dogs.

A wild dog management strategy is in place for Limeburners Creek National Park (NPWS 2005) to guide the management of wild dogs as predators of livestock and preserve the natural ecological role of the dingo.

The strategy also outlines a range of tools for managing public risk and expectations, particularly in locations where wild dogs display habituated behaviour. Policy and procedures were put in place in 2008 to guide the management of wild dog–human interactions across the region, including Limeburners Creek National Park.

1.5.3 Pathogens

Pathogens currently understood to represent a potential threat to park values include phytophthora (a root-rot fungus), myrtle rust and chytrid fungus. However, such is the nature of pathogens that new threats may emerge at any time with the potential to significantly affect park values by decreasing biodiversity, impacting populations of threatened species, reducing aesthetic values and hence recreational opportunities within the parks, and impacting wilderness values.

1.5.4 Management considerations and opportunities

The Biosecurity Act and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including pest plants and feral animals. These requirements apply equally to public and private lands.

Under this framework, Local Land Services 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 regional strategic weed management plan* (North Coast LLS 2017) and *North Coast regional strategic pest animal management plan* (North Coast LLS 2018). These plans identify priority pest plants and feral

animals in each of the regions, plus the appropriate management response for the region (that is, prevention/alert, eradication, containment or asset protection).

The NPWS regional pest management strategy for North Coast Region (OEH 2012b) identifies pest plant and feral animal species and priority programs for the parks. The overriding objective of the pest management strategy is to minimise adverse impacts of introduced species on biodiversity and other park and community values while complying with legislative responsibilities.

The strategy also identifies where other site-specific or pest-specific plans or strategies need to be developed to provide a more detailed approach. Reactive programs may also be undertaken in cooperation with neighbouring land managers in response to emerging issues.

Threatened ecological communities in the parks are being negatively affected by introduced pest plants, particularly bitou bush, lantana, coastal morning glory and a suite of exotic grasses.

Pest plant and feral animal management efforts may be critical following large wildfires where the pest plant seed bank may have been stimulated, where there are increased threats to biodiversity (for example, increased predation by feral animals such as foxes and cats) or increased opportunities for pest control.

The proximity of the parks (particularly Goolawah National Park) to coastal settlements means escaped garden plants, which naturalise as pest plants, are likely to be a significant and ongoing problem.

Aquatic pest plants are significantly impacting waterways in the parks, particularly Goolawah Lagoon. Hydrological changes to Goolawah Lagoon, due to the opening and closing of the seaward entry, may impact populations of aquatic species. Future management of the entrance needs to consider how changes may impact the composition of both native and pest species.

Feral animals (foxes, cats, wild dogs, deer, feral pigs) are likely to be impacting native fauna and flora in the parks, although the extent of damage and level of impacts are not well understood.

The NPWS cooperates with other land management agencies (for example, Local Land Services) and neighbouring landholders to develop and implement effective pest plant and feral animal control programs. Numerous volunteer groups also work in partnership with NPWS on pest management programs in the parks.

Continuing successful partnerships with volunteer and community groups, in addition to partnerships with other agencies, will be vital to the ongoing success of feral animal and pest plant control programs within the 3 parks.

Pest species management requires an adaptive approach, where priorities can be adjusted to reflect emerging problems; changes in seasonal conditions; changes in the distribution, abundance or impacts of established feral animal and pest plant populations; or changes in best practice pest species management.

As noted previously, some habituation of wild dogs has been observed at Point Plomer Camping Area in Limeburners Creek National Park where nuisance behaviour can occur (for example, stealing food and items of clothing) and, on occasions, aggressive behaviour towards people, including following and stalking.

Targeted trapping occurs as required in Limeburners Creek National Park and strategies to deter nuisance wild dogs are implemented as needed. Ongoing control measures, involving targeted public awareness activities and the strategic management of problem animals have been effective.

Pathogens pose a potentially significant threat, particularly to the biological values of the parks and ongoing survey and monitoring is necessary to ameliorate this risk. Scientific

understanding of pathogens in the parks is in its infancy and staff and park users' knowledge about pathogens is consequently also limited.

The known vectors for the spread of most pathogens (for example, human, vehicle, animal, soil and water movement) can be difficult to contain/control. The importation of soil or gravel into the parks has the potential to introduce pest plants and pathogens, with widespread implications for park values.

Large loads of gravel are required for the ongoing maintenance of Point Plomer Road in Limeburners Creek National Park and may present a threat to park values.

Photo 2 **Managing coastal pest plants in Goolawah National Park is an ongoing challenge. Peter Davies/DCCEEW**

1.6 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 2012c).

Fire is a natural feature of many environments and is essential for the survival of many native species and plant communities. Some species have life cycles that are geared towards infrequent fires (for example, some wet sclerophyll species) and other species require more-frequent fires (for example, some heath and grassland species).

Fire regimes (that is, fire frequency, intensity and season of occurrence) are influenced by both natural forces and human activities. Inappropriate fire regimes can refer to high-frequency fires (that is, repeated fires at short intervals), high-intensity fires, or too-infrequent fires depending on the species or community. These inappropriate regimes can threaten the

survival of some plants and animals and lead to changes in the composition and structure of plant communities. In recognition of this, high-frequency fire has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000a) and inappropriate fire regimes have been identified as a threat to several threatened plants, birds, mammals and ecological communities.

Fire frequency guidelines aimed at maintaining biodiversity in the long term have been developed by NPWS for each of the broad vegetation formations that occur in New South Wales (Kenny et al. 2004; NPWS 2023). These guidelines specify upper and lower intervals (that is, numbers of years) between fires that are predicted to maximise plant diversity. The intervals are derived from the life cycle requirements and fire responses for as many plant species for which information is known in each vegetation formation. All 3 parks have threatened ecological communities which require specific fire requirements to protect their values.

Fire can threaten other park values, including Aboriginal cultural heritage sites, walking tracks and other visitor infrastructure. Soil erosion and sediment movement into waterways can increase following fire and the spread and establishment of pest plant species can be enhanced. By contrast, carefully managed fire can also provide an opportunity to combat pest plant and feral animals if enough resources are available.

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

1.6.1 Management considerations and opportunities

The parks will be managed to minimise the negative impacts of fire on life, property and the environment, to maintain fire regimes (frequency, intensity and timing) which are appropriate for conservation of native plant and animal communities and to inform the community of NPWS's fire management responsibilities.

Separate park-specific fire management strategies have been prepared or drafted for the 3 parks. Fire strategies define the fire management approach for the park; outline recent fire history and key assets within and adjoining the park (including sites of natural and cultural heritage value); and map fire management zones and fire control assets (for example, management trails and water supply points). Fire strategies also include fire regime guidelines for conservation of the parks' vegetation communities and operational guidelines to protect specific cultural heritage, flora and fauna values.

Limeburners Creek National Park has been subject to extensive fires in the past, partly due to the large areas of fire-adapted vegetation types (for example, heath and dry sclerophyll forest) and lack of access for firebreaks through low-lying wet areas. Inappropriate fire regimes, arson and illegal campfires are threats to the park's natural and cultural values, particularly in the wilderness area.

There is an elevated risk of escaped campfires from illegal camping, particularly along North Shore Beach adjacent to Limeburners National Park. Fire escaping from designated camp sites in the parks is also a potential source of wildfire.

Maintenance of species and habitat diversity through implementation and monitoring of appropriate fire regimes is required. Sensitive species, communities or habitat elements such as koalas, headlands, foredunes, hollow-bearing trees and fallen logs are particularly vulnerable to inappropriate fire regimes. The Big Hill area and large sections of Limeburners Creek National Park have experienced a loss of hollow-bearing trees. This loss is being

offset by installing nest boxes. Killuke Mountain, with a high incidence of hollows and fallen logs, is being managed by fire prescriptions.

Hazard reduction burning can impact on park values if plant communities are not burnt at the right fire frequency or intervals required for their survival. Planning for the NPWS hazard reduction program needs to consider important biodiversity values of the parks, particularly the threatened ecosystems and habitat for threatened fauna.

Fire has been excluded from Themeda Grasslands for too long, resulting in invasion of shrubs, including coast banksia and littoral rainforest species. Prescribed fire may be appropriate to manage the interface between these grassland and shrub communities. The vegetation on the coastal dune system has the potential to revert to littoral rainforest in the absence of fire. Exclusion of fire from these landscape elements is considered appropriate.

Fires impact on the flora and fauna composition and threaten Aboriginal cultural heritage sites, walking tracks and infrastructure. The parks contain a high proportion of landscape features indicative of the presence of Aboriginal objects (OEH 2013). In the absence of systematic surveys to identify objects, it is likely that unrecorded cultural heritage items/sites occur within the parks. While appropriate prescriptions are implemented during the planning of prescribed fires, wildfires pose a risk to Aboriginal cultural heritage.

NPWS recognises that cultural burning is important to enhance and protect natural and cultural values; to express and maintain culture, kinship and identity; and to continue to share knowledge and practice. The NPWS *Cultural Fire management policy* supports culturally informed burning and community (low-risk) cultural burning in partnership with Aboriginal people.

NPWS participates in local bush fire management committees and cross-tenure fire management planning for these parks. Cross-tenure fire management priorities are described in the relevant district bush fire risk management plans prepared by bush fire management committees under the *Rural Fires Act 1997*. Close liaison with neighbours and the Rural Fire Service has been undertaken to manage threats of fire entering or escaping from adjoining property for all parks.

Trails identified in the fire management strategies are to be maintained for strategic fire management and need to be maintained to an appropriate standard to enable access for fire suppression and management (see Section 4). Appropriate trail construction and maintenance standards should be implemented to minimise impacts on the environmental and cultural heritage values of the parks.

Valuable assets and built infrastructure within the parks are vulnerable to wildfire. Hazard reduction planning and implementation should include the protection of these assets.

1.7 Climate change

Human-induced climate change has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b) and the associated loss of habitat is listed on the Environment Protection and Biodiversity Conservation Act (Cth DCCEEW no date, b).

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 2020–2039 are described as 'near future' and projections for 2060–2079 are described as 'far future'. The snapshot shown in Table 4 is for the North Coast Region which includes the parks (OEH 2014).

Table 4 Climate change predictions

Near future (2020–2039)	Far future (2060–2079)
Maximum temperatures are projected to increase 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 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 (i.e. >35°C) will increase	The number of cold nights (i.e. <2°C) will decrease
Rainfall is projected to decrease in spring and winter	Rainfall is projected to increase in summer and autumn
Average fire weather is projected to increase spring and summer	Severe fire weather days are projected to increase in summer and spring

Source: OEH 2014.

Of particular significance to the parks covered by this plan, climate change is predicted to result in increased coastal hazards (for example, beach erosion, long-term recession and coastal inundation) because of sea level rise and increases in heavy rain events and cyclonic winds associated with more-frequent and intense East Coast Lows. This may have significant implications for natural and built visitor infrastructure and assets, with potential flow-on effects on visitor safety and enjoyment.

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 summer rainfall and rainfall intensity in the region are likely to increase sheet and rill erosion on the steeper slopes of the hinterland. Expected declines in run-off in spring and winter are likely to reduce seepage flows and hence activity of some forms of gully erosion, although this change will be offset where stabilising vegetation declines. Higher summer and autumn rainfalls are likely to increase the risk of mass movement in all currently vulnerable slopes in the hinterlands, but negative water balances may offset this effect through reduced water content in soil profiles (DECCW 2010).

Climate change may significantly affect biodiversity by changing the size of populations and the distribution of species and altering the geographical extent and species composition of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates, species with narrow ecological requirements, and species that naturally occur in small and isolated patches (for example, swamps, heathland, rainforests).

1.7.1 Management considerations and opportunities

Climate change is likely to impact a wide range of park values. The level of risk to species and ecological communities is difficult to predict and will depend on their capacity to adapt to climate change in situ, their capacity to disperse to new areas, and the compounding effects of other factors such as fires, feral animals, pest plants and pathogens.

Visitor infrastructure (for example, beach access points) may be damaged during high seas and storm activity, limiting recreational use of the intertidal zone. Changes to work programs and asset management regimes are likely to occur in response to changing weather, fire regimes and other climate-related circumstances.

Stabilising and protecting dunes and beaches are important as the first line of defence for protecting the coastline from the increasing wave and wind activity.

The distribution of feral animal and pest plant species may change in response to warmer temperatures and increased spring/summer rainfall, and areas that are currently unaffected may be threatened by new incursions of pest plants and feral animals. Pathogens could expand into new areas in response to warmer temperatures and periodic increases in rainfall.

Programs to reduce the pressures arising from threats such as habitat fragmentation, invasive species and bushfires will help reduce the severity of the effects of climate change on the parks.

1.8 Fragmentation and edge effects

The broader landscape in the region has been extensively cleared, resulting in biodiversity losses and significant fragmentation of habitat. The Goolawah parks (that is, Goolawah National Park and Goolawah Regional Park) are relatively narrow areas of land and subject to edge effects making them vulnerable to disturbances. Adjacent land uses place pressures on these parks through the incursion of pest plants, particularly escaped garden plants. The dumping of garden refuse within the park seriously degrades local vegetation and can also become a fire hazard.

Adjacent urban and agricultural areas also place pressure on these parks through a range of activities such as predation by straying pets, impacts from straying stock, stormwater drainage, encroachments and unauthorised recreational activities. Stray domestic dogs and cats are likely to occur in significant numbers in northern Goolawah National Park, immediately south of Crescent Head.

Illegal clearing or damage of native vegetation within the park or along the park boundary can have significant negative impacts on park values. Impacts range from the loss of individual plants to further fragmentation and isolation of the remnant vegetation within the park.

The long-term conservation of biodiversity is supported by the protection, enhancement and connection of remaining habitat across the landscape, incorporating vegetation remnants on both public and private lands.

1.8.1 Management considerations and opportunities

The impact of edge effects and habitat fragmentation can be reduced by encouraging protection and restoration of adjacent native vegetation on public and private lands, particularly in identified wildlife corridors. Opportunities to continue partnering with nearby landholders, local councils and regional authorities for access, fire, feral animal and pest plant control can minimise impacts associated with edge effects. Another opportunity is considering future strategic acquisitions to enhance habitat connectivity.

