NSW NATIONAL PARKS & WILDLIFE SERVICE

Royal National Park, Heathcote National Park and Garawarra State Conservation Area

Planning Considerations

environment.nsw.gov.au

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Published by:

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

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
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How to use this report

This planning considerations report outlines the matters considered in preparing the *Royal National Park, Heathcote National Park and Garawarra State Conservation Area Plan of Management*, 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 actions that 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 parks and any requirements to undertake these activities, including whether consent must be sought from the NPWS to undertake them.

This planning considerations report will be updated when appropriate, for example, if we have new information on:

- the values of the parks (e.g. new threatened species)
- management approaches (e.g. new weed and feral animal management techniques)
- new programs.

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

Acknowledgements

Royal National Park, Heathcote National Park and Garawarra State Conservation Areas are in the traditional Country of the Dharawal People.

NPWS gratefully acknowledges the efforts of the many volunteers who continue to make significant contributions to the conservation of park values.

This report was prepared by staff of NPWS.

Contact us

For more information or any inquiries about this plan of management or Royal National Park, Heathcote National Park and Garawarra State Conservation Area, contact NPWS by email at npws.royal@environment.nsw.gov.au; by mail to PO Box 144, Sutherland NSW; or by telephone (02) 9542 0632.

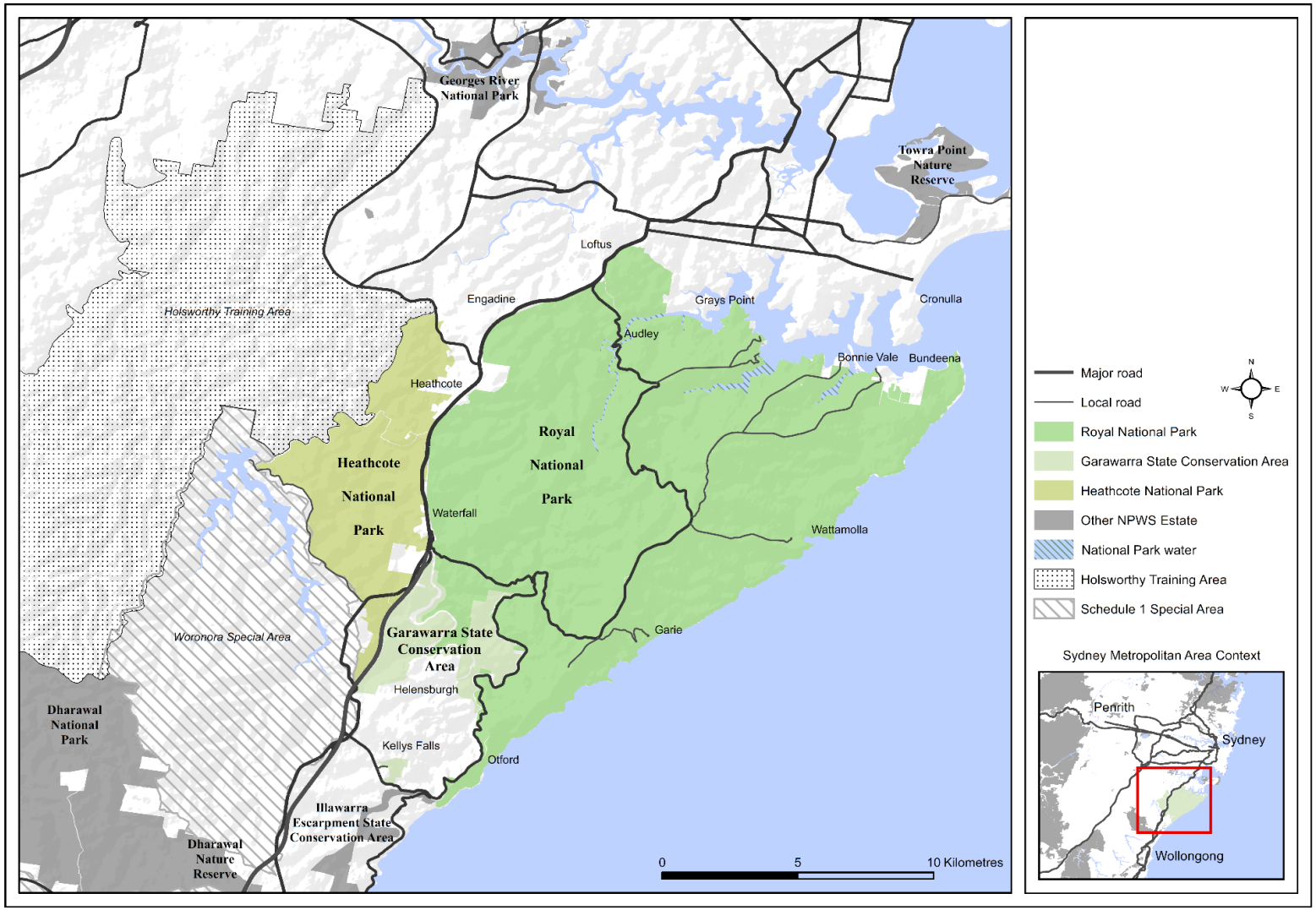

Figure 1 Location of the parks

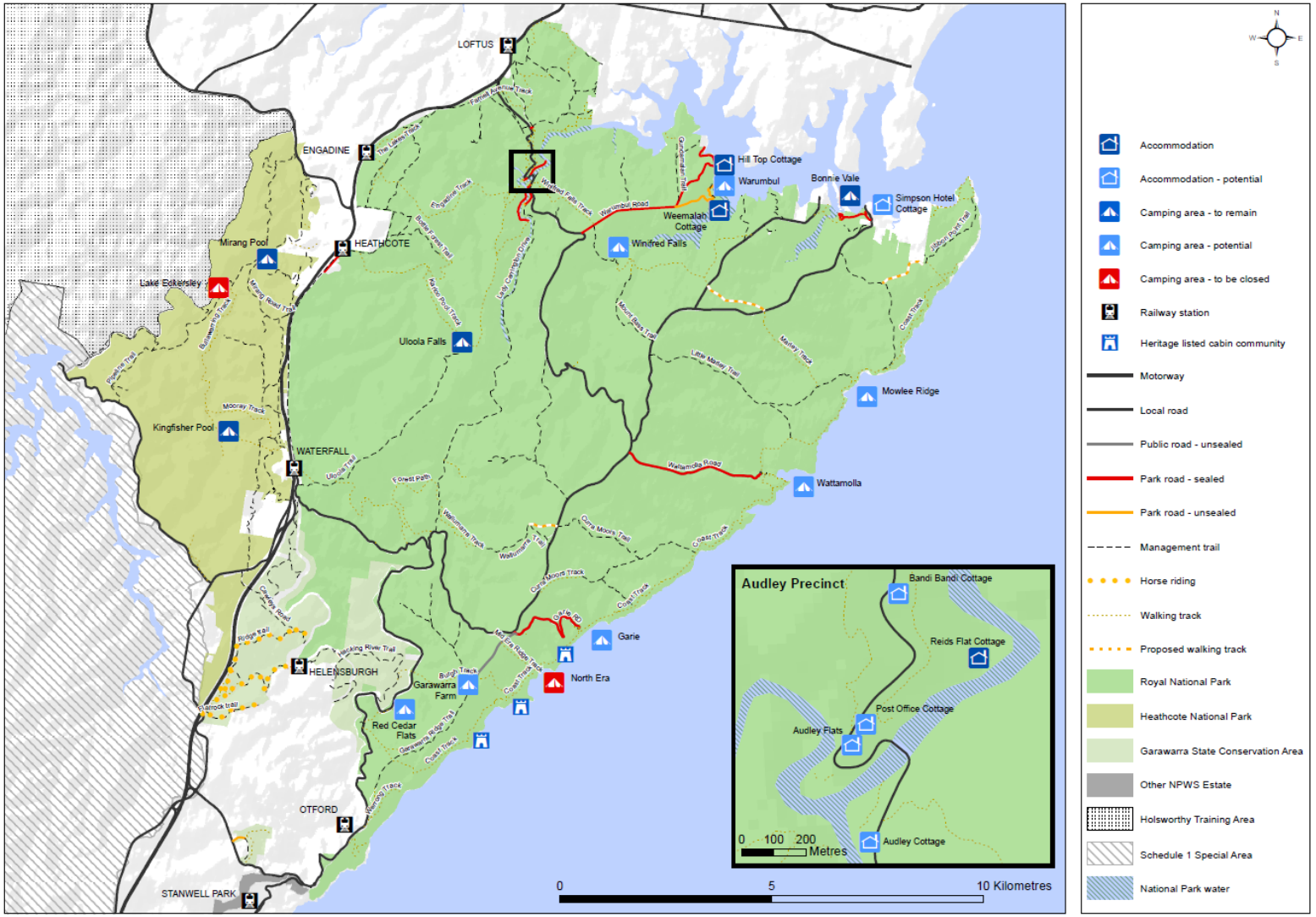

Figure 2 Royal National Park, Heathcote National Park, Garawarra State Conservation Area

Royal National Park, Heathcote National Park and Garawarra State Conservation Area

Royal National Park, Heathcote National Park and Garawarra State Conservation Area are located on the north-eastern edge of the Woronora Plateau in the southern part of the Sydney Basin Bioregion.

The parks cover approximately 18,912 hectares. Royal National Park is 15,087 hectares, Heathcote National Park is 2,826 hectares, and Garawarra State Conservation Area is 999 hectares. They form part of a large network of national parks, government-owned lands (e.g. Department of Defence, WaterNSW), and reserves between the Great Dividing Range to the west and Australia's eastern shoreline. The parks are vital in maintaining a network of conservation areas and providing wildlife corridors and habitat protection for numerous animal and plant species.

The northern sections of the parks are bordered by the residential areas of southern Sydney, with the southern extent of the parks bounded by northern Wollongong's suburbs. The parks are an oasis between the major urban centres of Sydney and Wollongong, providing an area for people to reconnect with nature and enjoy the outdoors, and protecting native species habitats.

What is the Sydney Basin Bioregion?

Australia is divided into bioregions. Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. Bioregions are characterised by climate, landform and biodiversity, and do not conform to administrative boundaries.

The Sydney Basin Bioregion covers about 4.53% of New South Wales and consists of a geological basin filled with near-horizontal sandstones and shales of Permian to Triassic age that overlie older basement rocks of the Lachlan Fold Belt. The dominant sandstone is often referred to as Hawkesbury sandstone and includes uplifted landscapes in the west (such as in Blue Mountains National Park) and coastal landscapes of cliffs, beaches and estuaries in the east (such as in Royal National Park). The bioregion protects numerous species of plants and animals and provides a range of ecosystem services such as clean water.

Combined with the region's geological diversity, the climate has resulted in a wide range of habitats and remarkably diverse vegetation communities. The parks have the highest animal species richness in the Sydney Basin Bioregion (Schulz & Magarey 2012) and are significant in sustaining ecosystem functioning and supporting local animal and plant species.

Water is a key feature within the parks, with freshwater rivers, groundwaters, estuaries and the ocean all dominant features. The Woronora River (part of the Georges River catchment) forms the western boundary of Heathcote National Park, while the Hacking River (including Kangaroo Creek) flows north through the central area of Royal National Park and Garawarra State Conservation Area. There are many smaller creeks and intermittent tributaries, waterfalls and pools scattered through the parks. There are several smaller drainage systems flowing in an easterly direction which discharge directly into the Pacific Ocean, as

well as groundwater-fed freshwater springs and upland swamps that support groundwater-dependent ecosystems.

The parks are located within the administrative areas of the La Perouse, Illawarra, Tharawal and Gandangara local Aboriginal land councils; and Sutherland Shire Council and Wollongong City Council. Land adjacent to the north-west side of Royal National Park is zoned as a mix of environmental living, low, medium and high density residential and local commercial centres (Engadine and Sutherland) (Sutherland Shire Council 2015). Land adjacent to the southern edge of the parks is predominantly zoned for low density residential developments, with areas of environmental protection and environmental living zones in the region of Otford and surrounds (Wollongong City Council 2009).

It is estimated that there are more than 6 million visits to the Royal National Park each year (Roy Morgan 2019). Due to the park's proximity to Sydney, visitors are drawn from a wide catchment and include large numbers of interstate and international visitors. Significant population growth in Sydney and Wollongong is predicted over the next 20 years, with the combined growth of suburbs in the Sutherland Shire and Wollongong expected to increase by more than 500,000 by 2034 (DPIE 2019a; idcommunity 2018). This population growth is expected to result in a significant increase in the number of visitors to Royal National Park.

Park management considers broader Commonwealth, state and local government strategic environmental and land-use planning initiatives, including the *Greater Sydney Region Plan: A Metropolis of Three Cities* (GSC 2018) and the *Greater Sydney Local Land Services Local Strategic Plan for 2016–2021* (GSLLS 2016). These plans identify the importance of the national park system in the Sydney Basin in protecting biodiversity and waterways and providing recreational opportunities.

Photo 1 Wattamolla, Royal National Park. David Finnegan/DPE

1. Protecting the natural environment

1.1 Geology and landform

The parks are dominated by Hawkesbury sandstone, and also include pockets of Narrabeen sandstones and shales, Permian sediments, Quaternary sands and Wianamatta shale (Young & Young 2006). The parks are characterised by steep valleys and ridges, rocky outcrops, rivers and streams that are broken by a series of waterfalls and pools and often terminate in spectacular cliff lines. Upland swamps are a common feature towards the coast and in Heathcote National Park (Fairley 1995; Keith et al. 2006; OEH 2012a). The result is a particularly diverse and resilient ecology, with the parks representing one of the most important regions for conservation and biodiversity within the Sydney Basin Bioregion.

The spectacular cliffs along the northern section of the coast attract many visitors to Royal National Park and are a key feature on the very popular Coast Track walking route. These coastal cliffs display exposed 'layer cake' geology and well-developed rock platforms rising to over 200 metres in elevation. The northern section of the coastline is dominated by cliffs cut into sandstone. Further to the south the cliffs are formed from the softer Narrabeen groups, containing layered shales that slump when eroded instead of forming cliffs. In the southern coastal region, the Narrabeen layers have produced rich, shale-derived soils in sheltered, coastal valleys, with beaches forming at creek mouths. These support pockets of closed moist forest and littoral and subtropical rainforests (DECCW 2011a).

Photo 2 Coastal cliffs, Royal National Park. David Finnegan/DPE

The parks have many unusual geomorphological features for Hawkesbury sandstone plateau environments (Young & Young 2006; Schultz & Magarey 2012). These include relic clifftop dunes between Jibbon and Marley Beach, which are among the best preserved examples in the state due to their protection in the national park system. These dunes were

formed during the sea level rise that occurred 6000 to 10,000 years ago. The beach ridges, formed through relatively unique low wave energy conditions, provide an insight into how the NSW shoreline has changed over time. Other significant geological features within the parks include freshwater lagoons at Jibbon and Marley, low beach ridges on the eastern side of Cabbage Tree Basin, upland swamps, limestone formations in the Palona sandstone cave and laterite patches on higher ridges. These features combine to support the diverse ecology of the region.

Numerous sources of freshwater are found in the parks, forming important elements of the landscape. The Hacking River, Kangaroo Creek and South West Arm Creek have cut deep valleys through Royal National Park as they flow north into Port Hacking. Heathcote National Park protects the catchment of Heathcote Creek and part of the catchment of the Woronora River, which drains into the Georges River. Smaller drainage systems in Royal National Park flow towards the coast and discharge directly into the Pacific Ocean, south of Port Hacking. These rivers and creeks contain diverse communities, including plants, macroinvertebrates, fish and microbial communities, which aid water purification. These freshwater rivers and creeks may also provide habitat for the platypus and native water rat (see 1.3).