2. Looking after our culture and heritage

Both Aboriginal and non-Aboriginal people place values on cultural and natural landscapes. These values may be attached to the landscape as a whole, or to parts of the landscape (for example, a particular plant, animal or place). All landscapes contain the imprint of human use. On any given area of land some historical activity will have taken place. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land-use practices, and people continue to influence the land through their use and practices.

2.1 Aboriginal culture and heritage

Prior to European settlement, the entire region was under the custodianship of the Dunghutti and Birpai Aboriginal peoples, who retain a significant cultural connection to this Country.

Aboriginal communities have a close association with and connection to the coastal environments in the parks. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge, kinship systems and strengthening social bonds. Aboriginal heritage and connection to nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

Box 6: What is 'Country'?

To Aboriginal people, the landscape is made up of many features that are interrelated. These include land, water, plants and animals, places and stories, historical and current uses, and people and their interactions with each other and place. These features are central to Aboriginal spirituality and contribute to Aboriginal identity. They are inseparable and make up what is known as '**Country**'. As Rose (1996) explains:

'Country in Aboriginal English is not only a common noun but also a proper noun. People talk about Country in the same way that they would talk about a person: they speak to Country, sing to Country, visit Country, worry about Country, feel sorry for Country, and long for Country. People say that Country knows, hears, smells, takes notice, takes care, is sorry or happy. Country is a living entity with a yesterday, today and tomorrow, with a consciousness, and a will toward life. Because of this richness, Country is home, and peace; nourishment for body, mind, and spirit; heart's ease.'

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

The parks play a fundamental role in the lives of local Aboriginal people, helping to maintain a link to the past, enabling continued connections to Country, and contributing to the cultural identity of local Aboriginal people. The parks provide opportunities for continued connections to Country for contemporary Aboriginal people and protect numerous Aboriginal sites and objects with specific cultural heritage values, including burial sites, shell middens, camp sites and stone quarries.

Aboriginal cultural heritage is living and ongoing and is linked to the landscape and all its components. The land links Aboriginal people with who they are and where they belong; and can help provide for their physical, emotional, spiritual, cultural and community needs. Access to Country is essential to Aboriginal people for cultural learning and cultural renewal. The connection that Aboriginal people have to the land is accompanied by a duty of care for the land and a strong desire to actively participate in its management.

The current known period of occupation and use by Aboriginal people in the area dates to 5,000 to 6,000 years ago. A wide range of habitats along the coast were essential in providing an abundance and variety of relatively reliable food resources, including rocky shores, estuaries, wetlands and forests. Archaeological excavations of middens in the parks suggest the local diet included a range of shellfish, such as the pipi, Sydney cockle, triton shell, hairy mussel, turban shell and top-shell. Prior to European contact, Aboriginal people in the area probably lived a semi-sedentary lifestyle, although movements along the coast would have occurred, particularly for ceremonies and to share seasonally abundant foods (Creswell 1985).

The story of Aboriginal occupation in the parks, both pre- and post-contact, is preserved through numerous cultural sites and objects. Past sandmining is likely to have destroyed a great deal of archaeological evidence before it could be documented, particularly shell middens and burial sites. Shell middens are also likely to have been affected by early lime production in the area, which involved burning large quantities of oyster shells, some of which were probably collected from Aboriginal middens (NPWS 2001). Nevertheless, the parks are particularly significant because numerous sites are concentrated within a relatively small area.

Point Plomer and Queens Head, in particular, contain significant evidence of Aboriginal occupation, including burial sites (one of which was accidentally disturbed in the 1980s), shell middens, open camp sites, stone tool working sites, quarries and axe grinding grooves. Evidence of a stone fish trap, one of only 3 known on the NSW North Coast, can be found in the waters adjoining Limeburners Creek National Park. Since European settlement, stones have been rearranged on several occasions, such that the origin of the current stone arrangement is unclear. However, the area certainly had the potential to provide a dependable supply of food and thereby support a relatively permanent occupation by Aboriginal people (Creswell 1985).

European settlement in the area began in the 1830s. Although many Aboriginal families were permanently separated and dislocated in the area during settlement, the parks remain immensely important for contemporary use by the Aboriginal community, particularly for cultural practice, fishing and cultural camping.

2.1.1 Management considerations and opportunities

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

Other than at the Point Plomer Camping Area precinct (Hill 2017), no systematic surveys of Aboriginal cultural heritage sites and objects have been undertaken in the parks. This limits our understanding of the significance of the parks to Aboriginal people and the condition and management requirements of cultural sites and objects.

Aboriginal cultural heritage sites within the parks require protection from deliberate vandalism from unauthorised vehicle access, unauthorised collection (especially from shell middens), erosion and accidental disturbance. Some walking tracks and lookouts are located close to significant Aboriginal cultural sites and have the potential to damage cultural values.

Sand dunes contain cultural heritage sites important to the Birpai and Dunghutti peoples, including middens, burials and ceremonial sites. The beaches also provide a source of traditional food for local Aboriginal families, including pipis. Vehicles driving on sand dunes and beaches are impacting important cultural sites.

Aboriginal cultural heritage in the parks requires greater interpretation to enhance the level of understanding among non-Aboriginal people of the relationship between Aboriginal people and Country. There is scope for the use of traditional languages, Aboriginal names, or the use of co-naming for roads, trails and sites of interest as a way of increasing awareness of the Aboriginal cultural heritage values of the parks.

Involvement in the management of the parks by Aboriginal people can also provide practical opportunities for training and employment of Aboriginal community members.

2.2 Historic heritage

History since European settlement is represented through our historic heritage, which comprises places and items that may have historic, scientific, cultural, social, archaeological, architectural, landscape or aesthetic significance. NPWS conserves the significant historic heritage features of NSW parks.

Fishing is one of the earliest known European use of the parks. From around the late 1800s, fishermen lived in handmade huts and shacks in remote sites adjacent to the coast. One such hut, built by a man called Arthur Landers, was situated near Racecourse Camping Area in Goolawah National Park. No remains of this hut exist today.

Fishing remained an important industry into the 1950s, with catches generally taken to Port Macquarie. Today, commercial beach hauling continues within and adjacent to the parks.

During the 1820s, Limeburners Creek was a regionally important site for lime production. This involved burning shells to produce lime, which was subsequently used to produce a building mortar for development of the penal settlement of Port Macquarie. It is believed that oyster shells were targeted; collected from oyster beds and coastal deposits, including Aboriginal middens. The practice is considered to have given rise to the current European name for Limeburners Creek.

Gold mining took place around 1881 when an area around Limeburners Creek was proclaimed as part of the Orara Gold Field. However, there is little evidence the activity was in any way profitable and was only pursued for a short time. There was also a whaling station at the southern end of Barries Bay for a short while, but no evidence of the station remains. Today Barries Bay is used for recreation and commercial mullet hauling.

Parts of the Racecourse area within Goolawah National Park have a history of being farmed. Around the early 1900s, the more productive areas that were not frequently inundated were cleared for pasture.

Throughout the 3 parks, particularly during the Great Depression (1930s–40s), several men lived reclusive lives in small, handcrafted huts. One such hut was occupied by a man called Kevin Hill, after whom Big Hill Point in Limeburners Creek National Park was named. Some foundations of his hut may still be present on the north-west slope of the hill, although this has not been confirmed.

Former remains of another hut, located near Limeburners Creek, no longer exist. Both sites, along with other potential heritage sites on Big Hill and at Point Plomer, have been formally registered on the NPWS Historic Heritage Information System. No historic items have so far been registered within either of the Goolawah parks. Most evidence of heritage value has been destroyed by fires in Limeburners Creek National Park.

Sandmining (for ilmenite, monazite, rutile and zircon) began in the Macleay area in the 1950s and was conducted over most of the dunes in the Goolawah parks. A separation plant was established in the northern section of what is now Goolawah National Park. The majority of Limeburners Creek National Park was spared from mining, except for the area

immediately south of Point Plomer (behind North Shore Beach). Point Plomer Road was created in 1964 to support mining operations, allowing access between Crescent Head and Port Macquarie. Mining ceased in the area in 1975.

Past sandmining has significantly influenced landforms and vegetation within parts of the parks. The entire foredune section of Goolawah National Park, for example, was reshaped as a result of mining and the sea entrance (mouth) of Goolawah Lagoon was closed.

Post-mining rehabilitation works involved the use of several native plant species not local to the area (for example, *Casuarina equisetifolia* and *Leptospermum laevigatum*) (Brady and Ekert no date), some of which have subsequently become pest plants.

The opening of Point Plomer Road to the public resulted in many more visitors accessing the area, particularly for surfing, camping and fishing. Camping took place at numerous sites along the coast, eventually leading to the formalisation of the current major camping areas at Racecourse, Delicate Beach and Point Plomer.

Point Plomer became a formal camping area in 1956, although a boat shed was built and occupied there in 1953 by Russ Radley, a fisherman who came to the area in the early 1920s. A house and cabins were subsequently erected, and the Radley family became the first caretakers of the Point Plomer Camping Area.

Today, all 3 parks retain a strong traditional visitor base; often reflecting generations of recreational use (see Section 3). The parks and surrounding land remain generally free of any significant residential or commercial development, and this largely reflects an ongoing community campaign to conserve the natural bush setting that is so characteristic of these parks.

2.2.2 Management considerations and opportunities

There is limited interpretation of European historic heritage in the parks. Most evidence of European historic heritage sites/items within the parks has been destroyed by fire. Opportunities exists to improve historic heritage interpretation.

3. Providing for visitor use and enjoyment

The parks provide access to clean, sandy beaches, unspoilt headlands and rocky shores and have a very long history of recreational use. The absence of visible development in the parks contributes to an increasingly unique recreational setting where people can enjoy stretches of generally unspoilt coast in New South Wales.

Activities currently undertaken within and adjacent to the parks include camping, fishing, swimming, surfing, canoeing, cycling, walking, birdwatching, whale watching, snorkelling, scuba diving and picnicking. Delicate Camping Area in Goolawah Regional Park is one of the few NPWS parks where people can camp near the coast with their dogs. Visitor accommodation is offered in Plomer Beach House in Limeburners Creek National Park.

Visitor opportunities provided by the parks are mostly those at the low-key end of the spectrum where natural elements dominate over built elements. NPWS aims to ensure that visitors enjoy, experience and appreciate the parks while conserving and protecting park values.

The parks provide recreational landscapes for the local communities of Port Macquarie, Kempsey and Crescent Head. The parks are also very popular with visitors from outside the region, including interstate and overseas travellers. The 3 parks covered by this plan are located within the Mid North Coast Tourism Region of New South Wales (Tourism Research Australia 2012).

The region is characterised by relatively rapid population growth, which is driven in large part by people's desire to live in a comparatively unmodified coastal environment where the climate is mild.

Visitor data for the Macleay Valley Coast region (which incorporates the Goolawah parks) shows that the region received over half a million visitors in 2017–18. Over half (56%) of these were domestic overnighters, while 42% were day trippers and around 2% were international visitors (Kempsey Shire Council 2019).

Visitor use will also be managed in the regional context, recognising the spectrum of opportunities available in the vicinity of the parks.

3.1 Camping, accommodation and day use opportunities

The parks currently provide a broad range of low-key visitor facilities that complement the more developed opportunities provided off-park. There is a high level of repeat visitation, and some families have been camping in the parks for generations, often using the same camp site for their annual holidays. As such, the parks also serve the important social function of enabling relatives and friends to reconnect in a familiar, undeveloped, natural setting.

Visitation peaks during Easter and Christmas school holidays, with most activity concentrated along the beaches and around headlands.

There are many accommodation options for park visitors in nearby towns and adjacent to the parks that provide more developed accommodation options (for example, self-contained holiday cabins, holiday houses and motels), including the Crown lease inholding at Point Plomer (Point Plomer Holiday Cabins). This brings seasonal influxes of large numbers of tourists who visit the parks as day visitors.

3.1.1 Camping and accommodation

Hard-roofed visitor accommodation is provided in Plomer Beach House in Limeburners Creek National Park. This is a fully furnished, 4-bedroom house which accommodates up to 10 people and is currently managed by NPWS as overnight visitor accommodation.

There are 4 camping areas in the parks which provide for vehicle-based or walk-in camping experiences. Walk-in camping is a popular activity, and sites are provided in Goolawah National Park at Racecourse Camping Area.

Car-based camping, caravanning and car touring are increasing in popularity. These activities require level camp sites, access to amenities and vehicle parking. All 3 parks currently offer car-based camping.

Camping facilities complement, rather than duplicate, those provided off-park in that they are basic and provide for a more nature-based experience.

Aboriginal cultural camping opportunities are provided in Limeburners Creek National Park (Back Beach Cultural Camp) and Goolawah Regional Park (at Delicate Camping Area).

Camping opportunities in the parks are described in Table 5.

Photo 3 Point Plomer is a popular camping spot. John Spencer/DCCEEW

Table 5 Camping areas and facilities in the parks

Camping area	Setting	No. of sites[2]	Access	Style of camping	General facilities
Racecourse Camping Area	Coastal beachside, basic facilities/ serviced low[1]	20	Walk-in/2WD/4WD; pedestrian access to Goolawah Beach	Limited walk-in, car, camper trailers, parking adjacent to camp site, unpowered	Cold showers, toilets
Delicate Camping Area	Popular coastal beachside with domestic dogs, basic facilities/serviced low[1]	40 + 10 for cultural camping	2WD/4WD; pedestrian access to Delicate Beach	Larger groups, car, camper trailers, caravans, parking adjacent to camp site, unpowered	Toilets, cold showers, picnic tables
Melaleuca Camping Area	Bushland on banks of Big Hill flood mitigation channel, serviced low[1]	50	2WD/4WD; overflow camping during peak periods	Larger groups, car, camper trailers, caravans, parking adjacent to camp site, unpowered	Toilets, picnic tables
Point Plomer Camping Area	Popular coastal beachside, high level of local use/ repeat visitation, serviced high[1]	90	2WD/4WD; pedestrian access to swimming and surfing beaches	Group walk-in, car, camper trailers, parking adjacent to camp site, unpowered	Wheelchair accessible amenities, cold showers, picnic tables,

1. As identified in *Park facilities manual* (NPWS 2016).
2. Indicative number.

Wilderness areas maintain opportunities for solitude and compatible self-reliant recreation that encourages public awareness and appropriate use of wilderness. Opportunities for self-reliant, walk-in bush camping within the Limeburners Creek Wilderness Area need to minimise impacts to wilderness values. NPWS encourages low-impact bushwalking practices such as:

- hygienic and ecologically sound waste disposal practices
- use of portable stoves
- not disturbing vegetation at camp sites.