Upland swamps are found in poorly drained headwater valleys on the sandstone plateau, and include Uloola Swamp and others along the Wallumarra Track. These swamps are dependent on groundwater discharge.

Royal National Park includes land below the high-water mark in Cabbage Tree Basin, South West Arm Creek and the Hacking River, making National Parks and Wildlife Service (NPWS) responsible for the riverbed at these locations. These sheltered waterbodies support nursery grounds for juvenile fish and invertebrates and seagrass beds, and Cabbage Tree Basin also supports saltmarshes and mangrove habitat. The basin is of geomorphic interest as it is one of the few sites where long-term (>6000 years) shoreline changes in a low wave environment can be investigated. There is also evidence of a long history of Aboriginal occupation, with artefacts and sites known throughout the catchment and around the perimeter of the waterbody. Cabbage Tree Basin was also the site of Australia's first marine fish hatchery, which operated in the early 1900s (West & West 2000).

1.1.1 Management considerations and opportunities

The parks' geodiversity is impacted by natural processes, proximity to urban areas and visitor use.

Geological surveys reveal instability along several areas of the cliff coastline. These areas are undergoing natural erosion processes, and areas may become unsuitable for visitor use. NPWS will continue to manage visitor safety while allowing natural processes to occur and protecting geological values from human use and development.

The instability of sandy soils means that erosion is a problem in areas of heavy visitor use along popular walking tracks in the parks, particularly the Coast Track and associated tracks, and in coastal camping areas. The Coast Track is vulnerable to wind and water erosion and requires specialised construction techniques to protect and repair the walking route. Major upgrades have recently been undertaken on the track, including realignment of sections and the installation of boardwalks and other track surfaces to minimise further erosion and environmental damage. Upgrades and maintenance works along the Coast Track will continue to be a priority. Changes in visitation use and patterns over time will require adaptive management to minimise the potential for accelerated erosion. To protect fragile soils, particularly in the coastal zone the development of any tracks and trails will required careful planning.

Water quality in the parks has continued to decline with increased levels of turbidity, excessive algal growth and high levels of bacteria of faecal origin known to be affecting the freshwater creeks and rivers. Declining water quality is mostly due to the parks' proximity to

urban areas, including Helensburgh, Otford, Waterfall, Heathcote and Engadine. Stormwater draining into the parks is a particular problem for water quality and the spread of weeds and rubbish. NPWS will supports water quality and aquatic ecosystem health of waterways in the parks (e.g. through research partnerships) according to NSW water quality guidelines.

Increased turbidity due to soil erosion in the riparian zone is an issue. The high erodibility of soils combined with high rainfall in the upper Hacking River catchment result in a significant erosion hazard, enhancing siltation and declining water quality. To reduce the risk of erosion in both the Hacking and Woronora catchments, the riparian zone of creeks and rivers will be a priority for the bush regeneration program.

Marine and estuarine environments in the parks will be managed in accordance with the objectives of the *Coastal Management Act 2016* and the *Marine Estate Management Act 2014* and any relevant coastal management plan. Areas of Royal National Park may be affected by coastal and estuarine management activities conducted outside of the park boundaries. Accordingly, the NPWS participates in the development of local coastal management plans.

Some coastal lagoons in the parks, such as Marley and Wattamolla, alternate between being open or closed to the ocean. Generally, natural processes will be allowed to operate to the greatest extent possible, and any management of intermittently closed and open lakes and lagoons (ICOLLs) in the parks will be in accordance with relevant Department of Primary Industries and NPWS policies, and any estuary management plan that applies.

Photo 3 Boardwalk installation on the Coast Track, Royal National Park. Clare Manson Photography

Water-based recreational activities have the potential to impact shoreline habitats and the marine beds of South West Arm Creek and Cabbage Tree Basin. The provision of boat moorings can limit the use of boat anchors and reduce impacts on the seabed. The provision and management of moorings in the national park will consider environmental impacts and visitor safety. The establishment of moorings is administered by the relevant waterway management agency and is subject to environmental impact assessment and relevant approval processes, including consideration of use and demand in the context of the broader Port Hacking area. NPWS works with the relevant waterway management agencies to regulate activities (including use of personal watercraft) and manage the waterways within the national park to reduce erosion and impacts on environmental values.

Upland swamps are generally protected by their relative inaccessibility, but the impact of visitors needs to be monitored and management adapted if required.

Six hectares of Heathcote National Park is within the 'Woronora Special Area'. These special areas are declared under Schedule 1 of the *Water NSW Act 2014* to protect drinking water supplies. WaterNSW and NPWS jointly manage the special areas guided by the *Special Areas Strategic Plan of Management 2015,* which outlines the agency's respective responsibilities (WaterNSW & OEH 2015). The strategic plan sets out principles and objectives for management of the special areas that consider the complementary purposes of protecting water quality and conserving natural and cultural heritage values.

The special area is subject to additional legislation and policy, including the Water NSW Act 2014, Water NSW Regulation 2020 and *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*. WaterNSW has primary regulatory responsibility for managing access to the special areas. Public entry is generally not permitted to Schedule 1 lands and certain activities are prohibited to protect the quality and quantity of the water supply.

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* requires that a public authority must, before it carries out or consents to any activity in the special area, consider whether the activity would have a neutral or beneficial effect on water quality.

1.2 Native plants

With more than 1,000 plant species and 52 different plant communities recorded, the parks display one of the most diverse and rich concentrations of plant species in temperate Australia. This species richness and significance is recognised by the inclusion of Royal National Park and Garawarra State Conservation Area on the National Heritage List (see section 2.2).

The parks are a significant part of a network of protected land extending from the Nattai and Blue Mountains national parks in the west, to the coast and south to the wet forests of the Illawarra. There are large areas of relatively undisturbed vegetation in the parks, which contribute significantly to this connectivity. These connected plant communities allow the movement of native animals and plants across the landscape.

The major vegetation formations and communities are listed in Appendix B. The most common vegetation formation is the dry sclerophyll forest covering more than 56% of the parks, including most of Heathcote National Park and sandstone ridgetops and sheltered aspects and gullies throughout Royal National Park. The dry sclerophyll forest in the parks includes threatened ecological communities (see Appendix B).

More than 30% of the vegetation is heathland which occupies the exposed sandstone plateau, particularly in the eastern section of Royal National Park. This is the largest area of heathland in the Sydney region (DECCW 2011a). The heathlands consist of 10 distinct plant communities. The distribution of these communities reflects the complex interactions between soil type, moisture availability and fire regimes. The dominant community is Coastal

Sandstone Heath-Mallee, which occupies more than 5,000 hectares. Smaller areas of wet heath are found on patches of poorly drained parts of the plateau, and exposed sections of the coast support a low coastal scrub.

Rainforest is found on rich soils in sheltered gullies in Garawarra State Conservation Area and the southern end of Royal National Park. Littoral rainforest is found on protected headlands and escarpment slopes south from Garie in Royal National Park. The subtropical, warm temperate and littoral rainforests in Royal National Park are now the northernmost examples of the once extensive rainforests in the Illawarra region (DECC 2008).

Freshwater wetlands in the parks include lagoons, reedlands and swamp communities. Coastal freshwater lagoons are found at Jibbon and Marley. These lagoons have fluctuating levels of standing water which results in varied native vegetation, including sedges, rushes and aquatic herbs. Woody shrubs and small trees are found on the margins of the wetlands.

Photo 4 Coastal heath, Royal National Park. Natasha Webb/DPE

Two upland (or hanging) swamp communities are found on the sandstone plateau in Royal and Heathcote national parks. The swamps occur on damp and regularly waterlogged peat soils and support very diverse vegetation, providing habitat to a wide variety of birds, mammals, reptiles and invertebrates. Swamps are valuable for understanding the impacts of fire on vegetation as they contain palaeontological records which have been preserved for over 10,000 years.

Small areas of forested wetlands are found in the lower reaches of the Hacking River on low-lying alluvial deposits and on coastal estuarine flats and margins of lagoons. Saline wetlands are found in South West Arm Creek and Cabbage Tree Basin in Royal National Park. These estuarine communities include algal beds, seagrass meadows, mangroves and saltmarshes. Cabbage Tree Basin is one of the most significant estuarine habitats in Port Hacking,

containing about 94% of the saltmarsh, 37% of the mangrove and 1% of the seagrass remaining in Port Hacking (West & West 2000). The saltmarsh in the basin consists of low succulent herbs and rushes on tidally inundated land, providing storm protection, sediment control, water purification and nurseries for fish.

Three seagrass species occur in estuaries in or near Royal National Park. Seagrass beds are extremely fragile habitats and can easily be destroyed. Ribbonweed and paddleweed, which re-establish relatively quickly after disturbance, are found near the Bonnie Vale boat ramp. Strapweed, found near Bonnie Vale and in Cabbage Tree Basin, is less susceptible to disturbance, but is extremely slow to recover. Strapweed populations have suffered significant declines in 6 NSW locations, including Port Hacking, and have been listed as endangered populations under the threatened species schedules of the *Fisheries Management Act 1994*.

Maritime grasslands occur on clay soils on exposed headlands, cliff faces and podsolised sand dunes along the southern coastal zone in Royal National Park.

What is an ecological community?

An ecological community is a naturally occurring collection of native plants, animals and other organisms occupying a particular area. Ecological communities are threatened when they become at risk of extinction. Currently, more than 100 threatened ecological communities are recognised in New South Wales by their listing under the *Biodiversity Conservation Act 2016*.

Twelve threatened ecological communities have been recorded in the parks and a further 3 communities have been mapped but their status requires confirmation (Table 1). Some of these communities are also listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Photo 5 Cabbage tree palms, at Palm Jungle in Royal National Park. Nick Cubbin/DPE

Table 1 Threatened ecological communities in the parks

Threatened ecological community (vegetation formation)	Occurrence	BC Act status	EPBC Act status
Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion (Dry sclerophyll forest)	On transitional clay and sandy soils in Garawarra SCA and southern Royal NP	EEC	–
Bangalay Sand Forest, Sydney Basin and South East Corner Bioregions (Dry sclerophyll forest)	On flat, low-lying coastal marine sand deposits near Bundeena in Royal NP	EEC	–
Turpentine-Ironbark Forest in the Sydney Basin Bioregion (Wet sclerophyll forest)	On shale and shale-enriched sandstone soils, in small areas at East Heathcote in Royal NP	CEEC	CE
Kurnell Dune Forest in the Sutherland Shire and the City of Rockdale (Wet sclerophyll forest)	A small area south of Jibbon near Bundeena in Royal NP	EEC	–
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions (Rainforests)	South of Garie in Royal NP	EEC	CE
Illawarra Subtropical Rainforest in the Sydney Basin Bioregions (Rainforests)	In the most protected locations in Royal NP	EEC	CE
Sydney Freshwater Wetlands in the Sydney Basin Bioregion (Freshwater wetlands)	Jibbon and Marley in Royal NP	EEC	–
Coastal Upland Swamp in the Sydney Basin Bioregion (Freshwater wetlands)	Royal NP, Heathcote NP	EEC	E
Swamp Oak Floodplain Forest of the Sydney Basin Bioregion (Forested wetlands)	Coastal areas of Royal NP	EEC	E
Swamp Sclerophyll Forest on Coastal Floodplains of the Sydney Basin Bioregion (Forested wetlands)	Bundeena in Royal NP	EEC	–
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (Saline wetlands)	Cabbage Tree Basin, Royal NP	EEC	V
Themeda Grassland on Seacliffs and Coastal Headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions (Grasslands)	Coastal areas of Royal NP	EEC	–
Duffys Forest Ecological Community in the Sydney Basin Bioregion (Dry sclerophyll forest) **	Northern part of Royal NP	EEC	–
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (Heathland)**	On sand dunes at Jibbon in Royal NP	CEEC	E
River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Forested wetlands) **	Along lower reaches of the Hacking River in Royal NP	EEC	–

SCA = State Conservation Area; NP = National Park; BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act; EEC = endangered ecological community; CEEC = critically endangered ecological community; CE = critically endangered; E = endangered; V = vulnerable.

** Status in the parks is unconfirmed.

Table 2 Threatened plants in the parks

Common name	Park	BC Act status	EPBC Act status
Acacia baueri subsp. *aspera*	Royal NP	V	–
Bauer's midge orchid	Heathcote NP, Royal NP	E	E
Buttercup doubletail	Royal NP	E	V
Camfield's stringybark	Heathcote NP, Royal NP	V	V
Coast groundsel	Royal NP	E	–
Deane's paperbark	Heathcote NP, Royal NP	V	V
Hairy geebung	Royal NP	E	E
Leafless tongue orchid	Royal NP	V	V
Magenta lilly pilly	Royal NP	E	V
Nettled bottle brush	Royal NP, Heathcote NP	V	–
Prickly bush-pea	Heathcote NP	V	V
Round-leafed wilsonia	Royal NP	E	–
Scrub turpentine	Garawarra SCA	CE	–
Thick-leaf star-hair	Royal NP	V	V
Villous mint-bush	Royal NP, Garawarra SCA	V	V
Woronora beard-heath	Heathcote NP	V	V

Source: DPIE (2020a) and Fairley (2010).

NP = National Park; SCA = State Conservation Area; BC Act = Biodiversity Conservation Act; EPBC Act = Environment Protection and Biodiversity Conservation Act; V = vulnerable; E = endangered; CE = critically endangered.

Sixteen threatened plant species have been recorded in the parks (Table 2). Two of these species, prickly bush-pea and Woronora beard-heath, have a very localised distribution and have only been recorded in Heathcote National Park. Threatened fungi species have also been recorded in the parks. Several other plant species recorded in the parks are considered to be rare or threatened Australian plants (ROTAPs) and their status may be at risk (Briggs & Leigh 1996).

There is a record of *Chorizema parviflorum* in the parks, but the endangered population, *Chorizema parviflorum* in the Wollongong and Shellharbour Local Government Areas, is located outside the parks (DPIE 2020e).

The threatened Bynoe's wattle has been recorded in the vicinity of Royal National Park and may potentially occur. However, surveys have failed to locate the species in the parks (NSW SC 2002). There are historical records of thick-lip spider-orchid near Loftus oval but this species may now be extinct (Fairley 2010).

1.2.1 Management considerations and opportunities

Strategies for the conservation of threatened species, populations and ecological communities have been set out in a statewide *Biodiversity Conservation Program* (DPIE 2020c). 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 (DPIE 2020d).Relevant actions will be implemented in the parks.

The following key *Saving our Species* program management sites and actions have been identified in the parks:

- Villous mint-bush: Royal National Park. Monitoring and survey actions are required at this site. Annual mint-bush surveys have been undertaken since 2015.
- Coast groundsell: Royal National Park. Management, monitoring and survey actions are required at this site.
- Camfield's stringybark: Royal National Park. Management and monitoring actions are required at this site.
- Woronora beard-heath: Heathcote National Park. Management and monitoring actions are required at this site.

Restoration of habitats and degraded areas in the parks is prioritised through *Saving our Species* programs, weed and feral animal management strategies and other relevant park management programs. Volunteer bush regeneration programs (see Box 1) are aligned to these priorities.

Box 1: Volunteers in the parks

Engaging park user groups and communities in volunteer programs aligned with their interests, such as mountain biking and bushwalking, or linking park neighbours with local programs helps to build support and understanding of park management.