3.1.2 Cultural camping

Cultural camping opportunities are provided at Back Beach Cultural Camp in Limeburners Creek National Park and at Delicate Camping Area in Goolawah Regional Park. Aboriginal families have been using these camp sites for years, and provision of sites for cultural camping will continue (including during peak visitation).

Camping in the parks is particularly important to the Aboriginal community because it allows people to gather on Country. These gatherings contribute greatly to cultural renewal, cultural practice and learning. NPWS works with the Dunghutti and Birpai Aboriginal communities to guide management and usage of cultural camping areas.

3.1.3 Day use opportunities

Day use areas are used for picnicking and as a base for beachside activities such as sightseeing, fishing, surfing and swimming. Several vantage points in the parks offer views along the coast, including Racecourse Headland and Queens Head. Spectacular views are offered at these locations, with a short walk to an informal lookout at Queens Head and Racecourse Headland both of which are easily accessible by vehicle. The day use areas in the parks are shown in Figures 1 and 2.

3.1.4 Management considerations and opportunities

Due to the popularity of the parks, most camping and day use areas experience seasonal overcrowding, which impacts on visitor experience and safety, facilities and the natural and cultural values of the parks.

Precinct planning helps manage impacts from increasing visitation. These plans can include consideration of carrying capacity, improvements to the layout of visitor facilities, safety and accessibility of precincts for campers and day visitors, while retaining visitor sites low-key and undeveloped character.

Point Plomer Camping Area attracts a high level of local use and repeat visitation, particularly as it provides ready access to swimming and surfing beaches and well known recreational fishing sites.

A draft precinct plan has been developed for Point Plomer and will be revised following community input. Precinct plans will be progressively developed for other popular visitor precincts in the parks.

Access to the larger, western section of Melaleuca Camping Area is generally only available during peak holiday times as it serves as an overflow area. At other times access is usually not available, in order to minimise incidents of antisocial behaviour in the area.

Strategies are needed to actively manage increasing visitor numbers and support a range of sustainable visitor experiences in the parks. An online booking system for camp sites has been implemented, which has assisted in managing overcrowding and ghost camping

(where camping equipment is left in situ, but the camp site is unoccupied for a day or more). Bollarding is required at some car parks to protect natural heritage values (for example, Themeda grassland communities at Racecourse car park, Racecourse Headland and Queens Head).

Unauthorised roadside vehicle-based camping is occurring in the park. A small number of visitors camp in day use areas which can disrupt access for day visitors and increase maintenance costs.

Informal day use occurs at some locations along Maria River Road and can lead to rubbish dumping and impacts on surrounding vegetation. There is an opportunity to formalise a day use site off Maria River Road in Limeburners Creek National Park to help mitigate these impacts.

There is some antisocial behaviour in the parks, which diminishes visitor experience and can lead to user conflict and damage to the environment.

Due to the complex land tenure boundaries (for example, from NPWS-managed national park and regional park to council-managed beaches and Crown lands), managing high day use visitation in these areas requires joint strategies with councils and other land managers for education and compliance programs and provision of signage.

Ground fires increase the risk of wildfires and create a safety risk. Ground fires also reduce visitor amenity because they leave a scar on the ground, and large ground fires can contribute to antisocial behaviour. The installation of additional designated fireplaces and the use of solid fuel portable braziers (except during total fire bans) are options to reduce the impacts of ground fires.

Illegal firewood collecting around camping areas impacts native vegetation and fauna. These impacts can be minimised if campers bring their own firewood or by restricting the use of campfires in locations such as day use or wilderness areas. Options to install gas/electric barbecues in day use areas could be considered based on future demand.

3.2 Visiting with domestic dogs

Due to their history as state parks, the Goolawah parks have for many years been a favoured camping and day use destination for people to visit with their domestic dogs. Pets are not generally allowed in parks as they can harm native animals. However, dogs can be allowed in a regional park if this is consistent with the plan of management.

Delicate Camping Area in Goolawah Regional Park remains one of the few camping areas in NPWS parks on the NSW coast where visitors take their dogs camping by the beach.

In 2011, park additions to the northern end of Goolawah National Park included Paul Clancy Trail and Back Crescent Beach Access track (see Figure 2 – Map A inset). These tracks had traditionally been used by dog walkers to access the leash-free area on Goolawah Beach, known locally as Crescent Back Beach, which at the time was managed by Kempsey Shire Council. After these areas were added to the park, a transitional arrangement was implemented to allow visitors with dogs to continue accessing Goolawah Beach through the national park.

In 2015, the intertidal areas of the beach were added to Goolawah National Park, and Goolawah Beach came under NPWS management guided by the National Parks and Wildlife Act.

3.2.1 Management considerations and opportunities

Historic use of Goolawah National Park by visitors with dogs has established long-standing patterns of use and expectations among some park visitors. A joint education and

compliance program has been implemented to alert visitors about regulations regarding dogs in the parks, particularly Goolawah National Park, and to identify alternative areas where dogs can be walked.

3.3 Walking opportunities

Walking allows visitors to be in close contact with the natural environment and can increase understanding and enjoyment of parks and the environment generally. The parks provide numerous opportunities for beach walking as well as shorter walks over headlands. Tracks are generally unformed, and there is minimal signage, which is in keeping with the low-key experience offered in these parks.

There are a number of established walking tracks in the parks, including loop tracks around headlands and a number of pedestrian beach access tracks (see Figures 1 and 2). There are also additional pedestrian beach access tracks within day use areas and camping areas that may not be shown on these maps due to map scale. Currently, there is limited wheelchair access to beaches adjacent to the parks and opportunities to provide access will be investigated.

Recreational use of the wilderness area is constrained by the sensitive nature of management trails and surrounding wetland vegetation.

Facilities, signposting and other management devices are generally avoided in wilderness areas unless deemed essential for public safety, management operations or environmental protection. Protection of natural values has priority over providing for recreational use in wilderness areas.

3.3.1 Management considerations and opportunities

Walking tracks can become an environmental threat to soil, geological features, water sources, plants and animals if track design is inadequate or if tracks are poorly maintained. Walking tracks can fragment habitats and disturb the environment, which can have detrimental effects on biodiversity and habitat quality (Ballantyne and Pickering 2015).

Research indicates that the environmental outcomes of walking tracks can be improved by managing and reducing informal tracks, limiting the number of entry points to tracks, maintaining a centralised visitor flow and increasing signage for walking tracks (Ballantyne and Pickering 2015).

When maintaining walking tracks NPWS considers the need to maintain a natural aesthetic while also acting to ensure visitor safety and the protection of natural and cultural values. For example, impacts associated with beach access tracks can be minimised by hardening the track surface or rerouting to a more sustainable alignment that avoids significant values.

There are opportunities to improve walking experiences within the parks by rerouting or linking sections of existing tracks. Few existing beach access tracks and/or viewing platforms are suitable for visitors with restricted mobility.

3.4 Recreational 4-wheel drive access

All 3 parks can be accessed from the north via Crescent Head using the 2-wheel drive section of Point Plomer Road (see Figure 1). The southern 4-wheel drive section of Point Plomer Road, south of Queens Head, is unsealed and is often in poor condition.

Limeburners Creek National Park can also be accessed via various public roads, including the Maria River Road which runs along the park's western boundary, or from Port Macquarie via the Settlement Point Ferry and then along the southern section of Point Plomer Road or

along North Shore Beach. Management trails are not open to the public due to the highly erodible sandy soils and low-lying wet areas in the parks.

The intertidal zones along Goolawah Regional Park and Goolawah National Park were added to the park in 2015 and are managed by NPWS. There were no changes to existing use of Delicate Beach and Big Hill Beach in Goolawah Regional Park as a result of this gazettal, and these beaches are being maintained as vehicle-free zones for the safety of campers and day users.

The NSW North Coast is a popular 4-wheel driving destination and there are numerous beaches along this coastal stretch offering 4-wheel drive opportunities both north and south of the parks. The intertidal zone of North Shore Beach in Limeburners Creek National Park is the only beach in the parks where recreational users are permitted to drive. This northern NPWS-managed section of intertidal zone adjoins the council-managed intertidal zone to the south, stretching down to the Hastings River.

Four-wheel driving on beaches can present safety issues for visitors, harms native flora, fauna and cultural sites and can cause conflict and safety issues for park visitors. In addition, many of the beaches in the parks are exposed to moderate wave energy and are afforded little protection from headlands (Short 2007) so are not always suitable for 4-wheel driving. The sandy, erodible nature of the soils at beach access points also results in high maintenance costs.

3.4.1 Management considerations and opportunities

The vehicle-free, pedestrian safe zone regulations in the northern and southern ends of North Shore and Goolawah beaches is often disregarded by beach drivers, causing safety issues for visitors in these locations. In peak periods these zones are operating beyond carrying capacity with over 100 vehicles parked at the northern end of North Shore Beach during summer.

Vehicles in pedestrian zones are leading to many near-miss incidents, including incidents with children. NPWS has installed signage and actively patrols these zones, but ongoing assistance is required from councils to assist with compliance activities and to manage visitor safety.

Beach driving poses a major threat to beach-nesting shorebirds and turtles, particularly over the nesting period from August to March (see Section 1.3), and the integrity of coastal dunes in Limeburners Creek and Goolawah national parks is being severely impacted by beach driving activities (see Section 1.1).

Sand dunes also contain cultural heritage sites important to the Birpai and Dunghutti peoples, and beaches provide a source of traditional food. Damage from vehicles driving on sand dunes and beaches is impacting important cultural sites and reducing pipi populations along the coast. These activities are further accelerating the impacts of coastal erosion, leading to further shoreline recession during storm events.

This beach does not provide recreational drivers with a ‘through road’ to other areas and other beach 4-wheel driving alternative options are available north of Crescent Head and on North Shore Beach.

Restricting access to only commercial fishers will reduce the number of vehicles using the beach and therefore reduce impacts on the dunes and provide safe roosting, feeding and nesting areas for threatened fauna.

Illegal track creation and vehicles driving on dunes are ongoing management issues. Access to the beaches requires careful consideration to ensure environmental and cultural values of the beach are not diminished and it is safe for visitors.

The southern 4-wheel drive section of Point Plomer Road south of Queens Head is unsealed and is often in poor condition, which can impact on wetland values and is a safety issue for emergency access and firefighting vehicles. Improvements may be required to manage impacts and to maintain 4-wheel access to firefighters and emergency vehicles (see Section 4).

There are 11 formal and a number of smaller informal car parks providing pedestrian beach access in the parks. Some of the car parks may need to be reviewed, consolidated or formalised in the future if demand increases and vehicles continue impacting park values.

3.5 Recreational fishing and boating

The parks' waters, intertidal zones and adjacent ocean allow visitors to undertake a range of popular recreational activities, including fishing and boating.

'Park waters' refers collectively to Saltwater Lake and the section of Limeburners Creek within Limeburners Creek National Park. The 'intertidal zone' is the zone between the mean low water mark and mean high water mark, and can include sandy beaches, rocky shores and estuarine areas.

The current seaward/eastern boundary of the parks generally extends as far as the mean low water mark. As such, the majority of beaches and rocky shores are within the park and are managed by NPWS, except for some of the northern and southern ends of beaches and headland areas (see Figure 2). Where NPWS provides formal access to beaches either within or adjacent to a park, NPWS's duty of care extends to managing the risk to visitors on these beaches (and estuaries or other waterways).

The parks have a particularly long history of recreational fishing and bait collection. Recreational fishing occurs predominantly along the parks' beaches, around headlands and in estuaries and lakes. Many of the parks' beaches offer persistent deep beach gutters and headlands provide several protected rock gutters. Only a relatively small amount of recreational fishing occurs in Limeburners Creek and Saltwater Lake due largely to difficulties associated with access.

Recreational fishing in New South Wales is subject to licensing under the Fisheries Management Act and requirements under the *Rock Fishing Safety Act 2016.*

The boat ramp at Big Hill (which is on Crown land adjacent to Goolawah Regional Park) has not been maintained and is in a state of disrepair. NPWS does not encourage the use of the Big Hill boat ramp because it is not considered an appropriate launching location. The nearby NPWS boat ramp at Point Plomer has been upgraded and provides an alternative, safe launching spot for recreational fishers.

The licensing and management of commercial fishing is discussed in Section 5. Provisions relating to driving on beaches are dealt with in Section 3.4.

3.5.1 Management considerations and opportunities

Management responsibility for the intertidal zone varies across the parks. This can lead to confusion about what rules apply and which agency has management responsibility. For example, the intertidal zones adjacent to headlands, including Queens Head, Point Plomer and Big Hill Point are Crown reserves managed by Crown Lands NSW. Applying a consistent approach to the management of intertidal zones would help address these inconsistencies.

The Big Hill boat ramp requires improvement. Visitors use the Big Hill boat ramp to access the beach (on foot), however, an alternative pedestrian beach access track from the day use area to the beach is a longer-term option.

The likely increased frequency of severe storm events and the effects of king tides and predicted sea level rise will influence the way in which the risks associated with recreational use of the intertidal zone are assessed and treated in the future.

The creation of illegal trails through dunes and wilderness to access areas of Limeburners Creek National Park is impacting park values and is an ongoing compliance issue.

3.6 Other recreational and visitor opportunities

The parks are popular for access to many other coastal recreational activities such as swimming, surfing, canoeing, nature appreciation and photography, and there are some limited opportunities for cycling.

Swimming is a popular activity at the beaches of the parks however, these beaches are not patrolled. Limeburners Creek and Saltwater Lake offer opportunities for canoeing and nature appreciation.

Cycling is one of the fastest growing recreational activities in New South Wales and is a popular pursuit in many national parks and reserves. Due to the sandy soils and low-lying, wet nature of the parks, cycling opportunities are limited to short day-rides on park roads (Figures 1 and 2) and a limited amount of cycling also takes place on beaches (for example, between Crescent Head and Racecourse Camping Area).

Cycling on management trails within Limeburners Creek Wilderness Area is likely to impact wilderness values as these trails pass through landscapes that are low-lying, swampy and frequently inundated. Other areas of Limeburners Creek National Park are not accessible due to the steep terrain and dense vegetation.