A range of volunteers continue to make significant contributions to the conservation of park values and the management of visitor use.

Before the early 1990s volunteer activities in Royal National Park were informal (except for some Cabins Coastcare projects). After the January 1994 bush fires, bush regeneration projects were developed with volunteers and have grown since this time. Currently, a rich mix of community projects exist, coordinated under the umbrella of the Friends of Royal National Park. This group was incorporated in 2009, and volunteers now contribute either via NPWS-supervised activities or as authorised and supported skilled groups, such as the Coastal Cabins Landcare group, Royal Bushies and individuals not formally affiliated with any particular group. Other volunteers making a significant contribution to management and use of the parks include volunteers associated with the Burning Palms, Era and Garie surf clubs and the Coastal Cabins Fireguard.

All volunteers in the park are covered under volunteer agreements and registrations. All activities undertaken by volunteers must be consistent with the plan of management and the annual Royal Area Operations Plan. Bush regeneration activities will be aligned with the priorities identified in weed and feral animal management strategies and other relevant park management programs. NPWS will continue to support and nurture the Friends of Royal National Park and affiliated volunteer groups to achieve a proactive and self-reliant approach to volunteer activities.

Heathlands and freshwater wetlands will be a priority for protection and restoration. Installation of minimal impact pathways, such as elevated boardwalks, and realignment of existing walking tracks in these communities will minimise erosion and protect habitats. Priority fauna habitats for conservation in the parks are described under 1.3.

Many recovery plans for NSW threatened species have been previously 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 Commonwealth prepares recovery plans for nationally listed threatened species under the Environment Protection and

Biodiversity Conservation Act. These apply to any nationally listed threatened species occurring in the parks, including Deane's paperbark and magenta lilly pilly.

Many plant species and ecological communities in the parks are threatened by weed invasion, grazing by feral animals, trampling by humans and feral animals, rubbish dumping, altered hydrological regimes, inappropriate fire regimes (see Box 2) and recreational pressures such as the illegal creation of new tracks and trails (DEC 2004). Some of these threats are increased on the urban interfaces of the parks (see Box 3). Small areas of remnant plant communities are more susceptible to these impacts due to increased edge effects.

Box 2: Fire in the parks

Fire has been an important influence on the parks for many thousands of years. Aboriginal people used fire as a tool for hunting and for managing food resources.

Fire history records since 1965 show that fires have occurred almost every year in Royal National Park, with 4 major fire events that have burnt more than 50% of the park (1968, 1988, 1993, 2001). A single wildfire burned more than 50% of Royal National Park and all of Heathcote National Park in the summer of 2001–02.

Fire is an important element in maintaining the diversity of native plants and animals. In fire-adapted communities some plants respond to fire by flowering or releasing seed, while for others heat activates seeds and smoke triggers germination. However, the time between fires is a key factor in ensuring we retain the range of plants and animals that currently exist in fire-adapted communities; both too frequent and too infrequent fire can cause species to decline (Watson & Tran 1999). High frequency fire has been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000a). In the parks, communities with limited ability to recover after fire include rainforest, riparian scrub and saline wetland communities, and the impact of fire in these communities needs to be minimised.

Major impacts of fire on native animals in the parks include loss of hollow-bearing and standing dead trees. Initial research on the impact of extensive (and high intensity) fires on animal species suggests that arboreal mammals, shrub-frequenting birds and litter-dwelling skinks are the most susceptible groups (DEC 2004; K Madden [DECCW], 2011 pers. comm.). The provision of unburned refuge areas is a significant factor in mitigating the impacts of fire on animal species.

NPWS fire management's primary objectives 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. A fire management strategy that defines the parks' fire management approach has been prepared (NPWS 2016). The strategy includes biodiversity thresholds for key vegetation formations to show appropriate periods of time between burns and maximum fire exclusion to maintain biodiversity. Fire management strategies are implemented cooperatively and in coordination with other fire authorities, neighbours and the community (OEH 2013). NPWS is a member of the Illawarra and Sutherland Shire Bush Fire Management Committees.

Research that informs and refines fire management strategies to protect natural values will be supported, including long-standing studies that examine changes in composition and abundance over significant time frames.

Other specific threats to communities and species in the parks include:

- Remnant stands of Coastal Sand Bangalay Forest and Coastal Sand Littoral Forest near Bundeena are threatened by the weeds bitou bush and lantana.
- Coastal grassland communities are threatened by weed shrubs, including introduced species such as bitou bush and lantana and native species such as coastal wattle, coast banksia and coastal rosemary.
- Myrtle rust is a particular threat to the critically endangered scrub turpentine (Wollongong Shire Council 2011).
- Threats to freshwater wetlands include fire, disruption to hydrogeological regimes (including groundwater), illegal trail bike riding, weed invasion and trampling from recreational use and feral animals, and climate change (leading to a change in vegetation structure). The impact of visitors on freshwater wetlands, including upland swamps, needs to be monitored.
- The saltmarsh communities in Cabbage Tree Basin are in poor condition and are threatened by grazing, trampling and digging by introduced deer, heavy recreational pressure, fire, rubbish dumping, weed invasion, sedimentation and the incursion of mangroves that have expanded upstream into Cabbage Tree Creek (West & West 2000; Keith & Pellow 2005). Sea level rise associated with climate change presents the greatest threat to the long-term persistence of intertidal habitat, sandflats and estuarine vegetation because even small rises of sea level will permanently inundate these intertidal zones.
- Seagrass beds in the Port Hacking catchment have declined by 30–50% in the last 50 years (Sutherland Shire Council 2007). The decline has been seen in Cabbage Tree Basin, which was previously dominated by shallow seagrass beds, including strapweed, and is now dominated by sandy shoals and a narrow creek. Threats to seagrass include scouring by vessels and sand movement (exacerbated by dredging and channel modifications), which smothers seagrass and encourages mangrove expansion.

Box 3: Urban interfaces

Urban areas adjoin the parks at Grays Point, Kirrawee, Engadine, Waterfall, Heathcote, Helensburgh, Otford, Bundeena and Maianbar. A variety of park management issues occur at these interfaces, including increased feral animals and weeds, fires, pollutants, encroachments and rubbish dumping.

Water run-off from urban areas can contain litter, household chemicals and sediment that may alter water quality and flow patterns. These changes can promote weed growth and negatively impact the health of waterways. Increased weed density impacts the health of native plant communities leaving them less resilient to other impacts such as feral animal grazing.

Illegal tracks and camps often occur at the urban interfaces. Creation of mountain bike ramps, tracks and jumps has damaged habitat in the parks, particularly near Helensburgh and Heathcote.

Asset protection zones (APZs), designed to reduce bushfire fuels and protect surrounding assets and human life, often occur along the boundary with urban areas. Private property encroachments (including the building of structures and other private uses) in the APZs can restrict emergency access, reduce the effectiveness of these zones and threaten park values.

Effective management of these urban interfaces can lead to positive outcomes for the community and the parks.

Photo 6 Regrowth after bushfire, Royal National Park. Michael Van Ewijk/DPE

1.3 Native animals

The parks are an area of outstanding animal diversity, with 347 species known to occur or visit (DECCW 2011a; DPIE 2020a). This species richness is due to the large diversity of habitats, including beaches, rocky shores, mangroves, heathlands, mudflats, wetlands, rainforests and riparian habitats. This diversity is unique in the Sydney Basin Bioregion and supports many threatened and significant animals. At least 44 species listed as threatened under the Biodiversity Conservation Act and/or the Environment Protection and Biodiversity Conservation Act have been recorded in the parks (Appendix D).

Twenty-one frog species have been recorded in the parks, including 2 threatened species: the red-crowned toadlet and the giant burrowing frog. Two other threatened species, the stuttering frog and the green and golden bell frog, no longer occur in the parks (DECCW 2011a). The area supports high densities of the regionally significant Freycinet's frog, which has declined significantly in the northern parts of its range (R Goldingay [Southern Cross University] and H Hines [Queensland Department of Environment and Resource Management], pers. comm.).

The parks support more than 40 species of reptile, including geckoes, legless lizards, dragons, goannas, skinks and snakes. Two threatened species, the Rosenberg's goanna and the broad-headed snake, occur in high densities compared to other areas in the Sydney Basin Bioregion (DECC 2008) and the parks contribute significantly to the regional conservation of these species (DECC 2007; DECCW 2011a). Royal National Park is recognised as an important refuge for invertebrates, and the endangered giant dragonfly has been recorded in swamps and swamp margins in the parks.

At least 134 bird species have been recorded. The parks support several birds listed under the Japan–Australia Migratory Bird Agreement (JAMBA), China–Australia Migratory Bird Agreement (CAMBA) and Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA) (DECCW 2011a). The masked owl, eastern grass owl and endangered swift parrot are a high conservation priority in the area (DECCW 2011a).

A range of native mammals have been recorded, with the most widespread being the common ringtail possum and the sugar glider, while the mountain brushtail possum and feathertail glider have a more restricted distribution. Threatened native mammal species in the parks include the koala, eastern pygmy-possum, grey-headed flying-fox and 5 microbat species (Appendix D). The parks support one of the most important eastern pygmy-possum populations (see Box 4) in New South Wales (Bowen & Goldingay 2000).

Box 4: Eastern pygmy-possum – an iconic threatened species

The parks are very important for the eastern pygmy-possum, a threatened species listed under the Biodiversity Conservation Act. This species is commonly found in woodland and heath in the parks where large areas of high-quality habitat exist, and it is more frequently encountered in these parks than anywhere else in the Sydney region (Tulloch 2003; DECC 2008). The possums are an important pollinator of heathland plants because they feed on nectar and pollen collected from banksias, eucalypts and bottlebrushes. They shelter in tree hollows, holes in the ground, abandoned bird nests, ringtail possum dreys (nests) and vegetation thickets (e.g. grass tree skirts).

Threats to this species include habitat loss or degradation caused by fragmentation, high frequency fires, alteration in wetland and heathland hydrological characteristics, grazing and trampling of vegetation by rusa deer and removal of hollow-bearing and dead trees and fallen timber. The species is also threatened by road mortality and predation by foxes, cats and black rats.

Conservation strategies in the parks include controlling feral predators (foxes and cats) and deer, avoiding burning of habitats, retaining fallen logs and hollow-bearing trees, and improving habitat connectivity between Heathcote and Royal national parks.

Eastern pygmy-possum. Ken Stepnell/DPE

Native ground mammals include the short-beaked echidna and swamp wallaby, which are found in nearly all vegetation communities. The long-nosed bandicoot has a widespread but patchy distribution, while the common wombat and euro are probably restricted to limited areas in Heathcote National Park (DECCW 2011a). The threatened eastern quoll and parma wallaby were once known from the area but are now considered locally extinct (DECCW 2011a). The threatened spotted-tailed quoll was also considered locally extinct (DECCW 2011a), but this species has been recorded in Heathcote National Park and Garawarra State Conservation Area within the last 20 years.

Freshwater aquatic species known from the parks include the platypus and the native water rat. Platypus have been recorded in the parks, although not since 2000. Any previous population of platypus may have been lost (DECCW 2011a) however, the parks contain freshwater areas that may provide suitable habitat.

The dusky antechinus is the rarest, and one of the most fire sensitive, of the small mammals in the parks. After first being reported in 1974, it was re-discovered in 2014 (Bionet Atlas 2021). Investigation is required to determine the distribution and abundance of this species in the parks.

Non-vegetative habitats in the parks such as caves, rock crevices, cliffs and rock overhangs provide important habitat for plants and animals. Human created artificial structures, including road culverts, bridges, underground aqueducts, railway and mine tunnels, also provide important habitat. Microbats, including the eastern horseshoe bat, large-footed myotis, large bent-winged bat and little bent-winged bat, depend on these features. A maternity roost site for the eastern horseshoe bat in the parks has particular conservation significance, as does the abandoned Stanwell Park-Otford railway tunnel just south of the parks.

1.3.1 Management considerations and opportunities

Royal National Parks is a key *Saving our Species* program management site for the broad-headed snake. Species monitoring has been undertaken under the program since 2017, building on long-term research and monitoring undertaken since 1998 (Newell & Goldingay 2005). Management actions have been implemented in the park, including site protection, signage and surveillance. Long-term trends indicate that the species population is stable despite impacts from wildfires in 2017–18 and some habitat disturbance.

The parks also contribute significantly to the conservation of the Rosenberg's goanna. Research to better understand the ecology of this species, including diet, habitat preferences, fire ecology and impacts of threats, would inform conservation strategies in these parks and across the region (DECCW 2011a).

Commonwealth recovery plans for nationally listed threatened species under the Environment Protection and Biodiversity Conservation Act apply to any nationally listed threatened species occurring in the park, including the swift parrot.

The highest priority threats to native animals in the parks are high frequency fire, fox predation and rusa deer herbivory and environmental damage (see section 1.4) (DECCW 2011a). There are many other threats to animals, with 37 of the 39 key threatening processes in New South Wales known to affect animals in the parks (see Appendix E). Other high priority threats to animals include road fatalities, loss of connectivity, hydrological changes, public disturbance of animals and their habitats, the removal of dead trees and fallen timber, and loss of hollow-bearing trees. A range of management recommendations have been identified to reduce the impact of threats to priority animal species, including recommendations for monitoring, further survey and research (DECCW 2011a). Effective management of these threats will have the greatest impact on protection of native animal species in the parks.

Box 5: Ecological health monitoring

The Royal parks are the among the first to see the implementation of a new ecological health monitoring system (Ecological Health Performance Scorecards).

A program of monitoring key ecological indicators will be implemented in the parks and the resulting data will be used to refine management actions. The monitoring program will provide an ongoing snapshot of what is happening with native plants and animals, important ecological processes, and threats to ecological health such as feral animals and weeds.

Specific threats to amphibians in the parks include the chytrid fungus (listed as a key threatening process under the Biodiversity Conservation Act) and hydrological changes to frog habitat. Chytrid fungus is likely to be a primary factor in the suspected loss of the green and golden bell frog and stuttering frog from the parks (DECCW 2011a) and may be a threat to other frog species in the parks.

Hydrological changes to wetlands, heaths and seepages are likely to impact several animal species in the parks, including frogs, waterbirds and invertebrates. These changes may result from local disturbances (such as road or trail construction and maintenance) or from sources outside the parks (e.g. drainage from development areas).

Active coalmining occurs in areas nearby to the parks and a coalmining lease exists over parts of the Garawarra State Conservation Area. Subsidence due to longwall mining has been recognised as causing habitat alteration, such as cracks beneath streams or other water bodies (NSW SC 2005). This may lead to a temporary or permanent loss of water flows and can cause permanent changes to riparian and upland swamp community structure and plant and animal composition.

Recreational activities can impact habitat and animal species. Management of these activities must balance ecological needs with the needs of visitors. For example, night-time mountain biking may have a negative impact on nocturnal ground-dwelling animals such as the broad-headed snake. Bushrock habitat, utilised by the broad-headed snake and other animal species, is sensitive to disturbance from bushwalking and mountain biking. This is an important consideration in the siting and management of tracks and other infrastructure.

Threats to microbats, including the threatened little bent-winged bat and large bent-winged bat, include the disturbance of natural and artificial roosting sites. Disturbance of roosts by the public and the incorrect gating of structures that support roosting colonies may result in roosts being abandoned (Hoye & Spence 2004).

It is estimated that thousands of koalas perished across New South Wales during the extensive bushfires in the summer of 2019–20 (NSW Parliament 2020). Much of south-west Sydney was not directly impacted by these fires, so remaining koala habitat in these areas is increasingly important to the survival of this species. The parks support habitat for koalas, with current records of koalas in all 3 parks. It is necessary to increase understanding of the distribution of koalas in the parks and their role in supporting the conservation of this species in south-west Sydney. Management priorities for this species are the protection of habitat and wildlife corridors and minimising impacts of road crossings.

Maximising the continuity of vegetation on a regional basis allows the movement of animals across the landscape and is critical to protecting native animals and minimising local extinctions in the parks. The parks are one of the better-connected protected area complexes as they are near extensive areas of native vegetation. However, there are significant barriers to movement, including the Princes Motorway, Princes Highway and railway. The mosaic of cleared and vegetated land between Helensburgh and Stanwell Park also limits connectivity. Increased urbanisation in this area may lead to further isolation of

the parks from the Illawarra escarpment. The installation of a fishway at the Audley weir has been proposed to allow for the movement of fish across the weir.

The effects of these barriers are most critically felt during catastrophic events such as extensive and severe wildfire; and are particularly acute for species with low dispersal ability, including frogs, reptiles and non-flying mammals. These barriers are likely to be a major factor in the local extinction of several species. Koalas are known to cross the highway and motorway between Heathcote National Park and Royal National Park/Garawarra State Conservation Area and are particularly vulnerable to being hit by vehicles. Options for addressing these barriers to animal movement are limited, but a combination of fencing, underpasses and overpasses has been shown to be effective in reducing road kills of animals (NSW Parliament 2020). The design and implementation of effective systems would require significant resources and cooperation across many levels of government. Additions to the parks may improve connectivity with other high conservation lands (or green corridors).

Photo 7 Koala in Garawarra State Conservation Area. Jessica Herder/DPE

Survey is required to determine the distribution and abundance of animal species in the parks, particularly rare and threatened species and those species that have been considered lost from the parks. Following survey and further investigation of habitat, consideration may be given to the reintroduction of appropriate species.

Monitoring of ecosystem health is particularly important and a program of monitoring key ecological indicators will be implemented in the parks (see Box 5).

Conservation of habitats is vitally important to the management of animals in the parks. At least 25 species known to once occur or visit the parks are now locally extinct (DECCW 2011a) and 15 species that were frequent visitors are now extremely rare visitors or have ceased to visit altogether. The greater glider was known to be present in Royal National Park until just after the 1994 wildfire and it is now suspected to be lost from the area. Its decline is probably associated with lack of hollow availability due to past forest harvesting practices, frequent wildfire, limited prime habitat availability and isolation (DECCW 2011). This is a significant species loss for the park which reflects the importance of habitat conservation, particularly the protection of hollow-bearing trees. The species extinctions, losses and declines seen in the parks are primarily associated with habitat loss, in particular loss of freshwater wetlands, heathlands, rainforest, shoreline habitats and grassy woodlands (DECCW 2011a).

Habitat conservation is a priority in the parks, and specific considerations are:

- Heathlands and freshwater wetlands are the highest priority animal habitats and their conservation is considered particularly important in the protection of several species of birds and small mammals (DECC 2007; DECCW 2011a).
- Heathland supports some of the largest populations of heath-dependent species in the region, including chestnut-rumped heathwren, southern emu-wren, beautiful firetail and tawny-crowned honeyeater. Heathlands are key habitat for several species lost from the parks, including tawny grassbird, eastern ground parrot and eastern bristlebird (DECCW 2011a). More species may be lost in the future without active management of these habitats.
- Freshwater wetlands, although limited in extent in the parks, support a disproportionately high number of priority animal species. Coastal freshwater wetlands have a very restricted distribution in the Sydney Basin Bioregion, with Royal National Park contributing significantly to the conservation of this habitat. These ecosystems are subject to ongoing threats including fire, disruption to hydrological regimes, illegal trail bike riding, trampling from recreational use and feral animals, weed invasion and climate change (leading to a change in vegetation structure). These threats must be actively managed to protect these habitats.
- Saltwater wetlands and coastal shoreline habitats are poorly protected in the Sydney region and are subject to ongoing threats in the parks (DECC 2008). Several migratory bird species that once frequently visited these habitats (some for breeding) now only visit in low numbers, as extremely rare visitors or no longer visit at all. Accordingly, the shoreline habitat group is a priority animal habitat for conservation in the parks (DECCW 2011a).
- Northern warm temperate and subtropical rainforests support a range of animals in the parks that are largely restricted to these habitats. These rainforests are restricted in extent in the parks (and in the Sydney Basin Bioregion) but they contribute significantly to the species richness of the parks and are considered priority animal habitat for conservation in the parks (DECCW 2011a).
- Wet sclerophyll forests provide important supporting and linking habitat to the rainforest habitats. These forests require management to support their rainforest elements and protect the neighbouring patches of rainforest. The wet sclerophyll forests are a priority animal habitat for conservation, though of a lower priority than freshwater wetlands, heathlands, rainforest, and coastal shoreline (DECCW 2011a).
- Sandstone escarpments, rocky outcrops and bushrock habitats support the broad-headed snake and other animal species and are a priority for conservation.

Photo 8 Swamp wallaby in Royal National Park. Peter Taseski/DPE

1.4 Weed and feral animal species

Weeds, feral animals and pathogens can negatively impact the environment, economy and society. The impacts are most commonly caused by introduced species. These species can have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values, with several listed as key threatening processes.

More than 190 introduced plant species have been recorded in the parks. The most significant weed species are listed in Appendix F. Many of these weeds are a threat to habitat values, and threatened plants, animals and ecological communities. Weeds 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 upon them. In addition, weed infestations can reduce the aesthetic appeal of the natural environment for public recreation and appreciation and impact on public safety.

The most significant feral animal species in the parks are deer and red foxes, both of which are widespread and known to have a significant impact on native species, plant communities and ecosystem health. Other feral animals recorded in the parks include cats, rabbits, goats, pigs and introduced birds (see Appendix F).

Deer have a significant impact on the environment, with herbivory and environmental degradation caused by deer listed as a key threatening process under the Biodiversity Conservation Act. This listing resulted from research conducted in Royal National Park where herbivory and trampling by rusa deer were found to have a range of environmental impacts. Deer alter vegetation structure and species abundance, reduce the regeneration ability of native species, create soil instability, disperse weeds and displace native animals such as swamp wallabies. In Royal National Park, significant impacts from deer have been noted in sandstone heath, woodland, littoral rainforest, grasslands and wetlands. Deer also impact surrounding local neighbourhoods by browsing on garden plants and damaging fences. They pose a significant traffic hazard and can be dangerous if cornered.

Foxes are a significant feral animal species and are widespread in the parks, including in habitats such as steep 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. Scat analysis in the parks has shown that foxes commonly prey on the long-nosed bandicoot, swamp wallaby, swamp rat and threatened eastern pygmy-possum (DECCW 2011a).

Predation of native wildlife by cats is listed in New South Wales as a key threatening process under the NSW *Biodiversity Conservation Act 2016*. Cats have a significant impact on the environment through predation of birds, reptiles, amphibians and small mammals and are an ongoing issue exacerbated by the proximity of the parks to urban and peri-urban areas.

At least 2 native bird species are considered a pest species in some locations in the parks, including sulphur-crested cockatoos at Audley and increased populations of noisy miner (DECCW 2011a). These species may be responsible for displacement of other native species.

The plant diseases phytophthora and myrtle rust have been detected in the parks. These pathogens can cause widespread dieback of native plants. Phytophthora is a soil-borne root pathogen that causes dieback in susceptible plants. It spreads through soil and plant roots in warm, moist conditions and can be carried in overland and sub-surface water flow and by water moving infested soil or organic material. Native and introduced animals spread the fungus, particularly through digging behaviours, but humans have the greatest capacity to transport contaminated soils (DPIE 2020b). Infection by phytophthora has been listed as a

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

Myrtle rust is a plant disease caused by the fungus *Austropuccinia psidii* that affects plants in the Myrtaceae family. Myrtle rust infects young, actively growing plant tissue, with the impact on infected plants ranging from minor leaf spotting to loss of new growth, defoliation, dieback and death of plants. Myrtle rust impacts a range of ecosystems, including coastal heath; littoral, subtropical and tropical rainforest; and wet and dry sclerophyll forests. Spores of myrtle rust are spread by wind, animals and human activity. Myrtle rust was first identified in Royal National Park in the late 1990s. Threatened species known to be at risk in the parks include Camfield's stringybark, Deane's paperbark and the critically endangered scrub turpentine. The introduction and establishment of exotic rust fungi on plants of the family Myrtaceae is listed as a key threatening process under the Biodiversity Conservation Act. Myrtle rust is a national threat recognised under the Environment Protection and Biodiversity Conservation Act as part of the novel biota and its impact on biodiversity key threatening process.

1.4.1 Management considerations and opportunities

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and feral animals. These requirements apply equally to public land and privately owned land. 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 Greater Sydney Region and South East Region (GSLLS 2017, 2018; SELLS 2017, 2018). These plans identify priority weeds and feral animals in each of the regions, plus the appropriate management response for the region (i.e. prevention/alert, eradication, containment or asset protection).

The NPWS branch pest management strategy identifies weeds and feral animal species and priority programs for Royal National Park, Heathcote National Park and Garawarra State Conservation Area. The strategy's overriding objective 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- or species-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.

Critical priority programs for weed control in the parks target weeds impacting on threatened species, populations and communities. Target weed species include asparagus fern, lantana and bitou bush (see Box 5), mother-of-millions, crofton weed, privet and pampas grass. Programs addressing new occurrences or suppressed populations of highly invasive weed species with potential for significant impacts on park values are also a priority. These species include boneseed, coolatai grass, ludwigia, sea spurge, senegal tea and yellow water poppy.

An integrated approach to weed management is employed in the parks using a range of techniques at critical times of the year, and often targeting more than one species. Methods may include physical removal, herbicide use, fire, biological control and revegetation. Key weed control programs include bush regeneration undertaken by NPWS staff, volunteers and contractors.

Photo 9 NPWS ranger examining a tree with myrtle rust. Mike Jarman/DPE

Box 6: 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 weeds 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 Coastal Sand Bangalay Forest and Coastal Sand Littoral Forest near Bundeena. Management of bitou bush and lantana in the parks will be guided by the relevant key threatening process strategies.

A critical priority program for feral animals is deer control in Royal National Park. The management of deer populations is essential for conserving the ecological integrity of the parks. There is an ongoing control program in the park, aiming to contain the spread of deer, protect assets and minimise threats to public safety.

Management of phytophthora and myrtle rust in the parks will be in accordance with current best practice management guidelines and will aim to minimise the spread of the pathogens and prevent impacts on new species and ecological communities (O'Gara et al. 2005; DPIE 2020b).

Box 7: Climate change

Human-induced climate change is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b) and habitat loss caused by human-induced greenhouse gas emissions is listed under the Environment Protection and Biodiversity Conservation Act. The following is a snapshot of the predicted changes to climate for the Metropolitan Sydney and Illawarra Regions (OEH 2014):

- Maximum temperatures are projected to **increase** in the near future* by 0.3–1.0°C
- Maximum temperatures are projected to **increase** in the far future by 1.6–2.5°C
- Minimum temperatures are projected to **increase** in the near future by 0.4–0.8°C
- Minimum temperatures are projected to **increase** in the far future by 1.4–2.5°C
- The number of hot days (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** in spring
- Severe fire weather days are projected to **increase** in summer and spring

The projected increases in temperature, number of hot days and severe fire weather days are likely to influence bushfire frequency and intensity across the region and the fire season is likely to be extended. Higher rainfall in summer and autumn will lead to more frequent flooding of low-lying areas and increased erosion and sediment-shedding from the hinterland (DECCW 2010).

Climate change may significantly affect biodiversity by changing the size of populations and the distribution of species and altering the geographical extent, vegetation structure and species composition of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates.

The potential impact of climate change on the parks is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from introduced animals. Low-lying coastal ecosystems and fragmented ecosystems are at highest risk, and sea level rise and coastal erosion pose risks of damage to infrastructure in low-lying coastal areas, such as Bonnie Vale.

It is likely that additional bird species will be recorded, particularly species typical of inland areas of the state, as a response to more frequent and extended drought periods occurring in inland New South Wales.

With climate change likely to affect the distribution of plant populations and the availability of habitats, the resilience and connectivity of the parks will be increasingly important in maintaining biodiversity in the region.

NPWS will continue to manage threats to the parks' values from climate change in a collaborative way with other land managers and park neighbours. Programs to reduce the pressures arising from other threats, such as habitat fragmentation, invasive species, bushfires and pollution, will help reduce the severity of the effects of climate change.

* Near future = 2020–2039; Far future = 2060–2079.

2. Looking after our culture and heritage

The parks are a place of significance to all Australians and contain a mosaic of significant pre- and post-settlement places, sites, relics and buildings. Prior to European settlement, the entire region was under the custodianship of Aboriginal people of the Dharawal language group and other Aboriginal peoples, who retain a significant cultural connection to this Country. Since settlement, Royal National Park became the oldest national park in Australia and paved the path for the conservation movement and protected area system in this country (Worboys et al. 2005).

2.1 Aboriginal culture and heritage

The parks form part of the lands of the Aboriginal people of the Dharawal language group, whose cultural boundaries are defined by landscape features and patterns of traditional use on Country. Dharawal is understood by many to be the language spoken by Aboriginal people in the land south of Botany Bay and the Georges River, west to Appin and south to Goulburn and Nowra. Dharawal is also the name of the native cabbage tree palm (see Box 7) and is the overarching spirit ancestor or totem for all Aboriginal people and clan groups who belong to and speak Dharawal. Language and Country go together and the people speaking the language belong to that Country (Ingray 2020). Aboriginal people have lived in this area for thousands of years. The long and continuing connection between Aboriginal people and the park landscape is recognised and respected.

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'.

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 traditional people of the area were rapidly displaced, and their cultural practices disrupted, when European settlers first came to the area following British occupation of Port Jackson in 1788. However, as many of the Dharawal People survived in the Illawarra and surrounding areas there are still many significant sites and connections to Country that exist in these parks. The Dharawal whale, the most widely recognised totem of the nation, is depicted in engravings several times in Royal National Park. The whale is a Dreaming figure for the Dharawal speaking people and its continuing presence, both in engravings and as it migrates along the coast, continues to bring Aboriginal people a strong sense of connection to this Country. Such totems are culturally important as they have deep spiritual significance and were important in the everyday life of Aboriginal people (Bursill et al. 2007).

There are over 1,700 recorded Aboriginal sites in the parks (DPIE 2019b) and the known occupation of the area dates over 8,500 years (Attenbrow 2012). Signs of the extensive use, occupation and spiritual connection with these lands is evident in rock engravings, grinding grooves, artefact scatters, shell middens in rock shelters and open locations, and rock shelters with drawings and stencils. The sites provide evidence of the tools and equipment people used in their daily lives, the raw materials they used in manufacturing these items

and the animals they hunted, fished and gathered. In the parks many of these sites are comparatively undisturbed, while some can be viewed along popular walking tracks (see Box 8).

Royal National Park contains 3 Aboriginal Places, declared under the National Parks and Wildlife Act, which are culturally sensitive sites of special significance to people of the Dharawal language group. Near the parks is another Aboriginal Place (Camp Wanawong), which was a ceremonial site for Aboriginal men and women and is a place where current generations of Aboriginal people feel a connection to their ancestors.

Box 8: What's in a name?