The *Strategic direction for horse riding in NSW national parks* (OEH 2012d) provides a framework for improving **horse riding** opportunities in New South Wales. The strategy provides for horse riding opportunities to be provided in appropriate locations, primarily on established management trails.

These parks do not have a history of recreational horse riding, although several park neighbours own horses, and some pony clubs operate in the wider region. Generally, the parks are not considered appropriate locations for recreational horse riding, both from the perspective of protecting environmental values and providing riders, horses and other park visitors with a safe and enjoyable experience.

Recreational horseriding opportunities are available in nearby parks, state forests and on council-managed beaches, including the southern end of North Shore Beach and Lighthouse Beach (Port Macquarie).

Drones (and similar devices) are increasingly used within national parks, primarily to take aerial images but also as a recreational activity. Drones are an important management tool for national parks, but they can also impact visitor enjoyment and wildlife behaviour (Vas et al. 2015; Lyons et al. 2017). Drones can also interfere with fighting bushfires and other park management activities. The use of drones within national parks and state conservation areas is guided by the NPWS *Drones in parks policy*.

Other recreational activities in the parks will be managed in accordance with the National Parks and Wildlife Act and Regulation and relevant policies.

3.6.1 Management considerations and opportunities

The plan considers appropriate cycling opportunities in these parks. Management trails pass through landscapes that are low-lying, swampy and frequently inundated, and therefore do not present good cycling opportunities. Other impacts associated with cycling include illegal trail development, riding off-trail, littering in remote parts of the parks and spreading pest plants and pathogens.

Horse riding is not a suitable activity on park roads or beaches due to the highly erodible soils and the high level of recreational use occurring in the coastal strip. As off-leash dogs are allowed on Big Hill Beach and Delicate Beach (adjacent to Goolawah Regional Park), it is not appropriate to allow horse riding in these areas because of the potential conflicts between horses and dogs.

The condition of the 4-wheel drive section of Point Plomer Road is not suitable for towing horse floats and is not appropriate for horse riding. Most management trails in the parks (particularly those in wilderness and wetland areas) are frequently inundated, or the landscape is otherwise swampy, rugged and densely vegetated, making them susceptible to damage and unsuitable for horse riding.

The high visitation of the coastal areas and the potential impacts on birds and other fauna, particularly in wetland and tidal areas, have been considered in determining drone use in these parks. The use of drones is required for some management purposes, including fire management and emergency service operations.

The use of these devices is controlled by the Australian Government under the Civil Aviation Safety Authority regulations. The current regulations stipulate that drones must not fly within 30 m of people, and they must not be flown over or above people, including at beaches, parks, ovals and roads.

Important considerations to determine suitable locations for abseiling and rock climbing in these parks include visitor safety, risks to significant conservation values (particularly in karst areas) and cultural heritage values.

3.7 Visitor information, education and research

Interpretation, signage and information are key components of the visitor experience, and poor-quality interpretation and information impact visitors' experience of a park. Meeting the needs of visitors will require a range of communication and interpretation strategies.

The parks are particularly important for the ongoing cultural exchange between the Aboriginal and broader communities and are essential for cultural practice and teaching within the Aboriginal community itself. Interpretation and presentation of Aboriginal culture and heritage in the parks occurs in partnership with the local Aboriginal community. There are opportunities to expand interpretation and presentation of Aboriginal culture and heritage in these parks.

The parks offer outdoor learning opportunities for primary and secondary students, higher education providers, park visitors and the general public. The NPWS community education Discovery program operates in the parks, offering a range of tours and activities, such as the 'Bitou bush bash' and 'Living with dingoes'. The parks are especially useful locations for teaching and learning about coastal processes (for example, coastal erosion, coastal geomorphology) and ecology.

The parks also provide opportunities for research across a range of disciplines, including geology, biology, archaeology and tourism. Research within the parks could provide data to assist in the management and conservation of natural and cultural values.

Education activities involving large groups (whether of a commercial or non-commercial nature), are generally not considered appropriate in declared wilderness areas and so will require NPWS approval.

3.7.1 Management considerations and opportunities

There is a need to balance the provision of on park information and interpretive material with retaining a remote and natural feel. This is particularly important in the Limeburners Creek Wilderness Area.

Greater cooperation and consistency between agencies is required when developing interpretive material to improve visitor and community understanding of appropriate activities upon different land tenures. This particularly relates to roads, beach access points and management of the intertidal zone where inappropriate access can impact conservation values. Improved visitor information can also increase understanding and appreciation of the natural and cultural values of the parks, recreation opportunities and visitor facilities, safety considerations and park regulations.

The local Aboriginal community is actively involved in interpreting and presenting the park's Aboriginal culture and heritage values. There are opportunities to expand interpretation, education and presentation of Aboriginal culture and heritage in these parks in partnership with the local Aboriginal community, including use of Aboriginal languages.

3.8 Commercial activities and events

A commercial activity is defined as an organised activity, operated by a business or organisation to generate income or profit. Commercial activities within the parks have many benefits, including:

- increasing opportunities for visitors to participate in nature-based recreation in a way that minimises personal risk
- providing opportunities to promote natural and cultural heritage values
- providing a range of visitor facilities and services.

Some activities do, however, have the potential to impact park values and the experience of other visitors where there is competition for facilities or overcrowding of sites.

Currently, there are a number of smaller commercial operators (predominantly surf schools) who operate within or adjacent to the parks and are licensed by NPWS or council. Apart from some land-based briefings, most of the activity associated with commercial surf schools occurs outside NPWS park jurisdiction. However, the NPWS's duty of care extends to those undertaking beach activities, and the NPWS also issues a licence to surf school operators for use of the park or for vehicle and pedestrian access through the parks.

3.8.1 Management considerations and opportunities

All commercial activities require a consent or licence under the National Parks and Wildlife Act or Regulation, and some operators are required to pay a fee for conducting activities in the park. Applications for on park commercial activities are assessed in accordance with relevant NPWS policies and procedures. NPWS also liaises with commercial operators to identify local or site-specific licence conditions that may be required for an operation or locality.

Commercial activities operating within the intertidal zone may impact on the experience and enjoyment of other park users (for example, overcrowding, noise or safety), and can also impact park facilities and natural and cultural values.

NPWS may be required to manage commercial operator access to recreational areas if there are safety concerns, environmental impacts or other management considerations. These parks allow for low-key recreational use in a relatively undeveloped and natural settings. This should be considered when determining appropriate commercial activities. Commercial fishing access is managed in accordance with the NPWS *Commercial fishing access policy.*

3.9 Non-commercial group activities (events and functions)

Currently, there are several recreational and educational group activities conducted in the parks, including NPWS Discovery activities. Other group activities which occur regularly within the parks include fishing and surfing competitions, cultural activities and organised social gatherings such as wedding ceremonies and reunions.

Events and functions are generally permissible on national park estate. However, these activities are not compatible with the principles of wilderness areas.

See Table 4 in the plan of management which describes park use regulations, including for group or private events. An appropriate level of sustainability and environmental assessments are required for consents and leases/licences.

Group sizes for events and functions will be limited to levels appropriate to protect natural and cultural heritage values, minimise impacts on other park users, and maximise visitor safety.

3.9.1 Management considerations and opportunities

Large-scale events and functions can cause unacceptable impacts on natural and cultural values due to the high levels of concentrated use at sites. Events and functions can also create conflict with other park users, due to issues of crowding, noise and competition for the use of limited facilities. Some areas are not suitable for events for environmental or cultural reasons.

4. Park infrastructure and services

Management of the parks and the provision of visitor facilities requires a range of infrastructure, including roads and management trails, car parks, walking tracks, water, toilets, work depots and storage.

NPWS assets and infrastructure are managed and maintained through the NPWS asset management system. This system is a strategic framework for delivering, maintaining and replacing NPWS assets necessary to support safe and sustainable visitor facilities and park management operations.

There is a 4-bedroom house (Plomer Beach House), the Plomer manager's cottage and a work shed at Point Plomer. Plomer Beach House is currently managed as overnight visitor accommodation (see Section 3.1). The shed is primarily used for storage, while the manager's cottage is currently used as temporary accommodation to assist with management of the camping area.

4.1 Park roads

The network of park roads and management trails is maintained to provide access to the parks for management activities (for example, fire management, pest plant and feral animal control, research). The management trails in the park are an important fire management asset, and most of the management trails are identified as strategic or tactical fire trails. Under the Rural Fires Act the relevant bush fire management committee prepares a fire access and fire trail plan to identify required access for fire suppression and management purposes and their required standards.

Maintaining roads and trails requires a major commitment of resources. It is important the road and trail network are regularly reviewed and, where necessary, rationalised.

In accordance with NPWS policy, vehicle use of management trails is only available for NPWS management and other authorised activities, including emergency response. Some management trails or beach access tracks may extend across adjacent lands owned and managed by other authorities or private individuals. Access agreements can be formalised in line with the reserve access strategy where appropriate and required.

Boundary gates and fencing regulate public access to the park. Boundary fencing exists along the park interface in several locations. New gates and fencing may be required elsewhere if new areas are added to the park. Internal park fencing is limited to that required for visitor management, principally to protect key nesting areas and rehabilitation areas and to ensure visitor safety.

An operating gravel quarry, Christmas Bells Quarry, is located in the north-west of Limeburners Creek National Park on Part 11 land (that is, land acquired by NPWS but not gazetted as national park) (see Figure 1). The quarry is registered with the relevant authority. The quarry, its immediate surrounds and Quarry Trail (the current access trail) are retained as Crown land vested in the Minister under Part 11 of the National Parks and Wildlife Act. The quarry is to be used to supply gravel for road works in lands managed under the Act and, subject to agreement, for some public roads that provide major access to these lands.

There are 2 water bores in the parks: one south of Racecourse Headland which provides water for camping areas in the Goolawah parks; and another in Limeburners Creek National Park immediately north of Point Plomer, which provides water for Point Plomer and the Back Beach Cultural camping areas. A water treatment system is in place to manage the quality of water supplied to campers at Point Plomer. A water treatment system may be investigated for Delicate Camping Area as part of a review of the current system.

4.1.1 Management considerations and opportunities

At the time of writing this report, management facilities and operations adequately supported park management with minimal environmental impacts. The installation, operation and maintenance of these facilities are undertaken in cooperation with other agencies, where applicable.

Safe and efficient access to and through the park is provided for authorised users (for example, emergency and firefighting vehicles and commercial fishers). No new trails or major realignments have been identified in the fire access and fire trail plans for these parks. For management trails that are no longer required, an opportunity exists to reduce their width and retain access for bushwalkers.

The access road off Point Plomer Road to Point Plomer Camping Area is adjacent to the camping area, leading to pedestrian conflict and dust saturating the adjacent camp sites in drier months. The Point Plomer Precinct Revitalisation project proposes relocating this road to improve pedestrian safety and reduce dust impacts on the camping area.

Illegal vehicle access on Saltwater and Dicks Hole management trails is an ongoing issue, with gates being vandalised or new tracks being formed around gates. This has also resulted in fires from arson and escaped campfires impacting on park values. Some internal fences are present. These may impact on wildlife movement and may require removal.

Sea level rise and coastal erosion pose a risk of damage to infrastructure in low-lying coastal areas, such as Point Plomer Camping and Day Use Area (see Section 1.7 – Climate Change).

5. Non-park infrastructure and services

The parks contain infrastructure and other assets which are owned, operated and/or used by other organisations or individuals that are not related to use or management of the parks. This includes public utility infrastructure (for example, drains, powerlines), apiary sites and beach access tracks for commercial fishers. Access is required for the use, operation, maintenance and/or repair of this infrastructure.

5.1 Non-NPWS infrastructure

The northern boundary of Limeburners Creek National Park near Melaleuca Camping Area is in part defined by an artificial drainage channel, which is part of the network of privately owned flood mitigation drains that are operated by Kempsey Shire Council. Big Hill Flood Gates are operated during flooding events to alleviate flooding within the floodplain to the west and north.

Machine access to the beach at Big Hill is required to operate the flood gates. Running along the southern bank of the channel there is an easement (around 20 m wide) to allow council access to the channel. No public use of the waterway is permitted.

There is an Energy Australia underground powerline into Point Plomer. These powerlines are not covered by a formal easement. In accordance with the *Electricity Supply Act 1995*, a network operator can operate and use the existing powerlines whether or not there is a formal easement in place. Clearings and vehicle trails along the powerlines can have significant environmental and visual impacts.

No access or maintenance agreement currently exists with Energy Australia, but the company must comply with the National Parks and Wildlife Act and Regulation when carrying out any maintenance or replacement work and will require NPWS consent for certain works.

The section of Point Plomer Road north of Big Hill Day Use Area is a public road and is managed by Kempsey Shire Council (Figures 1 and 2). The section over Big Hill between Big Hill Day Use Area and the northern end of Barries Bay Beach, although not gazetted as park, has been managed by NPWS since 1980 under consent from Kempsey Shire Council.

Maria River Road is a public road adjacent to the western side of Limeburners Creek National Park (Figure 1) and is maintained by Kempsey Shire Council and Port Macquarie-Hastings Council. The councils are currently sealing this road.

Several Crown/council road reserves are in or adjacent to the parks. Some of these are formed, while others are unformed (that is, they do not coincide with a constructed road). In some cases, the Crown/council road reserves do not currently provide access to private property, nor is access through them likely to be needed in the future.

Apiarists currently maintain seasonal honeybee hives at 3 sites in Goolawah National Park. Apiary sites are limited in size and are maintained by mowing or slashing. Access to apiary sites is off Point Plomer Road via short, mown access trails.

Existing apiary sites are recognised as existing interests under the National Parks and Wildlife Act as they pre-date the park's gazettal. Beekeeping is managed in accordance with NPWS policy.

5.2 Non-NPWS uses and services

Some roads or sections of roads that are gazetted as park provide the only practical means of access to private property and/or facilities owned and operated by other agencies. For example:

- The road leading to the water tank that provides drinking water for Crescent Head traverses Goolawah National Park (see Figure 2 – Map A).
- Tarcoola Road and Letterbox Trail through Limeburners Creek National Park provide access to private properties on the Maria River (see Figure 1).
- Killuke Mountain Trail, part of which traverses Goolawah National Park (see Figure 2 – Map A), has historically provided access to Crescent Head for nearby landholders, particularly during times of flood.

The Crown lease inholding at Point Plomer (Point Plomer Holiday Cabins) offers cabins and houses for holiday letting.