Some places in and around Royal National Park retain their local Aboriginal names (Bursill et al. 2007) including:

- *dharawal* = cabbage tree palm
- *dharaguri(gal)* = Bundeena and Royal National Park region
- *garrawarraah* = place of nesting eagles
- *jibbon/djeeban* = sand bars at low tide
- *wattamolla* = place near running water
- *yarrawarrah* = place of tall trees.

Photo 10 ***Wattamolla*** **is the Aboriginal name for 'place near running water'. Andrew Richards/DPE**

Other, less visible Aboriginal connections to these parks include traditional and continuing knowledge of the landscape and its plants and animals, spiritual connections to the place, and personal and community stories, memories and oral traditions.

The parks have deep spiritual significance for Aboriginal people, and they are important for the continuation of cultural practices and traditions. Aboriginal people continue to visit the parks to connect to Country. The parks are an important place of education, where Elders pass on valuable knowledge of ceremonies, story-telling and how to care for Country. The variety of perspectives and stories relating to these parks presents a range of opportunities for the Aboriginal communities within the parks.

Box 9: Jibbon Point

There are a number of Aboriginal rock art sites, both engravings and paintings, in the parks. Rock engravings, or petroglyphs, were made on sandstone by abrasion of the stone surfaces with hard objects. These sites are threatened by human impacts and natural weathering. While many of these sites are recorded and known to park managers and the Aboriginal community, to ensure their protection most are not publicly identified.

A very good example of a traditional rock engraving site that is celebrated and shared is at Jibbon Point. There are several large engravings depicting animals, people and spirits or Dreaming ancestors and whales are a feature of the site. The site is significant to Aboriginal history, culture and spirituality.

Whale engraving at Jibbon. Kathryn Korbel/DPE

The engravings at this site have suffered from erosion and abrasion as a result of people walking across them. NPWS and the Aboriginal community have constructed walkways, interpretative signs and pathways to minimise further damage to the engravings and preserve their cultural significance.

NPWS continues to monitor and maintain this site and recognises the Aboriginal communities' role in caring for this site and other Aboriginal cultural sites in the parks.

2.1.1 Management considerations and opportunities

Although the NSW Government has legal responsibility for the protection of Aboriginal sites, NPWS acknowledges the right of Aboriginal people to make decisions about their own heritage. Aboriginal people's spiritual and cultural connection to the parks is respected and there is recognition of the importance of incorporating local Aboriginal knowledge, such as traditional burning practices, into the ongoing management of the parks. Aboriginal communities are consulted and involved in the management of Aboriginal sites and related issues and NPWS is continuing to work with the Aboriginal community to develop mechanisms for ongoing involvement in park management decision-making.

Access to Country is extremely important for Aboriginal people. NPWS will support the local Aboriginal community to access Country to maintain, renew and develop cultural connections and practices, including access for non-commercial cultural use of resources. The Garawarra Farm area may provide an opportunity for the Aboriginal community to hold community open days or culture camps on Country.

Photo 11 Aboriginal smoking ceremony on Dharawal Country. Georgina Eldershaw/DPE

Visitors to the parks are often not aware of the Aboriginal history or significance of this place to Aboriginal people. There are opportunities for NPWS to work with the Aboriginal community to undertake and encourage activities that enhance the identity of the parks as an Aboriginal cultural landscape. The use of Dharawal language and artwork in park interpretation and signage may be one mechanism for enhancing this identity. Use of

language and art is implemented with the support and involvement of the appropriate local Aboriginal community.

Some Aboriginal sites in the parks are threatened by erosion and visitor impacts. Track and trail upgrades and track realignments will be considered in locations where Aboriginal values are being negatively impacted. Aboriginal rock engraving sites are subject to continuing weathering and erosion. NPWS will work with local Aboriginal communities to implement appropriate management. Management plans for the Aboriginal Places in the parks will be developed by NPWS in consultation with appropriate Aboriginal communities. These are developed in accordance with the NPWS *Aboriginal Places Policy* to ensure ongoing management and protection of these places.

Although there have been a number of archaeological surveys completed, there are gaps in our knowledge and understanding of how Aboriginal people used the parks. Archaeological surveys to date have focussed on coastal and estuarine sites. Future research should be directed to inland areas and include surveys in the Heathcote National Park and Garawarra State Conservation Area. Regular condition assessments are necessary to improve management and protection of sites in the parks.

There are opportunities for Aboriginal communities to promote, interpret, practice and share culture in the parks. NPWS will encourage opportunities for tourism-based Aboriginal cultural programs, including community partnerships and commercial tour operators, that provide interpretation of Aboriginal cultural heritage values that are culturally sensitive and appropriate and provide socioeconomic benefits to Aboriginal people. This may include use of the Garawarra Farm buildings and surrounds by the Aboriginal community for cultural tourism purposes. Any proposal would need to be consistent with the aim of improving understanding of Aboriginal cultural heritage of the Country and be subject to relevant environmental impact assessments.

The community is continuing discussions on identifying traditional and custodial connections to the lands that include the parks. There is currently a registered native title claim over land in the parks that is yet to be determined. NPWS recognises and supports the role of Aboriginal people in undertaking and leading these processes. While these processes are underway, NPWS will continue to engage as appropriate within the Aboriginal community regarding management of Country, Aboriginal sites and related issues.

2.2 Shared cultural heritage

Reserved in 1879, Royal National Park is the oldest national park in Australia and the second oldest in the world. The permanent reservation of a large natural area for the purposes of public recreation marked the start of Australia's national park system of protected areas (Worboys et al. 2005). The parks retain a living record of post-settlement and social history including artefacts, buildings and natural heritage.

The shared heritage (see Box 9) seen in the parks today is associated with the land-use history since settlement, including early land grants, the Depression era, resource use and extraction (timber, clay, gravel, ironstone and water), military uses during war times, recreational use and the evolving approach to conservation management.

Box 10: What is shared heritage?

Australia has one of the oldest records of human existence on the planet, with records dating back 40,000 years. Many places today have particular significance to Aboriginal people. Other places hold significant history to both Aboriginal and non-Aboriginal people, and very often this history is a shared one.

Shared heritage refers to history and heritage after 1788 when Europeans first settled in Australia. This heritage is shared by all Australians and includes places and items that may have historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. Shared heritage in the parks is made up of living stories as well as connections to the past, including natural resources, objects and traditions that need to be conserved for current and future generations.

History of the parks

European explorers Bass and Flinders first arrived at Wattamolla in 1796. Between 1822 and 1863 pastoralists took up land grants and established residences. Heathcote was established in 1843 and, with the expansion of mining in the Illawarra, Helensburgh in 1886. The recognition of the value of open space for health, recreation and scientific study resulted in the dedication of 18,000 acres (~7300 hectares) as national park in 1879, extending to 35,000 acres (~14,200 hectares) in 1880, with management placed in the hands of the National Park Trust. The National Park Trust was empowered to develop the park for recreation and by the early 1900s people were coming to the park to enjoy fishing, bushwalking and the beaches.

The Trust developed buildings, roads, and gardens with exotic plantings and animals, centred around the Audley area. Evidence of the Trust's management includes quarry scars from the excavation of large volumes of gravel, ironstone and claystone for road and rail construction; small dwellings or cabins at several locations in the park; and tree stumps from logging operations which continued until the 1920s.

The park was also used by the military at various times from 1890 until the 1960s. Evidence of military use includes firing ranges, accommodation, forts and gun emplacements.

A conservation ethic began to develop in the community in the early 1900s and by the 1930s conservationists began to lobby for a state national parks authority. The parks' connection to the developing conservation movement has been recognised by its inclusion on the National Heritage List (see Box 10). Heathcote National Park was originally reserved as a 'primitive area' in 1943 and the park is significant as an early illustration of the development of the wilderness concept in Australia. The park also has a historic connection to the steam locomotive railway (now the South Coast Line of Sydney Trains) through the supply of water from Lake Toolooma.

The area that is now Garawarra State Conservation Area included several early farms and land grants and was first reserved as Garawarra Primitive Area in 1934. The Kellys Falls area (added to Garawarra State Conservation Area in 2008) was originally owned by Mr Henry Halloran who established the Princess Marina and Kellys Falls historic walking tracks. Mr Halloran constructed numerous historic rock walls and resting areas along the walking tracks using rock sourced from local bushland and imported from the Shoalhaven.

Kellys Falls, Garawarra State Conservation Area. Nick Cubbin/DPE

Box 11: National Heritage List

The National Heritage List includes natural, historic and Indigenous places of outstanding significance to the nation.

In 2006, Royal National Park and Garawarra State Conservation Area were included on the National Heritage List (Place ID 105893) for the following reasons:

1. The place is a major centre of plant species richness. With more than 1,000 species, it has one of the richest concentrations of plant species in temperate Australia. The place is also extremely rich in perching birds, reptiles and butterflies and can be regarded as exemplifying the biodiverse Hawkesbury sandstone environment.
2. Royal National Park was the first national park to be established in Australia. Its declaration in 1879 marked the beginning of the development of Australia's national park system of protected areas. Establishment of the park as a recreation area for the then residents of Sydney also marks a time when public attitudes towards the Australian natural environment were becoming more appreciative. With greater access to and use of natural areas for recreation, the public's concern for the natural environment grew and this, in part, influenced the evolution of a broader conservation movement. The establishment of Royal National Park is considered the beginning of the Australian conservation movement.

Under the Environment Protection and Biodiversity Conservation Act, the Commonwealth Minister for the Environment must be informed of any works that will have, or are likely to have, a significant impact on the gazetted values of places on the National Heritage List.

In 1967, the Royal National Park and Heathcote State Park were reserved under the National Parks and Wildlife Act. Garawarra State Recreation Area was reserved under the Act in 1987.

Key areas of the parks that reflect its shared cultural heritage include the Audley precinct, Bonnie Vale and the coastal precincts of Royal National Park.

Audley

The Trust focused its early attention on Audley, developing it into a small village offering a variety of amusements (see Box 11) and surrounded by ‘pleasure gardens’, which can be seen today in the extensive lawns, boat hire facilities and the causeway.

After dedication of Royal National Park in April 1879 work began on land clearing and damming. By 1883 a dam across the Hacking River created a lake-like environment for pleasure craft, with these activities becoming one of the longest-lived recreational activities at Audley.

In 1884 a camp was established where the Hacking River meets Kangaroo Creek and named ‘Audley’. The camp included a dock, boat house, jetty, weatherboard pavilion, stables, stores, outhouses, smithy, forge and plant. Paddocks were fenced and bridges, culverts, new cottages for the workers and a boat slip constructed. Plantings of ornamental trees began early and continued through to 1890, including red cedar, catapla oak, Moreton Bay fig and lilly pilly. To fund these park improvements, attempts were made to exploit the coal, clay, gravel, timber, grass and oysters, but these were largely unsuccessful.

Between 1891 and 1893 the focus was on making the park visitor-friendly and further developments included a bridge over Kangaroo Creek, a bird aviary, rustic tables, facilities for the hiring of boats, a public kitchen, a windmill to supply water and accommodation for 30 guests. The accommodation was first known as the public pavilion, then The Rest and for most of its history Allambie House, until it was destroyed by fire in 1975. In 1893 the first guidebook was published. Toilets were provided in 1895 and a refreshment room in the following year (Heritage Council of NSW 2020). The Audley historic recreational complex was listed on the State Heritage Register in 1999 in recognition of its cultural significance (see Box 11).

A dance hall was built in the 1940s, and access to the park was improved by installing retraining walls along the Hacking River, and building roads and a rail link between Loftus and Audley.

Box 12: State Heritage Register – Audley historic recreational complex

Together with Lady Carrington Drive and the coastal cabin communities, the Audley precinct is one of the significant cultural landscapes in Royal National Park. Commonly known as a 'pleasure ground' or picnic ground, Audley is the oldest of the cultural landscapes in the park developed for recreational purposes (DEC 2006). The cultural significance of Audley was acknowledged in 1999, when it was listed as the Audley historic recreational complex on the NSW State Heritage Register (SHR ID 00976). The State Heritage Register recognises heritage that is of particular importance to the people of New South Wales and enriches our understanding of our history and identity.

The area retains its traditional role as the focal point of visitation to the park, and its buildings and structures reflect and symbolise the historic development of the park.

Historic elements in the Audley complex include Audley Post Office Cottage (built around 1883); Commonwealth Pavilion (1901 or 1911); Reids Flat Cottage (1915); Audley Boatshed (1938); Audley Dance Hall (1946); Varneys Bridge and a war memorial. State Heritage items are protected under the *Heritage Act 1977* and approval from the Heritage Council of NSW is required for major changes to these items.

Photo 12 Varneys Bridge and Currawong Flat Picnic Area, Audley. Nick Cubbin/DPE

Coastal cabins

Cabin communities were once common along the coast of New South Wales. Established between the 1930s and 1950s, the cabins at Little Garie (now 20 cabins), South Era (92 cabins) and Burning Palms (26 cabins) are now rare in the state and along with the Bulgo group, also in Royal National Park, they represent a small number of similar cabin groups remaining in Australia. The group of weekender cabins at Little Garie, South Era and

Burning Palms has been recognised for its particular historic and social heritage values by inclusion on the State Heritage Register (see Box 12). The cabin community at Bulgo at the southern end of Royal National Park is associated with the mining town of Helensburgh.

Box 13: State Heritage Register – coastal cabin communities

In 2012, the Royal National Park coastal cabin communities of Little Garie, Era and Burning Palms were listed on the State Heritage Register, recognising them as the largest and most intact groups of coastal weekender cabins remaining in New South Wales. The cabin communities are of state significance for their historic, aesthetic, associative, social and rarity value.

These cabin communities are historically important as evidence of the development of a distinctive way of life associated with recreation from the middle parts of the 20th century, once common in coastal NSW. The cabins developed as simple weekender accommodation around Sydney from the 1920s and 1930s starting with tent accommodation that developed into huts and cabins. The cabins also reflect development of recreation and conservation philosophy in the state. Many cabin occupants have formed Landcare groups and continue to undertake environmental restoration programs.

The listing defines a boundary around each cabin community (excluding the Era and Burning Palms surf life saving clubs) that encompasses all cabins in the areas of Burning Palms, Little Garie and South Era, but it is noted that the cabins are set in a broader landscape with views to and from the escarpment above the communities, the Burgh and Thelma ridges.

Photo 13 Cabins at South Era in Royal National Park. Nick Cubbin/DPE

The Aboriginal sites recorded within and around the cabin groupings provide evidence of the long Aboriginal use and occupation of this area (Brooks et. al. 2005).

In 1966, the NSW Government formalised the occupation of the cabins by issue of a permissive occupancy, followed in 1979 by licences issued under the National Parks and Wildlife Act, with the land continuing to be owned by NPWS.

In accordance with these licence conditions, a number of cabins were removed from Bonnie Vale and the coastal areas of South Era, Little Garie and Burning Palms. A moratorium on cabin demolition was put in place in 1990. In 2006, an agreement was reached giving cabin licensees a 20-year licence and most of the remaining cabins in the park are now occupied under licence. The cabins at Bulgo are currently occupied under old licence conditions.

Bonnie Vale

The landscape at Bonnie Vale has been used for camping activities long before the arrival of Europeans, evidenced by the Aboriginal cultural material at the site. George Simpson purchased a 50-acre (~24-hectare) lot and built a stone cottage on the site by 1867, and later a hotel. From the 1920s the site was used for tent camping, with the owners of Simpson's Hotel managing the camping area. By 1947, when the National Park Trust acquired the land on the foreshore of Port Hacking, including Bonnie Vale, the simple tents had evolved into semi-permanent camps and then into cabins. The Trust managed the continuing construction of roads and cabins as temporary accommodation for recreation in a formal way from this time (Ashley 1994).