Commercial fishers currently operating in the parks include seasonal ocean hauling, beach worming and collection of pipis. These commercial fishing activities are reliant on 4-wheel drive access through the parks to the beaches and along the beaches.

5.2.1 Management considerations and opportunities

The establishment and use of any non-NPWS infrastructure by third parties is subject to environmental impact assessment and requires consent. Consents may include conditions to ensure the protection of the natural and cultural values

The installation and maintenance of transmission lines and other utility infrastructure has a potential impact on the environment through clearing or trimming of vegetation, use of herbicides, maintenance of access trails and the visual impact of the transmission lines, towers and pipelines.

The scale of development in the Point Plomer inholding lease is not in keeping with the low-key setting of the parks and is impacting on the visual amenity and visitor experience at Point Plomer Camping and Day Use Area.

Appendices

Appendix A Legislation and policy

The following laws and policies apply to how we manage our parks (this is not a complete list):

NSW legislation

- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- Companion Animals Act 1998
- Electricity Supply Act 1995
- Environmental Planning and Assessment Act 1979
- Filming Approval Act 2004
- Fisheries Management Act 1994
- Heritage Act 1977
- Local Land Service Act 2013
- National Parks and Wildlife Act 1974 and National Parks and Wildlife Regulation 2019
- Rural Fires Act 1997
- Wilderness Act 1987

Other NSW laws may also apply to park management:

- Work Health and Safety Act 2011

Commonwealth legislation and policy

- Environment Protection and Biodiversity Conservation Act 1999
- Disability Discrimination Act 1992
- National Construction Code

NPWS policies and strategies

A range of NPWS policies and strategies may also apply to park management, including:

- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales
- fire management strategies
- park management policies
- regional pest management strategies.

Other laws, policies and strategies may also apply. Please contact NPWS for advice.

Appendix B Scientific plant and animal names

The following table shows the scientific name for common plant and animal names used in this plan.

Species marked with an asterix (*) are not native.

Common name	Scientific name
Plants	
Austral toadflax	*Thesium australe*
Bangalow palm	*Archontophoenix cunninghamiana*
Bare twig rush	*Baumea juncea*
Beach pennywort	*Hydrocotyle bonariensis*
Beach spinifex	*Spinifex sericeus*
Beaded samphire	*Sarcocornia quinqueflora*
Bitou bush*	*Chrysanthemoides monilifera* subsp. *rotundata*
Black she-oak	*Allocasuarina littoralis*
Bloodroot	*Haemodorum corymbosum*
Broad-leaved paperbark	*Melaleuca quinquenervia*
Brown pine	*Podocarpus elatus*
Cabbage palm	*Livistona australis*
Coast banksia	*Banksia integrifolia*
Coast wattle	*Acacia longifolia* subsp. *sophorae*
Coastal morning glory*	*Ipomoea cairica*
Coastal she-oak	*Casuarina equisetifolia*
Coastal tea-tree	*Gaudium laevigatum (*syn. *Leptospermum laevigatum)*
Coolatai grass*	*Hyparrhenia hirta*
Dwarf heath casuarina	*Allocasuarina defungens*
Fern-leaved banksia	*Banksia oblongifolia*
Forest red gum	*Eucalyptus tereticornis*
Grass trees	*Xanthorrhoea* spp.
Grey mangrove	*Avicennia marina* subsp. *australasica*
Groundsel bush*	*Baccharis halimifolia*
Heath banksia	*Banksia ericifolia*
Kangaroo grass	*Themeda triandra*
Kikuyu*	*Pennisetum clandestinum*
Lantana*	*Lantana camara*
Marine couch	*Sporobolus virginicus*
Milky mangrove	*Excoecaria agallocha*
Milky silkpod	*Parsonsia dorrigoensis*

Common name	Scientific name
Myrtle rust	*Austropuccinia psidii*
Native figs: Port Jackson fig, sandpaper fig, small-leaved fig, sandpaper fig	*Ficus rubiginosa, Ficus fraseri, Ficus obliqua, Ficus coronata*
Native violet	*Viola betonicilfolia*
Nodding raspwort	*Gonocarpos salsoloides*
Ochna*	*Ochna serrulata*
Old man banksia	*Banksia serrata*
Pink bloodwood	*Corymbia intermedia*
Red olive berry	*Elaeodendron australe*
Rough-barked apple	*Angophora floribunda*
Salt marsh rush	*Juncus kraussii*
Salvinia*	*Salvinia molesta*
Scented acronychia	*Acronychia littoralis*
Scented marsdenia	*Marsdenia suaveolens*
Scribbly gum	*Eucalyptus signata*
Sedges: Slender flat-sedge, tall saw-sedge, pithy sword-sedge, red-fruit saw-sedge, rough saw-sedge, roundhead bristle-sedge	*Cyperus gracilis, Gahnia clarkei, Lepidosperma longitudinale, Gahnia sieberiana, Gahnia aspera, Chorizandra sphaerocephala*
Swamp box	*Lophostemon suaveolens*
Swamp mahogany	*Eucalyptus robusta*
Swamp oak	*Casuarina glauca*
Tallowwood	*Eucalyptus microcorys*
Tea-tree	*Leptospermum laevigatum*
Tuckeroo	*Cupaniopsis anacardioides*
Water hyacinth*	*Eichhornia crassipes*
White-flowered wax plant	*Cynanchum elegans*
Winter senna*	*Senna pendula*
Yellow tulipwood	*Harpullia pendula*
Yellow wood	*Flindersia xanthoxyla*
Animals	
Antechinus	*Antechinus stuartii, Antechinus flavipes*
Australasian bittern	*Esacus magnirostris*
Australian fritillary	*Argynnis hyperbius inconstans*
Australian owlet-nightjar	*Aegotheles chrisoptus*
Beach stone-curlew	*Esacus magnirostris*
Bibron’s toadlet	*Pseudophryne bibronii*

Common name	Scientific name
Black rat*	*Rattus rattus*
Black-necked stork	*Esacus magnirostris*
Brolga	*Grus rubicunda*
Brush-tailed phascogale	*Phascogale tapoatafa*
Bush rat	*Rattus fuscipes*
Cat*	*Felis catus*
Comb-crested jacana	*Irediparra gallinacea*
Common blossom-bat	*Syconycteris australis*
Deer*	*Cervus* sp.
Dingo	*Canis lupus dingo*
Dog (domestic and wild)*	*Canis lupus familiaris*
Bar-shouldered dove, Amboyna cuckoo-dove, rose-crowned fruit-dove, wompoo fruit-dove common emerald dove, zebra dove	*Geopelia humeralis, Macropygia amboinensis, Ptilinopus regina, Ptilinopus magnificus, Chalcophaps indica, Geopelia striata*
Dragon (Eastern water dragon)	*Intellagama lesueurii*
Eastern bentwing-bat	*Miniopterus orianae oceanensis*
Eastern cave bat	*Vespadelus troughtoni*
Eastern grass owl	*Tyto longimembris*
Eastern grey kangaroo	*Macropus giganteus*
Eastern ground parrot	*Pezoporus wallicus wallicus*
Eastern horseshoe bat	*Rhinolophus megaphyllus*
Eastern long-eared bat	*Nyctophilus bifax*
Eastern osprey	*Pandion cristatus*
Fairy wrens:	*Malurus melanocephalus, Malurus cyaneus, Malurus lamberti*
Fantails	*Rhipidura albiscapa, Rhipidura leucophrys, Rhipidura rufifrons*
Freycinet's frog	*Litoria freycineti*
Giant dragonfly	*Petalura gigantea*
Gliders: Squirrel glider, Feathertail glider, Sugar glider	*Petaurus norfolcensis, Acrobates pygmaeus, Petaurus breviceps*
Glossy black-cockatoo	*Calyptorhynchus lathami*
Goannas	*Varanus gouldii, Varanus varius*
Gould's long-eared bat	*Nyctophilus gouldi*
Gould's wattled bat	*Chalinolobus gouldii*
Greater broad-nosed bat	*Scoteanax rueppellii*
Green and golden bell frog	*Litoria aurea*
Green turtle	*Chelonia mydas*
Grey-headed flying-fox	*Pteropus poliocephalus*

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park Planning considerations

Common name	Scientific name
Gulls	*Chroicocephalus novaehollandiae*
Hairy mussel	*Trichomya hirsuta*
Herons	*Egretta novaehollandiae, Nycticorax caledonicus*
Honeybee*	*Apis mellifera*
Ibis	*Threskiornis molucca, Ardea ibis*
Koala	*Phascolarctos cinereus*
Leatherback turtles	*Dermochelys coriacea*
Little bentwing-bat	*Miniopterus australis*
Little penguin	*Eudyptula minor*
Little red flying-fox	*Pteropus scapulatus*
Little tern	*Sternula albifrons*
Loggerhead turtles	*Caretta caretta*
Long-nosed bandicoot	*Perameles nasuta*
Masked owl	*Tyto novaehollandiae*
Monarch flycatchers	*Monarcha melanopsis, Symposiachrus trivirgatus, Myiagra inquieta, Myiagra rubecula*
Mosquito fish*	*Gambusia holbrooki*
Nankeen night heron	*Nycticorax caledonicus*
Northern brown bandicoot	*Isoodon macrourus*
Oystercatchers	*Haematopus longirostris, Haematopus fuliginosus*
Pelican	*Pelecanus conspicillatus*
Pied oystercatcher	*Haematopus longirostris*
Pig*	*Sus scrofa*
Pigeons	*Columba leucomela, Leucosarcia melanoleuca, Lopholaimus antarcticus, Ocyphaps lophotes, Phaps chalcoptera, Phaps elegans*
Pipi	*Paphies australis*
Plover	*Vanellus miles*
Possums	*Pseudocheirus peregrinus, Trichosurus caninus, Trichosurus* sp., *Trichosurus vulpecula*
Powerful owl	*Ninox strenua*
Rabbit*	*Oryctolagus cuniculus*
Red fox*	*Vulpes vulpes*
Red-necked wallaby	*Macropus rufogriseus*
Regent honeyeater	*Anthochaera phrygia*
Robins	*Eopsaltria australis, Petroica rosea*
Rose-crowned fruit-dove	*Ptilinopus regina*

Common name	Scientific name
Ruddy turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Sandpipers	*Limicola falcinellus, Actitis hypoleucos*
Scrubwrens	*Sericornis frontalis, Sericornis magnirostra*
Skinks: Copper-tailed skink, eastern water-skink, dark-flecked garden sunskink, pale-flecked garden sunskink, white's skink, three-toed skink, friendly sunskink	 *Ctenotus taeniolatus, Eulamprus quoyii, Lampropholis delicata, Lampropholis guichenoti, Liopholis whitii, Saiphos equalis, Lampropholis amicula*
Sooty oystercatcher	*Haematopus fuliginosus*
Southern boobook	*Ninox novaeseelandiae*
Southern emu-wren	*Stipiturus malachurus*
Southern myotis	*Myotis macropus*
Spotted-tailed quoll	*Dasyurus maculatus*
Squirrel glider	*Petaurus norfolcensis*
Swamp rat	*Rattus lutreolus*
Swamp wallaby	*Wallabia bicolor*
Swift parrot	*Lathamus discolor*
Sydney cockle	*Anadara trapezia*
Tawny frogmouth	*Podargus strigoides*
Terns	*Sterna hirundo, Thalasseus bergii*
Thornbills	*Acanthiza nana, Acanthiza pusilla*
Top-shell	*Austrocochlea porcata, Austrocochlea constricta*
Triton shell	*Cymatium parthenopeum*
Turban shell	*Turbo torquatus, Turbo militaris, Turbo undulatus*
Wallum froglet / Tinkling froglet	*Crinia tinnula*
Waterfowl	*Chenonetta jubata, Anas superciliosa, Oxyura australis, Anas castanea*
Wedge-tailed shearwater	*Ardenna pacificus*
Whistlers	*Pachycephala olivacea, Pachycephala pectoralis, Pachycephala rufiventris*
White-bellied sea-eagle	*Haliaeetus leucogaster*
Wompoo fruit-dove	*Ptilinopus magnificus*

Common plant names from PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney, http://plantnet.rbgsyd.nsw.gov.au (30/7/2020).

Animal names from BioNet Wildlife Atlas, (28/7/2020).

Appendix C Vegetation classes and communities

Class name (in order of formation dominance)	Vegetation community
Maritime grasslands	Kangaroo grass sod grassland of North Coast headlands, NSW North Coast Bioregion and South Eastern Queensland Bioregion. Spinifex strandline grassland, NSW North Coast Bioregion and South Eastern Queensland Bioregion.
Coastal swamp forests	Broad-leaved paperbark – swamp oak – tall sedge swamp forest on alluvial soils, South Eastern Queensland Bioregion and NSW North Coast Bioregion. Broad-leaved paperbark – flax-leaved paperbark – buff hazelwood – tall saw-sedge swamp sclerophyll forest on alluvial sediments of coastal plains on NSW North Coast Bioregion Broad-leaved paperbark shrublands and open forests on coastal headlands, South Eastern Queensland Bioregion and NSW North Coast Bioregion.
Freshwater wetlands – coastal freshwater lagoons	Goolawah Lagoon is currently an extensive coastal freshwater lagoon that would have supported one or more freshwater wetland communities identified by OEH (2012a). Heavy infestations of water hyacinth and salvinia have degraded the lagoon to such an extent that it is now difficult to determine those naturally occurring communities within the lagoon.
Coastal heath swamps	Sieber's paperbark – heath-leaved banksia – thyme honey-myrtle swamp sclerophyll shrubland of North Coast Plains and Sand Plains, characteristically on clays and clayey sands, South Eastern Queensland Bioregion and NSW North Coast Bioregion.
Wallum sand heaths	Coast wattle shrubland on coastal foredunes, South Eastern Queensland Bioregion and NSW North Coast Bioregion.
Coastal dune dry sclerophyll forests	Pink bloodwood – brush box open forest on coastal dunes and sandplains, South Eastern Queensland Bioregion and NSW North Coast Bioregion.
North Coast dry sclerophyll forest	Forest red gum – pink bloodwood – grey ironbark open forest to woodland on metasediment headlands, NSW North Coast Bioregion.
North Coast wet sclerophyll forest	Turpentine – brush box – flooded gum – blackbutt shrubby moist forest of subcoastal lowlands, NSW North Coast Bioregion and South Eastern Queensland Bioregion.
Littoral rainforest	Coast banksia – tuckeroo closed forest/shrubland of coastal Holocene dunes, NSW North Coast Bioregion and South Eastern Queensland Bioregion.
Lowland rainforest	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions.
Subtropical coastal floodplain forest	Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion.

Source: adapted from OEH (2012a) and the Plant Community Type Identification Tool (PCT Id Tool).

Common names from PlantNET (The NSW Plant Information Network System), Royal Botanic Gardens and Domain Trust, Sydney, http://plantnet.rbgsyd.nsw.gov.au (30/7/2020)

Appendix D Description of threatened ecological communities

A threatened ecological community (TEC) is the collective term for ecological communities that are listed as vulnerable, endangered or critically endangered under the *Biodiversity Conservation Act 2016*.

An ecological community is a naturally occurring group of native plants, animals and other organisms that interact in a unique habitat.

The following are listed as endangered ecological communities under the Biodiversity Conservation Act.

These vegetation communities are from OEH 2012a, and have been related to the Keith (2004) vegetation classes. Common and scientific names follow OEH 2012a.

Maritime grasslands

Kangaroo grass sod grassland of North Coast headlands, NSW North Coast Bioregion and South Eastern Queensland Bioregion

This community occurs on the seaward slopes of Racecourse Headland, where it is directly exposed to prevailing moist, salt-laden winds. Shrubs including coast banksia (*Banksia integrifolia* subsp. *integrifolia*) occur infrequently within this community.

The ground layer is very dense and dominated by kangaroo grass (*Themeda australis*), with other frequently recorded species such as a prostrate form of slender rice flower (*Pimelea linifolia*), golden everlasting (*Xerochrysum bracteatum*), Indian pennywort (*Centella asiatica*), *Viola banksii*, prickly couch (*Zoysia macrantha*) and *Lobelia anceps*.

Spinifex strandline grassland, NSW North Coast Bioregion and South Eastern Queensland Bioregion

This strandline grassland community forms a very narrow strip on the seaward side of the beach foredune. Coastal spinifex (*Spinifex sericeus*) dominates with herbs and prostrate shrubs include pig face (*Carpobrotus glaucescens*), *Ipomoea brasiliensis* and the introduced *Hydrocotyle bonariensis* and American sea rocket (*Cakile edentula*).

Coastal swamp forests

Broad-leaved paperbark – swamp oak – tall sedge swamp forest on alluvial soils, South Eastern Queensland Bioregion and NSW North Coast Bioregion

This community occurs on alluvial sediments in back swamps west of Point Plomer Road and on the lower margins of Goolawah Lagoon where inundation is prolonged.

Dominated by broad-leaved paperbark (*Melaleuca quinquenervia*) with occasional swamp oak (*Casuarina glauca*). There is usually no or little mid-storey apart from the robust climber common silkpod (*Parsonsia straminea*). The ground layer is generally scattered with tall sedge (*Carex appressa*), *Persicaria strigosa*, Indian pennywort and harsh ground fern (*Hypolepis muelleri*) common.

Broad-leaved paperbark – flax-leaved paperbark – buff hazelwood – tall saw-sedge swamp sclerophyll forest on alluvial sediments of coastal plains on NSW North Coast Bioregion

This community is confined to unconsolidated alluvial sediments on the coastal plains and swamps in Goolawah National Park; and it also fringes Goolawah Lagoon and occupies the poorly drained areas west of the Point Plomer Road.

A tall open swamp sclerophyll forest dominated by broad-leaved paperbark, with swamp oak and swamp mahogany occasional associates. The mid-stratum often supports a mid-dense to dense small tree layer with cheese tree (*Glochidion ferdinandi*), brush muttonwood (*Myrsine howittiana*), flax-leaved paperbark (*Melaleuca linariifolia*).

The understorey is variable in density and comprises a diverse mix of sedges, ferns and forbs. It is dominated by tall saw-sedge (*Gahnia clarkei*), swamp water fern (*Blechnum indicum*), harsh ground fern, *Persicaria strigosa*, jointed twig rush (*Baumea articulata*) and tall sedge.

Broad-leaved paperbark shrublands and open forests on coastal headlands, South Eastern Queensland Bioregion and NSW North Coast Bioregion

Confined to the south facing slopes of Crescent Head Headland, this community is dominated by broad-leaved paperbark, with tuckeroo (*Cupaniopsis anacardioides*), guioa (*Guioa semiglauca*), coast banksia and swamp oak. There is a mid-dense to dense shrub and small tree layer comprising cheese tree, large mock-olive (*Notelaea longifolia*), creek sandpaper fig (*Ficus coronata*), sweet pittosporum (*Pittosporum undulatum*) and lilly pilly (*Acmena smithii*).

Freshwater wetlands – coastal freshwater lagoons

Goolawah Lagoon is currently an extensive coastal freshwater lagoon that would have supported one or more freshwater wetland communities identified by OEH (2012a). Heavy infestations of water hyacinth and salvinia have degraded the lagoon to such an extent that it is now difficult to determine those naturally occurring communities within the lagoon. Limeburners Creek National Park contains large areas of freshwater wetlands.

Coastal heath swamps

Sieber's paperbark – heath-leaved banksia – thyme honey-myrtle swamp sclerophyll shrubland of North Coast Plains and Sand Plains, characteristically on clays and clayey sands, South Eastern Queensland Bioregion and NSW North Coast Bioregion

This community is found in poorly drained headwater valleys and dune swales with infertile sandy peats and humic sandy loams on coastal sand sheets and coastal plateaux. The structure of this community consists of dense sedgeland with open stratum of emergent sclerophyllous shrubs. It occurs in Limeburners Creek National Park and in Goolawah Regional Park.

Wallum sand heaths

Coast wattle shrubland on coastal foredunes, South Eastern Queensland Bioregion and NSW North Coast Bioregion

The upper stratum is dominated by coast wattle (*Acacia longifolia* subsp. *sophorae*), coast banksia and coast tea-tree (*Leptospermum laevigatum*). The ground cover is dominated by blady grass (*Imperata cylindrica*), climbing guinea flower (*Hibbertia scandens*), basket grass (*Oplismenus imbecillus*) and *Cyperus gracilis*.

Generally, this vegetation community has been heavily influenced by past mining activities, and so comprises a mix of native species, many of which are not of local provenance (Brady and Ekert no date).

Coastal dune dry sclerophyll forests

Pink bloodwood – brush box open forest on coastal dunes and sandplains, South Eastern Queensland Bioregion and NSW North Coast Bioregion

Confined to the sandy soils on dunes and on coastal plains, this community is dominated by pink bloodwood (*Corymbia intermedia*) and coast banksia. Tuckeroo is often present. The mid-stratum typically includes beach acronychia (*Acronychia imperforata*) while spiny-headed mat-rush (*Lomandra longifolia*), twining guinea flower (*Hibbertia scandens*) and bracken fern (*Pteridium esculentum*) frequent the lower stratum.

North coast dry sclerophyll forest

Forest red gum – pink bloodwood – grey ironbark open forest to woodland on metasediment headlands, NSW North Coast Bioregion

Located on the headland immediately south of Crescent Head. The dominant canopy species are forest red gum (*Eucalyptus tereticornis*), pink bloodwood (*Corymbia intermedia*), grey ironbark (*Eucalyptus siderophloia*), brush box (*Lophostemon confertus*) and tallowwood (*Eucalyptus microcorys).* Forest oak (*Allocasuarina torulosa*) is the mid-layer dominant. The ground layer is grassy containing kangaroo grass, blady grass and flax lily (*Dianella caerulea*).

North coast wet sclerophyll forest

Turpentine – brush box – flooded gum – blackbutt shrubby moist forest of subcoastal lowlands, NSW North Coast Bioregion and South Eastern Queensland Bioregion

Confined to a narrow band west of Point Plomer Road. This community is a very tall open forest occurring in a drainage depression where deep moist loams have accumulated. This occurrence has a particularly well-developed rainforest mid-strata and could be considered as a rainforest community.

The overstorey is dominated by swamp mahogany, brush box, flooded gum (*Eucalyptus grandis*), blackbutt (*Eucalyptus pilularis*), tallowwood (*Eucalyptus microcorys*) and pink bloodwood (*Corymbia intermedia*). There is a tall, diverse, mesic small tree layer containing species such as scentless rosewood (*Synoum glandulosum* subsp. *glandulosum*), forest oak, forest maple (*Cryptocarya rigida*), tree heath (*Trochocarpa laurina*), bangalow palm (*Archontophoenix cunninghamiana*), murrogun (*Cryptocarya microneura*), guioa and cheese tree.

Littoral rainforest

Coast banksia – tuckeroo closed forest/shrubland of coastal Holocene dunes, NSW North Coast Bioregion and South Eastern Queensland Bioregion

This community is located in the more protected locations on the foredunes in Goolawah National Park. It forms a closed forest or shrubland dominated by coast banksia (*Banksia integrifolia* subsp. *integrifolia*), tuckeroo (*Cupaniopsis anacardioides*) and beach acronychia (*Acronychia imperforata*). Rainforest shrubs dominate the mid-layer; the ground layer is dominated grasses and ferns.

This rainforest community occurs on Racecourse Headland in Goolawah National Park. Dominated by tuckeroo, yellow tulipwood (*Drypetes deplanchei*), red olive berry (*Elaeodendron australe*), coastal banksia, bird's-eye alectryon (*Alectryon coriaceus*), hard quandong (*Elaeocarpus obovatus*), brown pine (*Podocarpus elatus*), beach acronychia (*Acronychia imperforata*) and coast canthium (*Cyclophyllum longipetalum*), blue lilly pilly

(*Syzygium oleosum*), lilly pilly, guioa, ribbonwood (*Euroschinus falcatus* var. *falcatus*) and rusty fig (*Ficus rubiginosa*).

Shrubs include veiny wilkiea (*Wilkiea huegeliana*), narrowleaved palm lilly (*Cordyline stricta*), orange thorn (*Pittosporum multiflorum*), hairy pittosporum (*Pittosporum revolutum*) and coffee bush (*Breynia oblongifolia*). Vines include cockspur (*Maclura cochinchinensis*), white supplejack (*Ripogonum album*), simple water vine (*Cissus antarctica*), lawyer vine (*Smilax australis*), wonga vine (*Pandorea pandorana*), twining guinea flower (*Hibbertia scandens*) and burny vine (*Trophis scandens*). The ground layer is sparse but includes spiny-headed mat-rush (*Lomandra longifolia*), native flax (*Gymnostachys anceps*), blue flax lilly (*Dianella caerulea*).

Appendix E Threatened fauna and migratory birds

Common name	Scientific name	BC Act status[1]	EPBC Act status[1]	LBC NP	GNP	GRP
Birds						
Australasian bittern	*Botaurus poiciloptilus*	E	E	Y		
Barred cuckoo-shrike	*Coracina lineata*	V		Y		
Bar-tailed godwit	*Limosa lapponica*		C,J,K	Y		
Black-necked stork	*Ephippiorhynchus asiaticus*	E		Y		
Black bittern	*Ixobrychus flavicollis*	V				Y
Blue-billed duck	*Oxyura australis*	V		Y		
Broad-billed sandpiper	*Limicola falcinellus*	V	C,J,K	Y		
Brolga	*Grus rubicunda*	V		Y		
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		Y		
Caspian tern	*Hydroprogne caspia*		J		Y	
Cattle egret	*Ardea ibis*		C,J	Y	Y	
Comb-crested jacana	*Irediparra gallinacea*	V			Y	
Common sandpiper	*Actitis hypoleucos*		C,J,K	Y		
Common noddy	*Anous stolidus*		C,J		Y	
Common tern	*Sterna hirundo*		C,J,K		Y	Y
Crested tern	*Thalasseus bergii*		J	Y	Y	Y
Dusky woodswallow	*Artamus cyanopterus cyanopterus*	V		Y		
Eastern curlew	*Numenius madagascariensis*		CE, C,J,K	Y		
Eastern grass owl	*Tyto longimembris*	V		Y		
Eastern ground parrot	*Pezoporus wallicus wallicus*	V		Y		
Eastern osprey	*Pandion cristatus*	V		Y	Y	Y
Eastern reef egret	*Egretta sacra*		C	Y		
Fork-tailed swift	*Apus pacificus*		C,J,K	Y		
Glossy black-cockatoo	*Calyptorhynchus lathami*	V		Y	Y	
Lesser frigatebird	*Fregata ariel*		C,J,K		Y	
Latham's snipe	*Gallinago hardwickii*		J,K	Y		
Little lorikeet	*Glossopsitta pusilla*	V		Y	Y	
Little tern	*Sternula albifrons*	E	C,J,K	Y		
Masked owl	*Tyto novaehollandiae*	V		Y		
Olive whistler	*Pachycephala olivacea*	V		Y		
Pied oystercatcher	*Haematopus longirostris*	E		Y	Y	Y
Powerful owl	*Ninox strenua*	V		Y		

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park Planning considerations

Common name	Scientific name	BC Act status[1]	EPBC Act status[1]	LBC NP	GNP	GRP
Rainbow bee-eater	*Merops ornatus*		J	Y	Y	
Red-necked stint	*Calidris ruficollis*		C,J,K	Y		
Regent honeyeater	*Anthochaera phrygia*	E	CE	Y		
Rose-crowned fruit-dove	*Ptilinopus regina*	V			Y	
Ruddy turnstone	*Arenaria interpres*		C,J,K		Y	
Sanderling	*Calidris alba*	V	C,J,K	Y		
Short-tailed shearwater	*Ardenna tenuirostris*		J,K	Y		
Sooty oystercatcher	*Haematopus fuliginosus*	V		Y	Y	Y
Sooty shearwater	*Ardenna grisea*		J		Y	
Square-tailed kite	*Lophoictinia isura*	V		Y		
Swift parrot	*Lathamus discolor*	E	CE	Y		
Varied sittella	*Daphoenositta chrysoptera*	V		Y	Y	
Wandering tattler	*Tringa incana*		J			Y
Wedge-tailed shearwater	*Ardenna pacificus*		J	Y	Y	Y
White-bellied sea-eagle	*Haliaeetus leucogaster*	V		Y	Y	Y
White-throated needletail	*Hirundapus caudacutus*		V, C,J,K	Y	Y	
Wompoo fruit-dove	*Ptilinopus magnificus*	V		Y	Y	
Mammals						
Brush-tailed phascogale	*Phascogale tapoatafa*	V		Y		
Common blossom-bat	*Syconycteris australis*	V		Y	Y	
Eastern cave bat	*Vespadelus troughtoni*	V		Y	Y	
Eastern chestnut mouse	*Pseudomys gracilicaudatus*	V		Y		
Eastern long-eared bat	*Nyctophilus bifax*	V			Y	
Greater broad-nosed bat	*Scoteanax rueppellii*	V			Y	
Grey-headed flying-fox	*Pteropus poliocephalus*	V	V	Y	Y	Y
Koala	*Phascolarctos cinereus*	V	V	Y	Y	
Large bent-winged bat	*Miniopterus orianae oceanensis*	V		Y	Y	
Little bent-winged bat	*Miniopterus australis*	V		Y	Y	
Long-nosed potoroo	*Potorous tridactylus*	V	V	Y		
Southern Myotis	*Myotis macropus*	V		Y		
Sperm whale	*Physeter macrocephalus*	V		Y	Y	
Spotted-tailed quoll	*Dasyurus maculatus*	V	E	Y		
Squirrel glider	*Petaurus norfolcensis*	V		Y		
Amphibian						
Wallum froglet	*Crinia tinnula*	V		Y	Y	

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park Planning considerations

Common name	Scientific name	BC Act status[1]	EPBC Act status[1]	LBC NP	GNP	GRP
Green and golden bell frog	*Litoria aurea*	E	V	Y		
Reptile						
Loggerhead turtle	*Caretta*	E	E	Y		
Green turtle	*Chelonia mydas*	V	V	Y		
Insects						
Australian fritillary	*Argynnis hyperbius inconstans*	E	CE	Y		
Giant dragonfly	*Petalura gigantea*	E		Y		

Notes:

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

C = CAMBA (China-Australia Migratory Bird Agreement), J = JAMBA (Japan-Australia Migratory Bird Agreement), K = ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement).