At the height of Bonnie Vale's popularity during the 1950s there were 171 cabins at the site (AMBS 2009). Since this time many of the cabins have been removed and in 2020 8 cabins remain scattered through the site.

Recognised heritage features of the Bonnie Vale site include the foundations of Simpson's Hotel, a seawall (built 1921) and various archaeological remains. The Simpson's Hotel site is overlain by a more recent building known as the Ranger's House, which was used as a kiosk until the mid-1970s.

Box 14: Heritage places, objects, features and landscapes

A range of historic places, buildings and structures, objects and archaeological evidence exist in the parks. The parks have not been systematically surveyed for historical evidence but there are over 100 heritage items identified in Royal National Park. These items are recorded on the NPWS Section 170 Register, in accordance with requirements of the Heritage Act (NPWS 2020b). There are items in Heathcote National Park and Garawarra State Conservation Area with potential heritage value.

Recorded heritage items in Royal National Park include the Audley precinct, Bonnie Vale precinct, the coastal cabins, cottages (including Gogerlys and Hilltop) and cottage ruins, various military installations, tracks and roads (such as Lady Carrington Drive and the Honeymoon Track) and seawalls including the training walls in the Hacking River.

Heathcote National Park contains some heritage items including Lake Toolooma dam and associated boiler which were built to provide water to steam engines at Waterfall. The former route of the Old South Coast Road, now preserved as a fire management trail, is a potential heritage item. The park includes part of the Heritage Conservation Area for the Garrawarra Hospital, identified in the *Wollongong Local Environment Plan*.

In Garawarra State Conservation Area, potential heritage sites include a railway construction camp near Cawleys Creek, evidence of timber felling and quarrying and other relics of past land uses.

2.2.1 Management considerations and opportunities

NPWS is committed to identifying, conserving, displaying, and sharing the rich history and shared heritage of the parks. Many of the heritage items in the parks have not been formally assessed for significance and condition.

Conservation management plans have been produced for some key heritage including Audley (DECC 2006), Audley Boatshed (Cardy et. al. 2000), coastal cabins areas (Brooks et al. 2005), Gogerlys Cottage (University of Sydney 2000) and the Simpson's Hotel site at Bonnie Vale (NPWS 2001). Management of heritage places will be guided by the relevant plans and the plans will be reviewed and updated if required. The conservation management plan for the coastal cabins was prepared in 2005 prior to the State Heritage Register listing of the cabins in 2012.

A number of key heritage items are considered in precinct master plans, including the Audley and Bonnie Vale master plans. Works at Bonnie Vale have been undertaken in accordance with a master plan (Johnson Pilton Walker 2005) and a heritage action statement (AMBS 2009) for the site. A further heritage impact statement, prepared in 2020, assessed the remaining 8 cabins at Bonnie Vale. The remaining scatter of cabins across the Bonnie Vale landscape does little to evoke a sense of the original holiday village and the cabins are primarily constructed of asbestos cement sheet (fibro), with some being in a poor condition. In accordance with the heritage impact statement the remaining cabins will be progressively removed from the site. These works are consistent with the master plan (Johnson Pilton Walker 2005), the safety requirements for asbestos removal from work areas and public places, and will enhance the natural heritage values of the park (AMBS 2020).

Further works at Bonnie Vale, including improvements to access for boat launching, will be guided by the master plan and a precinct plan (to be developed) which will review access and camping and day use facilities. The existing facilities are regularly impacted by tidal inundation and flooding and this will increase with sea level rise.

Significant works have been undertaken at Audley and further works will be guided by the Audley master plan (DECC 2006), which accounts for heritage values in this precinct.

Box 15: Adaptive reuse

Adaptation or adaptive reuse means the modification of a heritage place to a new use that conserves its heritage values. It is now recognised that where a building can no longer function with its original use, a new use through adaptation is a legitimate way to preserve its heritage significance. Adaptive reuse of heritage buildings and structures may mean a simple change in use or it may mean alterations or additions to the buildings or structures to give them new purpose. Work to heritage buildings should conserve what is important about them and provide the opportunity to reveal and interpret their history, while also providing sustainable long-term uses (Heritage Office 2008).

A number of buildings in Royal National Park have been adapted to ensure protection of their heritage values and provide for new visitor uses. These include Audley Boatshed (boat and bicycle hire), Audley Dance Hall (cafe), and a number of cottages including Weemalah, Reids Flat and Hilltop (accommodation).

The NPWS office in Royal National Park houses a collection of items associated with the management history of the park such as Trust minutes and correspondence, early publications, photographs, maps and oral histories. There are also some large movable heritage items in the landscape, such as horse troughs. Care is required to store these items

in appropriate condition and ensure they are appropriately documented and made available for presentation to the community. A movable heritage plan for the parks guides the management of these items.

In response to community proposals for World Heritage listing of Royal National Park (Mosley 2012), NPWS investigated the feasibility of nominating Royal National Park to Australia's World Heritage Tentative List and found that the park does not meet the threshold for outstanding universal value under the World Heritage criteria. In the future, an alternative pathway to pursue World Heritage listing may be available under a different World Heritage theme.

Photo 14 Hat from the era of the Royal National Park Trust. Elizabeth Broomhead/DPE

3. Providing for visitor use and enjoyment

Royal National Park, Heathcote National Park and Garawarra State Conservation Area provide a broad range of visitor experiences. The parks attract vastly different numbers of visitors and different user groups. Royal National Park is one of the most visited parks in Australia (Roy Morgan 2019) with visitors coming to picnic, bushwalk, bike ride, camp, swim, surf, kayak, canoe and whale watch. Heathcote National Park primarily attracts bushwalkers seeking to experience nature in a less-visited environment. Visitors to Garawarra State Conservation Area are mostly seeking mountain biking and bushwalking opportunities. Most visitors to the parks are attracted to the coastal areas.

3.1 Visitor capacity

There are more than 6 million visits to the Royal National Park each year. The number and consistency of visitors to the park is causing issues of overcrowding, placing pressure on facilities and, in some locations, environmental and heritage values. The large numbers of visitors leads to closure of major visitor precincts at peak times and reduces the quality of experience for visitors who may be seeking a more natural environment experience.

The highest visitor pressure is being experienced in 3 main areas in Royal National Park: the coastline, Hacking River, and the foreshores of Port Hacking. The intensity of visitor use decreases with increasing distance from car or boat access points and is most concentrated where visitor facilities are provided.

Social media also drives visitation to particular locations, including Figure Eight Pools and Wedding Cake Rock. These sites can attract more than 1,000 visitors on busy days, placing pressure on surrounding tracks, car parks, amenities, and environmental features.

Photo 15 Wattamolla, Royal National Park. Peter Sherratt/DPE

Visitor numbers in many areas in Royal National Park are nearing capacity, and some may be operating at capacity or beyond, placing unsustainable pressure on the natural environment. Audley, Wattamolla and Garie precincts are closed to the entry of vehicles when the car parks are full. On peak days, including public holidays and most weekends in summer, Wattamolla precinct reaches capacity by mid-morning and further vehicle entry is restricted. Similar circumstances occur at Garie, Audley and Garawarra Farm (which provides access to Figure Eight Pools) car parks.

What is carrying capacity? This term describes 'the number of visitors an area can sustain without degrading the natural resources and visitor experiences' (Prato 2001). This is determined by considering the biophysical characteristics of an area, heritage and cultural values, social factors as well as management policies.

The carrying capacity of a precinct or park can then be used to establish the maximum number of visitors permissible at one time, or over the course of a day. Methods to manage visitor numbers, including booking systems, can be implemented to ensure that the number of visitors to a particular track, precinct or region does not exceed the carrying capacity. The management of visitor numbers requires an adaptive management approach, allowing policies to vary over time.

3.1.1 Management considerations and opportunities

Strategies are needed to actively manage increasing visitor numbers and support a range of appropriate visitor experiences in the parks while protecting the environmental and cultural values of the parks. Visitor management strategies may include capping visitor numbers at particular precincts via online booking.

A visitor management zoning system for the parks (see Box 15 and Table 3) identifies locations for passive and active recreational activities and visitor facilities appropriate to the management objectives for each zone.

Box 16: Visitor management zones

Zoning systems are used in national parks around the world to clearly delineate the activities that may or may not occur within a particular area. Zones generally define the acceptable uses and infrastructure development within specific boundaries and prioritise management objectives such as protection of key habitats. Zones can help eliminate user conflicts, improve the quality of recreational activities and aid in conservation management efforts.

Visitor management zones have been defined for the parks to provide a clear picture of future intent for visitor use and conservation, and to assist park managers with strategic prioritisation of resources and management effort.

Areas of the parks have been classified into 3 visitor management zones based on physical features, environmental and cultural conservation priorities and the desired level of visitor use. An additional zone provides for management of the Woronora Special Area. The zones have been informed by public consultation and a review of visitor management issues for the parks (Tourism Recreation Conservation 2020).

Zone 1 Nature-recreation: Most of the area of the parks is included in this zone. Conservation of cultural and natural values is the priority with the provision of low-intensity, passive visitor experiences where appropriate.

Zone 2 Recreation: Conservation of cultural and natural values and provision of passive and moderate to high intensity active visitor experience and facilities is the aim of this zone. This zone includes moderate to high use walking tracks, visitor nodes with basic facilities, and designated areas for a mountain biking track network. There is some potential for expansion and improvement of facilities at visitor nodes in this zone.

Zone 3 Visitor precinct: This zone includes the major visitor precincts in Royal National Park. This zone provides for sustainable visitor services and facilities in a natural setting with high levels of recreation and social interaction. The priority is to improve visitor services and reduce pressure on over-utilised facilities and infrastructure. Master plans or precinct plans will guide improvement of visitor facilities and services in these precincts.

Special Area Zone: Six hectares of Heathcote National Park, adjacent to Woronora Dam Road, are excluded from the above zones as they are part of the Woronora Special Area and are subject to the Water NSW Act 2014 and Water NSW Regulation 2020. Any activity or access to these areas requires WaterNSW consent. Any activity in these areas must consider a Neutral or Beneficial Effect (NorBE) assessment under the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011.

Table 3 Visitor management zones

Feature	Zone 1 Nature-recreation	Zone 2 Recreation	Zone 3 Visitor precinct
Guiding management principles	Conservation of cultural and natural values is the priority; with the provision of low-intensity, passive visitor experiences where appropriate.	Conservation of cultural and natural values and provision of moderate–high intensity passive and active visitor experience and facilities.	Provision of sustainable visitor services and facilities in a natural setting with high levels of recreation and social interaction.
Location (see Figure 4)	Most of Heathcote and Royal national parks and part of Garawarra State Conservation Area. Includes State Heritage Register listed coastal cabin communities.	Three components: • a network of moderate–high use walking tracks and management trails • a mountain biking track network • visitor nodes at Kellys Falls; Red Cedar Flats.	Four key visitor precincts at Audley, Wattamolla, Bonnie Vale and Garie. Potential for development of visitor precincts at Garawarra Farm, Coast Track head at Bundeena, Warumbul and the Temptation Creek area.
Visitor opportunities			
Bushwalking	Network of walking tracks and management trails.	Network of well-formed walking tracks and management trails.	Well-formed tracks including paved surfaces.
Cycling	Management trails only.	Management trails and designated tracks.	Management trails only.
Horse riding	No horse riding.	Designated management trails and tracks in Garawarra State Conservation Area (see Figure 9).	No horse riding.
Camping	Walk-in camping at designated camping areas (see Table 4).	Walk-in and vehicle-based camping at designated camping areas (see Table 4).	Walk-in and vehicle-based camping at designated camping areas (see Table 4).
Visitor facilities	Generally, no formalised parking provided. Walking tracks are generally grade 3 or 4. Basic visitor facilities only. Additional basic facilities, including parking at track-heads, may be provided where they are compatible with the cultural and natural values of the zone. Limited potential for intensification of visitor use.	Parking at track-heads, day use areas and other visitor nodes. Walking tracks are generally grade 2 or 3. Basic camping facilities. Visitor nodes have basic facilities, including toilets and picnic tables. Potential for additional visitor facilities to support the visitor opportunities identified for these areas.	Car parks provided. Walking tracks are generally grade 1 or 2. Well-developed picnic and camping areas with toilets. Potential for intensification of use and additional visitor facilities (within precinct described in the relevant master plan).
Visitor experience	Opportunities for passive recreation in a natural setting, with limited visitor facilities. Visitors can expect low–moderate levels of social interaction.	Opportunities for passive and active recreation in a natural setting, with some visitor facilities. Visitors can expect moderate–high levels of social interaction.	Modified natural environment with areas of intensive recreational use and significant visitor facilities. Visitors can expect high levels of social interaction.

*Special Area Zone: Six hectares of Heathcote National Park, adjacent to Woronora Dam Road, are excluded from the above zones as they are part of the Woronora Special Area and are subject to the Water NSW Act 2014 and Water NSW Regulation 2020. Any activity or access to these areas requires WaterNSW consent.

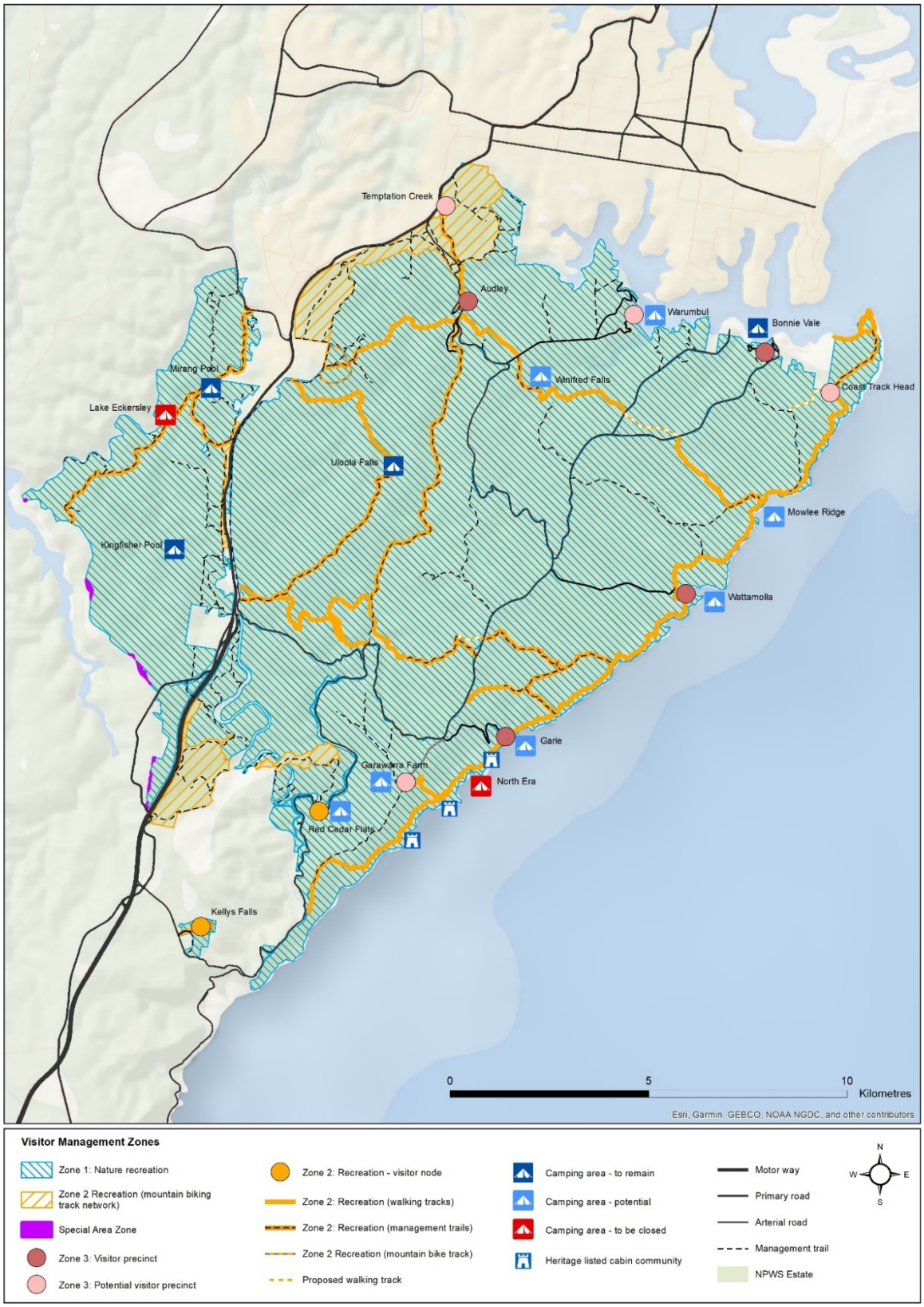

Figure 3 Visitor management zones

A number of locations in Royal National Park are extremely popular with visitors picnicking with family and friends, and engaging in leisure activities including bushwalking, boating, swimming and cycling. The 4 major visitor precincts providing these opportunities are Audley (Figure 5), Wattamolla (Figure 6), Bonnie Vale (Figure 7) and Garie (Figure 8). Improvements and upgrades to the visitor facilities at these locations will be guided by the plan of management and the following master/precinct plans for each of the precincts:

- The landscape master plan for Audley (DECC 2006). A range of works have been completed under this master plan. Further works will be completed including improvements to connectivity, such as new pedestrian bridges, which will allow the whole area to be experienced on foot rather than requiring vehicles.
- The Wattamolla master plan (OEH 2017a). This plan will guide improvements to car parking, access and circulation and upgrades to picnic areas, the kiosk and toilets.
- The Bonnie Vale master plan (Johnson Pilton Walker 2005). A range of works have been completed under this master plan. A new precinct plan will be prepared for Bonnie Vale. This plan will guide improvements to access, and camping and day use facilities, as the existing facilities are regularly impacted by tidal inundation and local flooding, and this will increase with sea level rise.
- A new precinct or master plan is required for Garie. This plan will guide improvements to visitor access and circulation, any necessary visitor and surf safety infrastructure and the provision of visitor accommodation including camping opportunities (see section 3.2).
- Hut or cabin and camping accommodation for walkers will be investigated and may be implemented at Bonnie Vale, Wattamolla and Garie to support the Great Southern Walk (see 3.2).

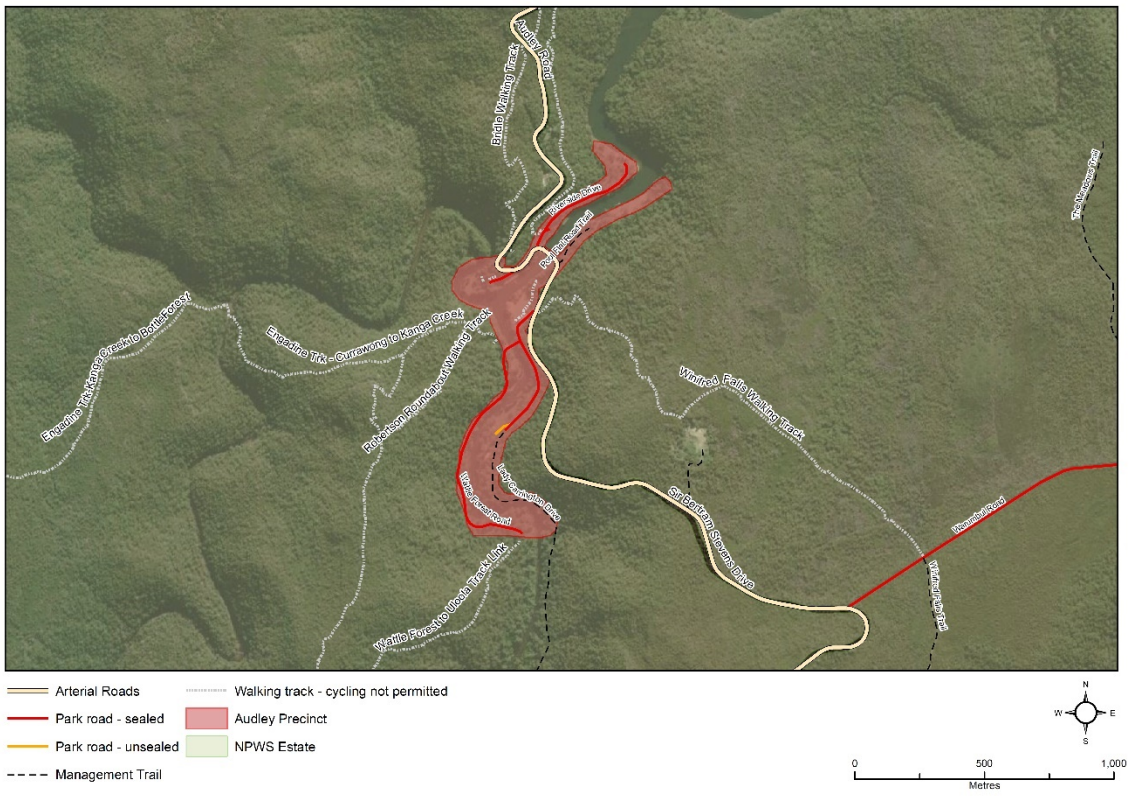

Figure 4 Audley precinct

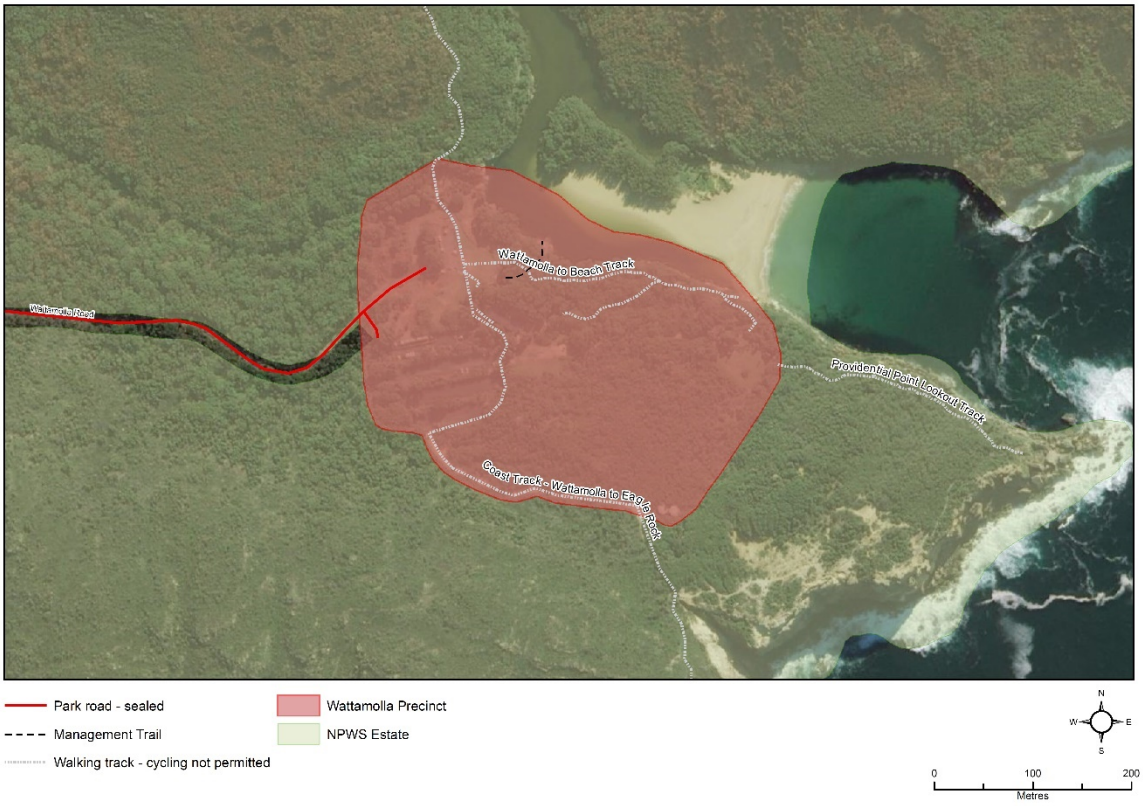

Figure 5 Wattamolla precinct

Figure 6 Bonnie Vale precinct

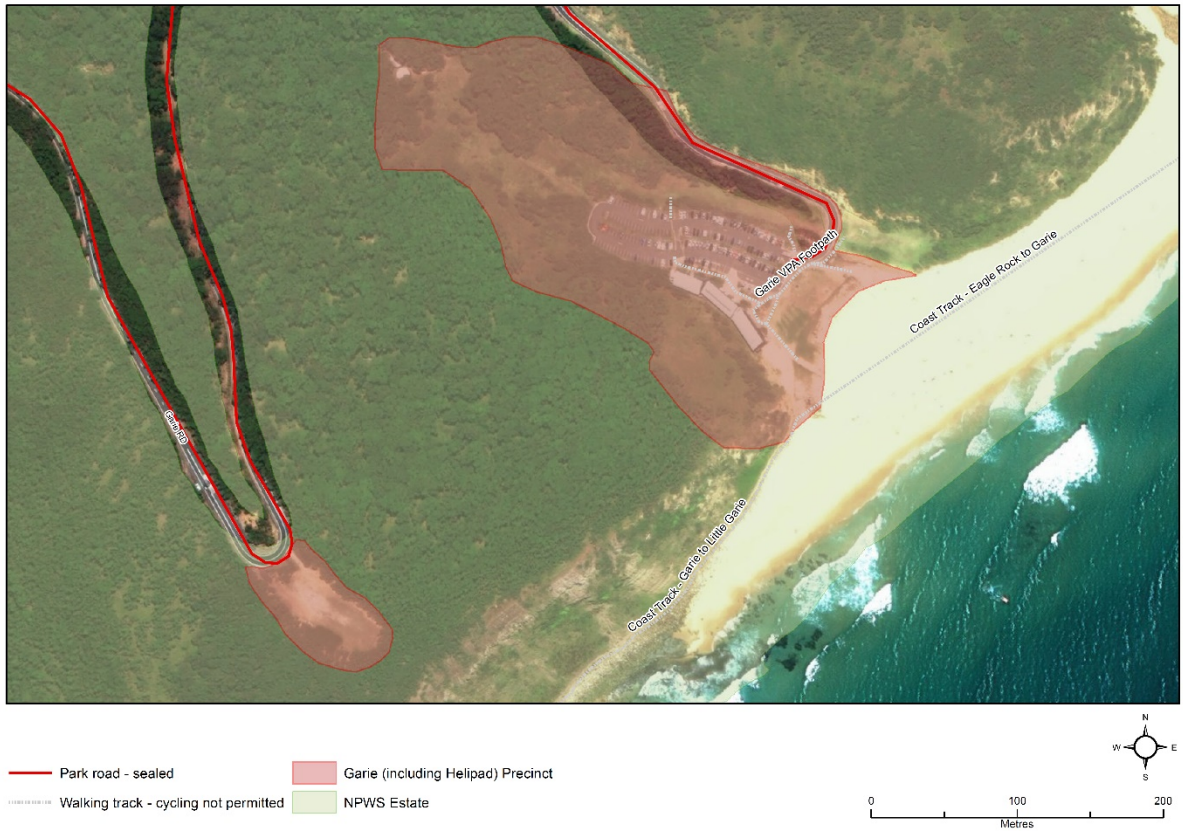

Figure 7 Garie precinct including the Garie helipad site

Photo 16 Garie Beach, Royal National Park. Nick Cubbin/DPE

A further 4 areas are identified as potential future Zone 3 visitor precincts (see Figure 4). The Temptation Creek area has potential to become a park entry point with associated visitor facilities including car parking, toilets and pedestrian/cycle links to the road and track network in the park (see Figure 5). At the primary access point for the Coast Track at Bundeena, improvements may include parking and an associated access road and other visitor facilities, such as toilets (see Figure 6). Garawarra Farm has potential for adaptive reuse to support sustainable visitor services, including facilities to enable educational or cultural activities or facilities and amenities for park visitors (see Figure 7). Garawarra Farm may also provide opportunities for camping. The existing picnic area at Warumbul, on the shores of South West Arm Creek, has the potential to be improved as a day use and camping area. Precinct plans and environmental impact assessment will guide any future development of these precincts.

Planning and development of visitor facilities and experiences in the parks will seek to improve accessibility and inclusion in accordance with the Disability Inclusion Action Plan (NSW Government 2015).

Figure 8 Temptation Creek: potential visitor precinct

Figure 9 Coast Track Head at Bundeena: potential visitor precinct

Figure 10 Garawarra Farm: potential visitor precinct

Figure 11 Warumbul: potential visitor precinct

3.2 Camping and other accommodation

There are currently 3 types of visitor accommodation in the parks: walk-in camping in Royal and Heathcote national parks, car-based camping in Royal National Park, and historic cottages available for private hire in Royal National Park. There is no camping or visitor accommodation in Garawarra State Conservation Area.

Walk-in camping is an extremely popular activity in the parks. There are currently 2 walk-in camping locations in Royal National Park at North Era and Uloola Falls, and 3 sites in Heathcote National Park at Kingfisher Pools, Mirang Pools and Lake Eckersley (see Table 4).

Car-based camping, caravanning and car-touring are increasing in popularity. These activities require level camp sites, access to amenities and vehicle parking. Many national parks in Australia offer a variety of car-based camping options and non-powered sites for caravans and camper trailers. Royal National Park currently offers car-based camping at Bonnie Vale.

Hard-roofed visitor accommodation is offered in Royal National Park in historic cottages that are available for private rental, including Weemalah Cottage, Hilltop Cottage and Reids Flat Cottage.

There are many accommodation options for park visitors in surrounding suburbs of Sydney and Northern Wollongong, and in Bundeena.

Photo 17 Hilltop Cottage, Royal National Park. John Spencer/DPE

3.2.1 Management considerations and opportunities

Demand is increasing for opportunities to camp in the parks, with current camp sites typically booked out months in advance. Due to overuse, camping areas are starting to show signs of degradation and are not meeting the needs of the public. The removal of waste, maintenance of toilet facilities, degradation of the soils and vegetation around sites and illegal camping have become significant management issues.

With 12 camp sites, North Era is currently the only camping area supporting walkers on the Coast Track. This small camping area is popular, but management of the site is an issue as there is no vehicular management trail providing access. Waste removal must be undertaken by helicopter, which is a significant management cost. Alternative camping areas could be considered that will provide more camp sites in different locations, better facilities, minimise maintenance expenditure and reduce the environmental impact of camping in the parks.

A small number of potential additional camping areas have been identified in Royal National Park which support the Coast Track and offer a range of visitor experiences (see Table 4). Existing and potential camping areas are to be reviewed for their environmental sustainability and viability. Establishment of new camping areas, and the number of sites to be provided, will be dependent on the outcomes of further investigation and environmental assessment processes. Decision-making criteria also includes visitor experience, environmental and cultural values, vehicle access (for management) and track walking distances.