Appendix F Feral animal and pest plants

The following tables summarise key information on feral animal and pest plants in the park at the time of publication of this plan. Current information on the status of feral animal and pest plants and whether they have a threat abatement plan can be found on the department's website. Further information is also available in the relevant NPWS pest management strategy. The *Local Land Service Act 2013* declares certain animals to be pests.

Priority pest plants

Common name	Scientific name	KTP	NSW TAP	Declared pest	WONS
Bitou bush	*Chrysanthemoides monilifera* subsp. *rotundata*	Y	Y	Y	Y
Coastal morning glory	*Ipomoea cairica*	N	N	Y	Y
Groundsel bush	*Baccharis halimifolia*	N	N	Y	Y
Kikuyu	*Pennisetum clandestinum*	Y	Y	N	N
Lantana	*Lantana camara*	Y	N	Y	Y
Ochna	*Ochna serrulata*	N	N	Y	Y
Salvinia	*Salvinia molesta*	N	N	Y	Y
Water hyacinth	*Eichhornia crassipes*	N	N	Y	Y
Winter senna	*Senna pendula*	Y	N	N	Y

KTP = key threatening process listed under the Biodiversity Conservation Act and Environment Protection and Biodiversity Conservation Act.

TAP = threat abatement plan prepared under the Biodiversity Conservation Act.

WONS = Weed of National Significance.

Feral animals

Common name	Scientific name	KTP	NSW TAP	Declared pest
Black rat	*Rattus rattus*	N	N	N
Cat	*Felis catus*	Y	Y	Y
Common/Indian miner	*Sturnus tristis*	Y	Y	Y
Deer	*Cervus* spp.	Y	N	Y
European cattle	*Bos taurus*	N	N	N
Feral dog	*Canis lupus familiaris*	Y	N	Y
Feral honeybee	*Apis mellifera*	N	N	N
Feral pigs	*Sus scrofa*	Y	Y	Y
Horse	*Equus caballus*	Y	N	Y
House mouse	*Mus musculus*	N	N	N
Mosquito fish	*Gambusia holbrooki*	Y	Y	N
Rabbit	*Oryctolagus cuniculus*	Y	Y	Y

Common name	Scientific name	KTP	NSW TAP	Declared pest
Red fox	*Vulpes*	Y	Y	Y
Spotted turtle-dove	*Streptopelia chinensis*	N	N	N
Wild dog	*Canis lupus familiaris*	N	N	Y

KTP = key threatening process listed under the Biodiversity Conservation Act and Environment Protection and Biodiversity Conservation Act.

TAP = threat abatement plan prepared under the Biodiversity Conservation Act.

Pathogens

Common name	Scientific name	KTP	NSW TAP
Root-rot fungus	*Phytophthora cinnamomi*	Y	Y
Chytrid fungus	*Batrachochytrium dendrobatidis fungus causing amphibian chytridiomycosis*	Y	Y
Myrtle rust	*Austropuccinia psidii*	Y	Y

The following section provides an outline of those species, or groups of species, considered to represent the most significant threat to park values.

Priority pest plants

Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) is a native of South Africa. It is state-level priority weed throughout New South Wales (North Coast LLS 2017) and is listed as a Weed of National Significance. Invasion by bitou bush leads to a decline in the species diversity of affected plant communities and the fauna that depend on them, and so is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 1999). Bitou bush readily invades a wide variety of disturbed and undisturbed coastal plant communities, out-competing native vegetation.

All 3 parks contain vegetation communities known to be susceptible to bitou bush invasion (that is, foredunes, hind dunes, headlands, open coastal forests and littoral rainforest) (DEC 2006). In some parts of the parks there are localised heavy infestations. Bitou bush threatens threatened littoral rainforests and Themeda grassy headlands in Goolawah and Limeburners Creek national parks (OEH 2012b). Relatively little is known about the effects of bitou bush on native fauna, however, the breeding success of ground-nesting seabirds has been diminished where infestations of bitou have overgrown nesting sites. In other habitats (for example, coastal woodland), infestations may limit food sources of native fauna, such as micro-bats and gliders. Threatened fauna in the parks potentially affected by bitou bush infestation include little tern and little bentwing-bat.

The bitou bush threat abatement plan (DEC 2006) lists actions to abate, ameliorate or reduce the impact of bitou bush on threatened species, populations and ecological communities. Limeburners Creek National Park is identified in the bitou bush threat abatement plan as a priority control site in New South Wales (DEC 2006). Treatment of isolated infestations and infestations around camping areas and other visitor areas will remain a priority in all 3 parks. Opportunities for control may also present themselves following extensive fire in the parks (OEH 2012b).

Lantana (*Lantana camara*) is one of the worst pest plants in Australia and is state-level priority weed throughout New South Wales (North Coast LLS 2017), is a key threatening process (NSW SC 2006a) and is also recognised as a Weed of National Significance. It is a large flowering shrub native to Central and South America and is a vigorous invader of

disturbed areas, often forming dense thickets. It is spread mainly by birds and thrives in warm environments with high rainfall, where it grows along forest edges, penetrates disturbed rainforest and invades open eucalypt woodlands.

Hind dune and remnant rainforest areas within the parks are particularly susceptible to invasion by lantana, and localised, dense infestations occur in all 3 parks. Lantana poses a significant threat to threatened littoral rainforest and Themeda grassland communities in the parks (OEH 2012b).

The national *Plan to protect environmental assets from lantana* (Biosecurity Queensland 2010) establishes national conservation priorities for the control of lantana. This plan is part of the implementation of the *Weeds of National Significance lantana strategic plan* and identifies the research, management and other actions needed to ensure the long-term survival of native species and ecological communities affected by the invasion of lantana. The parks contain remnants of 2 threatened plant communities (littoral rainforest and Themeda grassland) which are recognised as high priority communities in New South Wales at risk from lantana (Biosecurity Queensland 2010).

Aquatic pest plants include heavy infestations of water hyacinth (*Eichornia crassipes*) and salvinia (*Salvinia molesta*) found in Goolawah Lagoon, Goolawah National Park. These aquatic pest plants are significantly disrupting the lagoon ecosystem, impacting native aquatic plants and animals, decreasing water quality, and reducing the aesthetic and recreational values of the lagoon (OEH 2012b). They are both state-level priority weeds throughout New South Wales (North Coast LLS 2017) and both are listed as Weeds of National Significance.

Exotic grasses readily invade disturbed areas and can effectively out-compete many native grass species. Exotic grasses of particular concern in these parks include couch (*Cynodon dactylon*), broad-leaved paspalum (*Paspalum distichum*), kikuyu (*Pennisetum clandestinum*) and panic veldt grass (*Ehrharta erecta*). Exotic grasses can be found along roads, tracks and trails in the parks (for example, giant Parramatta grass in Limeburners Creek National Park), within camping areas and other disturbed sites (e.g. the camping areas in both Goolawah parks), and on grassy headlands where they are displacing native grass species and remnants of the Themeda grassy headlands threatened ecological community. Invasion of native plant communities by exotic perennial grasses is listed as a key threatening process in New South Wales (NSW SC 2003b). Priority control of exotic grasses, particularly kikuyu, is needed in littoral rainforest and grassy headlands in all 3 parks.

A number of **exotic vine** species have become established in New South Wales, the majority of which were originally introduced for horticultural purposes but have escaped into areas of native vegetation (NSW SC 2006b). Exotic vines can establish and spread quickly and will often smother native vegetation, impacting recruitment of native species. Exotic vines of particular concern in these parks include coastal morning glory (*Ipomoea cairica*), which often invades the margins of coastal rainforests and is readily dispersed through dumped garden waste and stormwater containing seeds. *Asparagus* spp., which commonly escape gardens adjacent to parks, disperse readily through tubers and berries which are palatable to a range of native bird species. Asparagus pest plants are state-level priority weeds (North Coast LLS 2017). Invasion and establishment of exotic vines and scramblers is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2006b) and several asparagus species are also listed as Weeds of National Significance.

Emerging pest plant issues

A number of pest plant species currently occur in the parks in relatively low densities, but have high potential for further spread. These include groundsel bush (*Baccharis halimifolia*), winter senna (*Senna pendula* var. *glabrata*) and Coolatai grass (*Hyparrhenia hirta*).

Groundsel bush, a regional priority weed (North Coast LLS 2017) rapidly colonises disturbed areas and is readily spread by wind, often over large distances. Groundsel bush is currently found in all 3 parks, particularly the northern parts of Goolawah National Park, Delicate Beach in Goolawah Regional Park, and Big Hill Point in Limeburners Creek National Park.

Winter senna is a woody pest plant that invades the understorey of coastal forests and woodlands. Because the species is a prolific seeder and is fast growing, it can out-compete and replace native vegetation and has the potential to become more widespread in these parks. There are currently several occurrences in Goolawah Regional Park, near the camping areas in the Goolawah parks and within Limeburners Creek National Park. It is a particular problem in littoral and bangalow palm forests (Brady and Ekert no date).

Winter senna is one of a number of pest plant species in the parks that have their origin as ornamental garden plants (others include ground asparagus, coastal morning glory, ochna). Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants, is a key threatening process under the Biodiversity Conservation Act (NSW SC 2010b) and Environment Protection and Biodiversity Conservation Act.

Feral animals

The term '**wild dog**' refers to all free-living dogs in New South Wales, including dingoes, feral dogs and their hybrids. Most wild dogs in New South Wales are hybrids with a relatively high level (>50%) of dingo genetics (Stephens et al. 2015; Cairns et al. 2021). Wild dogs can have significant impacts on livestock, especially sheep. Therefore, under the general biosecurity duty of the *Biosecurity Act 2015*, the occupier of lands (both private and public) is required to take all practical measures to minimise the risk of any negative impacts of wild dogs on their land or neighbouring lands.

The general biosecurity duty for wild dogs is directly informed by the NSW *Wild dog management strategy 2017–2021* (DPI 2017). This strategy promotes a balance between managing wild dogs in areas where they have negative impacts and preserving the ecological role of dingoes. The conservation of dingoes is listed as one of the strategy's goals. It is achieved via the development of regional wild dog management plans which focus control on areas where the risk of negative impacts are greatest, and not undertaking control in other parts of the landscape with a low risk of negative impacts from wild dogs, to preserve the natural ecological role of the dingo (North Coast LLS 2018). The NPWS *Wild dog policy* outlines how NPWS meets these dual requirements.

There is a long history of unauthorised **cattle** (*Bos taurus*) grazing on lands that now fall within the 3 parks. Cattle frequently stray into the parks and can have a range of impacts on park values. They destroy native vegetation (including threatened ecological communities) and can contribute to the introduction and spread of pest plants and pathogens (for example, bitou bush has been observed sprouting from cow pats in Goolawah National Park). Cattle have also eroded walking tracks and management trails in the parks, for example, the walking track over Big Hill Point.

The majority of cattle straying onto the parks are unmarked, making it difficult to establish who is responsible for individual animals. Exclusion of stray cattle from the parks is neither practical nor feasible.

Feral pigs (*Sus scrofa*) currently occur in low numbers in Limeburners Creek National Park and in the wetter areas of Goolawah National Park. The impact of feral pigs on conservation values is substantial because they forage, wallow and dig in wetland areas; and cause major disturbance and damage to soils, roots, sensitive ground flora and wetland environments. Areas disturbed by feral pigs are at risk from subsequent pest plant invasion and soil erosion, and feral pigs are also a potential host of a number of exotic diseases. Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a key

threatening process under both the Biodiversity Conservation Act (NSW SC 2004c) and Environment Protection and Biodiversity Conservation Act (Cth DCCEEW no date, b). A threat abatement plan has been prepared under the Commonwealth legislation, which sets out a national framework to guide coordinated actions to address the threat posed by feral pigs (DoEE 2017).

Other introduced animals of significance

Red foxes (*Vulpes vulpes*) occur in all 3 parks. Foxes are significant predators of medium-sized, ground-dwelling and semi-arboreal mammals and ground-nesting birds, including shorebirds and seabirds (DoL 2008). Foxes are a declared pest in New South Wales and have been implicated in the spread of a number of pest plant species, including bitou bush. Predation by foxes is listed as a key threatening process under both the Biodiversity Conservation Act (NSW SC 1998) and Environment Protection and Biodiversity Conservation Act (Cth DCCEEW no date, b). New South Wales and Commonwealth threat abatement plans establish long-term control programs to protect priority threatened fauna species and populations from the threat posed by foxes. Foxes are known to prey on bandicoots and wallabies within the parks (Ingersoll and Redpath 2002). Threatened fauna within the parks most likely to be impacted by foxes include little terns and pied oystercatchers.

Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) currently occur in relatively low numbers in the parks, due generally to unsuitable habitat and possibly also predation by wild dogs. However, rabbit and hare population numbers can increase quickly so these species could represent a higher priority for control in the future. Smaller rodents, such as the house mouse (*Mus musculus*) and black rat (*Rattus rattus*), are likely to be naturalised in the park. As with rabbits, these rodents have a propensity to breed up quickly so priority control in the future may be required.

Feral honeybee (*Apis mellifera*) populations are likely to occur within the parks. Feral honeybees are bees that have escaped from hives and have become established in the wild. Competition from feral honeybees is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2002a).

Feral honeybees impact biodiversity in 2 broad ways: via competition for tree hollows and via competition for floral resources, such as pollen and nectar. The loss of tree hollows via occupation by feral honeybees reduces the number of hollows available for native animals for breeding and shelter. Tree hollows are an extremely important resource that have limited occurrence within the 3 parks.

Pathogens

Pathogens are agents that cause disease and have the potential to cause widespread and irreversible damage to park values. Pathogens currently understood to represent a potential threat to park values include *Phytophthora cinnamomi* (a root-rot fungus), myrtle rust (*Austropuccinia psidii*) and chytrid fungus (*Batrachochytrium dendrobatidis*). However, such is the nature of pathogens that new threats may emerge at any time with the potential to significantly affect park values, by decreasing biodiversity, impacting populations of threatened species, reducing the aesthetic value and hence recreational opportunities within the parks, and impacting wilderness values.

Phytophthora is a soil-borne pathogen which causes a range of symptoms and contributes to plant death where there are other stresses present, such as water logging, drought and perhaps wildfire (NSW SC 2002b). Dieback caused by phytophthora is currently listed as a key threatening process under both the Biodiversity Conservation Act (NSW SC 2002b) and Environment Protection and Biodiversity Conservation Act (Cth DCCEEW no date, b). The

spread of phytophthora is linked to human, animal (for example, feral pig) and vehicle movements and it can also be dispersed in flowing water, such as storm run-off.

Phytophthora is not currently known to occur in the parks. However, many sites experience conditions favourable to the establishment and spread of phytophthora (for example, warm moist conditions, soil low in nutrients). Pathogens such as phytophthora could expand into new areas in response to local changes in climate, particularly warmer temperatures and/or increases in rainfall.

Myrtle rust is a plant disease caused by the exotic fungus *Austropuccinia psidii*. It was first detected on the Central Coast of New South Wales in 2010 and has established through coastal parts of the state from the Shoalhaven River north into Queensland. The spores of myrtle rust are readily spread by wind, animals and humans.

Myrtle rust infects the young, actively growing shoots, leaves, flower buds and fruits of plants in the family Myrtaceae, including the genera *Eucalyptus*, *Angophora*, *Callistemon* and *Melaleuca*. Leaves may become buckled and twisted, contributing to mortality among younger plants and reduced recruitment in mature plants. However, the likely impacts of myrtle rust on biodiversity are generally unknown (NPWS 2011).

Myrtle rust is known to occur within Kempsey Local Government Area and has been detected in Goolawah National Park and Goolawah Regional Park, although impacts currently appear to be minor. While extensive evidence of myrtle rust has not yet been documented within the parks, it is considered to pose a significant threat to their biological values. Species of the susceptible genera are found in the parks, although no threatened species from these genera are currently known to occur.

Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus. It is a highly virulent fungal pathogen affecting amphibians worldwide. Chytrid fungus is widespread in eastern Australia, where it has been linked to high mortality rates and dramatic declines in a number of native frog populations. Infection of frogs with chytrid fungus is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2003c) and Environment Protection and Biodiversity Conservation Act (Cth DCCEEW no date, b).

To date, no targeted surveys have been undertaken for chytrid fungus within the parks, and so the extent of the threat posed to frog populations is unknown. However, chytrid fungus is potentially fatal to all native species of amphibian and has been reported in green and golden bell frogs (NSW SC 2003c), populations of which occur in Limeburners Creek National Park.

References

Atkinson G (1999) *Soil landscapes of the Kempsey-Korogoro Point 1:100 000 Sheet report*, Department of Land and Water Conservation, Sydney.

Andrews DL (2005) Ecology of the tiger quoll *Dasyurus maculatus maculatus* in coastal New South Wales, MSc thesis, School of Biological Sciences, University of Wollongong.

Ballantyne M and Pickering CM (2015) 'The impacts of trail infrastructure on vegetation and soils: Current literature and future directions', *Journal of Environmental Management*, 164:53–64.

Biosecurity Queensland on behalf of the National Lantana Management Group (2010) *Plan to protect environmental assets from lantana*, Department of Employment, Economic Development and Innovation, Yeerongpilly, Queensland.

Brady and Ekert (no date) Management priorities for the fauna and flora of Goolawah Reserve, report to NPWS by Ekerlogical Consulting Services.

Cairns K, Crowther M, Nesbitt B and Letnic M (2021) 'The myth of wild dogs in Australia: are there any out there?', *Australian Mammology*, 10.1071/AM20055.

Creswell, S. (1985) Point Plomer: Description and Analysis of Aboriginal Occupation of a Rocky Headland and its Environments on the North Coast of N.S.W., unpublished report.

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (no date, a) *Wetlands*, DCCEEW webpage.

Cth DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (no date, b) *Species Profile and Threats Database, listed key threatening processes*, DCCEEW webpage.

Davies R, Speldewine P and Stewart B (2016) 'Low level off-road vehicle (ORV) traffic negatively impacts macroinvertebrate assemblages at sandy beaches in south-western Australia', *Scientific Reports*, 6, 24899; doi: 10.1038/srep24899.

DEC (Department of Environment and Conservation, NSW) (2006) 'NSW Threat abatement plan: Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)', DEC, Hurstville.

DECCW (Department of Environment, Climate Change and Water, NSW) (2010) *NSW Climate impact profile: the impacts of climate change on the biophysical environment in New South Wales*, Department of Environment, Climate Change and Water, Sydney.

DoE (Department of Environment, Cth) (2015) *Wildlife conservation plan for migratory shorebirds,* DoE, Canberra.

DoEE (Department of Environment and Energy, Cth) (2017) 'Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scofra*)', DoEE, Canberra.

DoL (Department of Lands, NSW) (2008) Goolawah State Park management plan, unpublished report by NSW Department of Lands.

DPI (Department of Primary Industries, NSW) (2017) *NSW Wild dog management strategy 2017–2021*, DPI, Sydney.

Environment Australia 2001, *A directory of important wetlands in Australia* [PDF 2.6MB], 3rd edn, Environment Australia, Canberra.

Griffith and Wilson (1995) Vegetation mapping and inventory, Limeburners Creek Nature Reserve [unpublished preliminary report to NPWS].

Hill T (2017) Cultural heritage site assessment: Point Plomer precinct, unpublished report to National Parks and Wildlife Service.

Ingersoll R and Redpath P (2002) *The flora and fauna of Goolawah Reserve: a resource inventory for planning and management*, Conservation Volunteers Australia and Department of Land and Water Conservation.

Insight Ecology (2017) *Macleay River estuary migratory and threatened shorebird species management strategy*, report prepared by Insight Ecology for Kempsey Shire Council, Kempsey.

Keith DA (2004) *Ocean shores to desert dunes: the native vegetation of NSW and the ACT*, Department of Environment and Conservation, Sydney.

Kempsey Shire Council (2019) The value of tourism to the North Coast 2019: Macleay Valley Coast Visitor Statistics 2018, Tourism Research Australia.

Kendall P and Kendall K (2005) Goolawah (west) reserve vegetation and fauna survey, unpublished report prepared for NPWS by Kendall and Kendall Ecological Consultants, West Kempsey.

Kendall P and Kendall K (2006) Koala habitat mapping of the Goolawah area from Crescent Head to Limeburners Nature Reserve, unpublished report prepared for the Koala Preservation Society of NSW Inc., Kendall and Kendall Ecological Consultants, West Kempsey.

Kenny B, Sutherland E, Tasker E and Bradstock R (2004) *Guidelines for ecologically sustainable fire management*, NSW Biodiversity Strategy, NSW National Parks and Wildlife Service, Sydney.

Lyons M, Brandis K, Callaghan C, McCann J, Mills C, Ryall S and Kingsford R (2017) 'Bird interactions with drones, from individuals to large colonies', *BioRxiv*, 109926.

Maguire (2018) *A review of dog impacts to beach-nesting birds and management solutions,* a report prepared for Birdlife Australia by Dr Grainne Maguire, November 2019.

North Coast LLS (Local Land Services, NSW) (2017) 'North coast regional strategic weed management plan 2017–2022', North Coast LLS.

North Coast LLS (2018) 'North Coast regional strategic pest animal management plan 2018–2022', North Coast LLS.

NPWS (NSW National Parks and Wildlife Service) (1998) *Limeburners Creek Nature Reserve plan of management*, NPWS, Hurstville

NPWS (2001) Northern wilderness assessment report – 2001, unpublished report by Northern Directorate, NPWS, Coffs Harbour, NSW.

NPWS (2003) The bioregions of New South Wales their biodiversity, conservation and history, NPWS, Hurstville.

NPWS (2004) *Guidelines for ecologically sustainable fire management* [PDF 1MB], NSW Biodiversity Strategy, NPWS, Hurstville.

NPWS (2005) Dingo management strategy Limeburners Creek Nature Reserve, unpublished report by NPWS Mid North Coast Region.

NPWS (2011) *Management plan for myrtle rust on the national parks estate* [PDF 1.5MB], Office of Environment and Heritage, Sydney South.

NPWS (2016) Park facilities manual, unpublished report, Office of Environment and Heritage, Sydney.

NPWS (2023) 'Fire management manual 2022–2023', Department of Climate Change, Energy, the Environment and Water, Parramatta.

NSW Government (1968) Report of the committee of enquiry on differences and conflicts between interests of parks and conservation authorities, scientific bodies and mining companies (Sim Report), (includes report on vegetation by McGillivray).

NSW Government (2000) 'Regional Forest Agreement for North East NSW', agreement between the Commonwealth of Australia and the State of New South Wales, March 2000.

NSW SC (New South Wales Scientific Committee) (1998) *Predation by the European red fox (Vulpes vulpes) – key threatening process listing*, NSW Department of Planning and Environment website.

NSW SC (1999) *Invasion of native plant communities by bitou bush and boneseed - key threatening process listing*, NSW Department of Planning and Environment website.

NSW SC (2000a) *High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2000b) *Anthropogenic climate change – key threatening process listing*, Department of Planning and Environment website.

NSW SC (2002a) *Competition from feral honeybees - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2002b) *Infection of native plants by Phytophthora cinnamomi - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2003a) *Removal of dead wood and dead trees - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2003b) *Invasion of native plant communities by exotic perennial grasses - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2003c), *Infection of frogs by amphibian chytrid causing the disease chytridiomycosis - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2004a) *Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing*, Department of Planning and Environment website.

NSW SC (2004b) Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion - Determination to make minor amendment to Part 3 of Schedule 1 of the TSC Act, Department of Planning and Environment website.

NSW SC (2004c) *Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2005) Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing, Department of Planning and Environment website.

NSW SC (2006a) *Invasion, establishment and spread of Lantana (Lantana camara) - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2006b) *Invasion and establishment of exotic vines and scramblers - key threatening process listing*, Department of Planning and Environment website.

NSW (SC 2010a) *Regent honeyeater (*Anthochaera phrygia*) - critically endangered species listing*, Department of Planning and Environment website.

NSW SC (2010b) *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants - key threatening process listing*, Department of Planning and Environment website.

NSW SC (2011) *Lowland rainforest on floodplain in the New South Wales North Coast bioregion - determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*, Department of Planning and Environment website.

OEH (Office of Environment and Heritage, NSW) (2012a) *Vegetation classification for the Northern Rivers Catchment Management Area of NSW*, Office of Environment and Heritage, Sydney.

OEH (2012b) 'Regional pest management strategy 2012–17, North Coast Region: a new approach for reducing impacts on native species and park neighbours', OEH, Sydney.

OEH (2012c) 'Living with fire in NSW national parks: a strategy for managing bushfires in national parks and reserves 2012–2021', revised edition, Office of Environment and Heritage, Sydney.

OEH (2012d) 'Strategic directions for horse riding in NSW national parks', Office of Environment and Heritage, Sydney.

OEH (2013) The Macleay Karst Area management plan, unpublished report by Office of Environment and Heritage.

OEH 2014, *North Coast: Climate change snapshot*, AdaptNSW webpage, Office of Environment and Heritage, Sydney.

Rose DB (1996) Nourishing terrains: Australian Aboriginal views of landscape and wilderness, Australian Heritage Commission.

Sandpiper Ecology (2019) Macleay River estuary migratory and threatened shorebird species strategy – Follow-up shorebird survey 2018/19, report prepared by Insight Ecology for Kempsey Shire Council, Kempsey.

Schlacher (2008) '4WD beach traffic—an acceptable use of sandy shores?', *National Parks Journal*, NPA Publications Pty Ltd, August-September 2008, Sydney.

Short AD (2007) Beaches of the New South Wales Coast, 2nd edition: a guide to their nature, characteristics, surf and safety, Sydney University Press, Sydney.

Stephens D, Wilton A, Fleming P and Berry O (2015) 'Death by sex in an Australian icon: a continent-wide survey reveals extensive hybridization between dingoes and domestic dogs', *Molecular Ecology*, 24(22).

Tourism Research Australia (2012) *Travel to Mid North Coast, year ending June 2012*, viewed November 2012.

Vas E, Lescroël A, Duriez O, Boguszewski G and Grémillet D (2015) 'Approaching birds with drones: first experiments and ethical guidelines', *Biology Letters*, 11(2), 20140754.

More information

- Biodiversity Conservation Program
- Cultural Fire management policy
- Enhance Bushfire Management Program
- Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park Plan of Management
- Key threatening processes
- National Parks and Wildlife Service (NPWS) website

- NSW BioNet website
- Register of leases, easements and rights of way
- Saving our Species program
- Threatened biodiversity profile search
- Weeds of National Significance – Weeds Australia website

Goolawah National Park, Goolawah Regional Park and Limeburners Creek National Park Planning considerations

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