Table 4 Camping areas: existing and potential

Site	Existing/ Potential	Type (current or *indicative* camp site numbers[A])	Visitor access	Zone
Royal National Park: Servicing Coast Track and overnight walks				
Mowlee Ridge	Potential	Camping area (*10*)	Walk-in	1
Wattamolla	Potential	Camping area (*40*)	Walk-in	3
North Era	To be closed	Camping area (12)	Walk-in	1
Garie, including Garie Headland	Potential	Camping area (*40*)	Walk-in	3
Garawarra	Potential	Camping area (*40*)	Walk-in	3
Uloola Falls	Existing	Camping area (6)	Walk-in	1
Winifred Falls	Potential	Camping area (*4*)	Walk-in	1
Royal National Park: Car-based and camper accommodation				
Bonnie Vale	Existing	Camping area and car-based camping area (incl. campervan) (74)	Vehicle	3
Red Cedar Flat	Potential	Camping area and car-based camping area (incl. campervan) (*10*)	Vehicle	2
Warumbul	Potential	Camping area and car-based camping area (incl. campervan) (*10*)	Vehicle	3
Heathcote National Park				
Mirang Pool	Existing	Camping area (4)	Walk-in	1
Kingfisher Pool	Existing	Camping area (6)	Walk-in	1
Lake Eckersley	To be closed	Camping area (2)	Walk-in	1

[A]site numbers will be subject to further investigation including environmental impact assessment

NPWS will continue to provide publicly accessible camping areas to support the Coast Track and other walks in the parks.

Many tourists and park visitors are seeking car-based camping and campervan accommodation close to Sydney. Red Cedar Flats, a visitor node in Zone 2, will be investigated for its suitability to provide accommodation for campervans and car-based camping. The area is relatively flat, currently cleared and has easy vehicle access, however, it will require upgrading to meet the needs of campers. Warumbul, an existing picnic area with toilet facilities, also has potential to provide for car-based camping. The area has easy vehicle access, existing cleared spaces and provides access to the foreshores of South West Arm. All camper and car-based camping areas in Royal National Park will remain non-powered and generator use will not be permitted. Camping and day use facilities at Bonnie Vale will be reviewed under a new precinct plan (to be developed) for the site, as there are significant issues with tidal inundation and local flooding of current facilities, and this is expected to increase with sea level rise. The precinct plan will also guide improvements to access, including any necessary new or modified access roads or trails.

Hard-roofed visitor accommodation in the form of small walkers huts or cabins may be constructed in 3 existing visitor precincts (Bonnie Vale, Wattamolla and Garie) to support the Great Southern Walk (Table 4). The location of these huts or cabins, and any necessary ancillary infrastructure, will be focussed on the existing visitor precincts, appropriate to the setting and will be subject to further planning and environmental impact assessment

processes. NPWS may engage services to support visitors at these locations. Camping sites will continue to be available for independent walkers on the Coast Track.

Additional cottages in Royal National Park may be considered for adaptive reuse and provision of overnight visitor accommodation (Table 5). Any adaptive reuse of buildings in the parks requires consideration of heritage values, and any upgrade or maintenance on existing buildings should consider opportunities to improve sustainability.

Table 5 Hard-roofed visitor accommodation and facilities in Royal National Park: existing and potential

Site	Location	Existing/potential purpose
Hilltop Cottage	Warumbul	Existing visitor accommodation
Reids Flat Cottage	Audley	Existing visitor accommodation
Weemalah Cottage	Warumbul	Existing visitor accommodation
Post Office Cottage	Audley	Potential visitor accommodation
Audley Flats	Audley	Potential visitor accommodation
Audley Cottage	Audley	Potential visitor accommodation
Cottage on Simpson's Hotel site	Bonnie Vale	Potential visitor accommodation; cafe or kiosk; education or cultural centre
Walkers huts/cabins	Bonnie Vale	Potential visitor accommodation to support walkers doing the Great Southern Walk
Walkers huts/cabins	Wattamolla	Potential visitor accommodation to support walkers doing the Great Southern Walk
Walkers huts/cabins	Garie	Potential visitor accommodation to support walkers doing the Great Southern Walk

3.3 Bushwalking

Bushwalking allows visitors to be in close contact with the environment and can increase understanding and enjoyment of parks and the environment. The parks provide a range of bushwalking opportunities with varying degrees of social interaction, physical challenge and self-reliance. Many visitors to the parks are attracted by the diversity of landscapes and network of more than 100 kilometres of walking tracks (see Figure 2). The track network is extensive in Royal National Park, while in Heathcote National Park and Garawarra State Conservation Area the network is less developed, and walkers primarily use management trails (formed trails used by park management vehicles).

The 26-kilometre Coast Track is one of the main drawcards for Royal National Park, attracting more than 250,000 local, regional and international walkers each year. Other popular tracks and trails in the park include the Forest Path, Lady Carrington Drive and Uloola Falls Track. It is estimated that more than 1,000 walkers use the access track to the Figure Eight Pools on busy days.

The Kellys Falls area in Garawarra State Conservation Area is also popular with walkers. It has a number of short walking tracks and is quieter than the larger precincts of Royal National Park.

Photo 18 Karloo Walking Track, Royal National Park. Natasha Webb/DPE

Walking tracks in the parks are classified to Australian Walking Track Grade System standards (AS 2156) to identify a track's suitability for different user groups as follows:

- Grade 1 – No bushwalking experience required. Suitable for wheelchair users who have someone to assist them (sealed path).
- Grade 2 – No bushwalking experience required. Tracks are compacted surfaces and may have gentle slopes. Walks are generally less than 10 kilometres in length (generally formed tracks).
- Grade 3 – Suitable for most ages and fitness levels. Some bushwalking experience recommended (generally formed tracks with some steep sections).
- Grade 4 – Experienced bushwalkers (generally rough, long tracks, limited directional signage).
- Grade 5 – Very experienced bushwalkers with specialised skills (generally very rough tracks, no directional signage).

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 and tracks are poorly maintained. Walking tracks can fragment habitats and disturb the environment, which can have detrimental effects on biodiversity and habitat quality (Ballantyne & Pickering 2015a,b). Large numbers of people using walking tracks can accelerate erosion of walking tracks. 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 & Pickering 2015a). Raised walking platforms or boardwalks reduce weed dispersal, track

erosion, vegetation damage and habitat fragmentation (Ballantyne & Pickering 2015a; Hill & Pickering 2006).

The popularity of the Coast Track continues to increase with walker numbers doubling in the last 5 years and currently estimated at over 250,000 per year. Many sections of the track have recently been upgraded, including the installation of boardwalks to reduce erosion, and these works will continue. Boardwalks may be installed on other tracks with high visitation and high soil erodibility where appropriate.

NPWS will seek to close the current network of illegal and informal tracks by guiding visitors to the established bushwalking track network.

The provision of any new walking tracks is limited by the potential impact on the parks' environmental and cultural values. No additional walking tracks will be created in Zone 1 or Zone 2 other than necessary realignments of existing tracks to protect natural or cultural heritage values or the creation of short connecting tracks (e.g. to provide loop tracks or connections to public transport). To protect park values and improve visitor safety a section of the Coast Track may be realigned to traverse Garie Headland. To improve visitor circulation and protect park values, new tracks and track realignments may be constructed in Zone 3 visitor precincts in accordance with precinct or master plans for these areas.

Three new connections to the existing walking track network (Figure 2) may be constructed to provide alternative walking experiences, reduce the current pressure and overcrowding on the Coast Track and protect environmental values. These new connections will support access from train stations to the walking track network and will link the western section of Royal National Park to coastal areas. Completion of these new connections will expand the opportunities for multi-day walking routes (Table 6) with walkers able to start in the western section of the park (accessible by train from Loftus or Waterfall stations) and continue in an easterly direction to link with the Coast Track. This offers different experiences for visitors who will be able to enjoy multi-day walks through inland areas of the parks and the coast. Camping areas to support multi-day walks will be located to minimise environmental impacts and to ensure access for maintenance is possible (see section 3.3).

Photo 19 New board walk on the Coast Track, Royal National Park. David Croft/DPE

Table 6 Multi-day walking tracks and camping locations

Walk	Track names	Distance	Grade	Potential camping areas
Bundeena – Otford	Coast Track	24 km	3–4	Mowlee Ridge, Wattamolla, Garie
Waterfall – Otford	Couranga, Walumarra and Coast Track	26 km	4–5	Garie
Waterfall – Bundeena	Couranga, Walumarra and Coast Track	28 km	3–4	Garie, Wattamolla, Mowlee Ridge
Loftus – Otford	Winifred Falls Trail, Marley Track and Coast Track	35 km	4–5	Winifred Falls, Mowlee Ridge, Garie
Loftus – Bundeena	Winifred Falls Trail, Marley Track and Coast Track	20 km	3–4	Winifred Falls, Mowlee Ridge

Additional toilet facilities are required in some areas to support the large number of people using the walking track network, and to protect the surrounding environment. Any new toilets will be located near walking tracks and management trails to facilitate maintenance. The location of any new facilities with be consistent with the visitor management zoning.

3.4 Cycling and mountain biking

Cycling and mountain biking are growing in popularity in the parks. In accordance with the NPWS *Cycling Policy* (NPWS 2020a) and the *Sustainable Mountain Biking Strategy* (OEH 2011) cycling is permitted on park roads and management trails throughout the parks and on designated and signposted multi-use tracks in limited areas in the parks. Cycling and mountain biking are not permitted on designated walking tracks or off track.

Under the previous plan of management (NPWS 2000), mountain biking was only permitted on park roads and management trails throughout the parks. In response to significant growth in the parks' popularity for mountain biking, a small network of authorised mountain bike tracks was trialled in the Temptation Creek and East Heathcote areas of Royal National Park from 2002. Following this trial, an audit of the tracks and trails being used for mountain biking was undertaken (DirtArt 2015), tracks suitable for ongoing mountain biking use were identified, and a proposed mountain biking network was released for public review via a discussion paper (OEH 2017b). After consideration of public comments, an updated audit of tracks (DirtArt 2020) and a preliminary environmental assessment which included assessment using the *DECCW (2011) Sustainability assessment criteria for visitor use and tourism in New South Wales national parks* to identify the Zone 2 areas and a multi-criteria assessment analysis (outlined in the Royal Parks Mountain Biking Plan) to assess all the tracks, NPWS has prepared the *Royal National Park, Heathcote National Park and Garawarra State Conservation Area – Mountain Biking Plan* which identifies a proposed network of tracks designated for mountain biking together with strategies for managing this activity. The mountain biking plan has been informed by consultation over many years with mountain bike interest groups, conservation groups, park neighbours and other interested groups and individuals and considers environmental, cultural and visitor needs. It is consistent with all NPWS policies and strategies related to cycling and mountain biking

3.4.1 Management considerations and opportunities

NPWS is committed to providing a diversity of cycling opportunities in the parks in environmentally and culturally appropriate locations. Research has shown that, when

mountain bike networks are designed and managed appropriately, the natural and cultural values of the parks can be protected (Pickering et al. 2010). However, careful consideration must be given to track design, location, soil type, cultural values and threatened species and communities (Burgin & Hardiman 2012).

Mountain biking is permitted on park roads and management trails throughout the parks. Opportunities for mountain biking on tracks will be provided on designated and signposted tracks (as detailed in the mountain biking plan) in the Zone 2 areas of Temptation Creek, East Heathcote and Helensburgh and Heathcote National Park link zone (see Figure 4). These tracks will generally be dual direction and designated as multi-use tracks which allow for walking and cycling. Subject to environmental and suitability assessment, a small number of existing walking tracks may be designated for multi-use to provide cycling connections, consistent with the mountain biking plan. Tracks under current consideration include Bundeena to Maianbar, and Temptation Creek to Audley.

Photo 20 Mountain bike rider on Loftus Loop Trail, Royal National Park. Andrew Richards/DPE

The network detailed in the mountain biking plan has been designed to protect cultural and environmental values of the parks. The network of tracks will be implemented subject to environmental impact assessment and available resources. The network must also comply with any additional requirements identified in any NPWS policies and strategies related to cycling and mountain biking

The mountain biking plan details requirements for track design, maintenance and closure and rehabilitation of informal tracks that are not part of the network. Volunteer organisations have indicated a willingness to have stewardship of the network. Partnerships with these organisations will be fostered.

3.5 Other recreational activities

The parks are popular for a range of other recreational activities, including boating, swimming, surfing, fishing, geocaching and horse riding.

There are several waterways adjacent to and within the parks that are popular for watercraft. Powered watercraft are not permitted south of the bridge in Cabbage Tree Basin, or upstream of the Audley weir.

There is a history of horse riding in parts of Garawarra State Conservation Area. The *Strategic Directions for Horse Riding in NSW National Parks* (OEH 2012b) provides a framework for improving riding opportunities in New South Wales. The strategy provides for horse riding opportunities to be provided in appropriate locations, primarily on established management trails. Horse riding is permitted on a small number of designated management trails and tracks in Garawarra State Conservation Area (Figure 9).

Drones (and similar devices) are increasingly used within national parks. These drones are primarily used to take aerial images, but also as a form of recreation. Drones can impact the recreational and ecological values of the parks. Drone noise can impact both visitor enjoyment and wildlife behaviour (Vas et al. 2015; Lyons et al. 2017). The use of drones within national parks and state conservation areas is guided by the NPWS *Drones in Parks Policy* (NPWS 2019).

Geocaching and virtual geocaching occasionally occur in some areas of the park. Geocaching is an activity where participants use a global positioning satellite receiver to find the location of the cache. Geocachers must obtain written consent from NPWS to place a physical cache in the parks.

Swimming and surfing are popular activities at the beaches along the coastline of Royal National Park. The beaches and swimming locations present a number of hazards for swimmers and most of the beaches are not patrolled. Visitors need to use caution at all beaches, but particularly at Garie, Marley and Wattamolla due to rips and their feeder currents. NPWS works with and supports Surf Life Saving Sydney and its volunteers at the Garie, Burning Palms and Era surf clubs, to assess and manage risks at these coastal locations.

The beaches and rock platforms in Royal National Park are popular for fishing. Fishing is permitted in most areas of the park subject to licensing requirements under the Fisheries Management Act and requirements under the *Rock Fishing Safety Act 2016*.

3.5.1 Management considerations and opportunities

South West Arm Creek is a serene waterway in a natural setting, providing opportunities for boat users to appreciate the natural environment, away from the busier, more active boating locations in Port Hacking. Cabbage Tree Basin is a shallow waterway with significant environmental values. Boating activity in these areas is regulated by the relevant waterway management agency, while NPWS has the responsibility for the management of the seabeds, including any structures attached to them (such as moorings).

Inappropriate use and overuse of South West Arm Creek has the potential to disturb the character of the waterway and impact the significant environmental values. A small number of publicly accessible boat moorings exist in South West Arm Creek (one mooring in Gooseberry Bay and 5 moorings further upstream in South West Arm Creek). The provision and management of moorings in the national park will consider environmental impacts and visitor safety. The establishment of moorings is administered by the relevant waterway management agency and is subject to environmental impact assessment and relevant approval processes including consideration of use and demand in the context of the broader Port Hacking area. South West Arm Creek is within the restriction zone for personal

watercraft meaning they must not be driven in an irregular manner within 200 metres of the shoreline. Effectively, personal watercraft in this area must only be operated generally in a straight line and in accordance with speed restrictions.

Photo 21 Kayak on South West Arm Creek, Royal National Park. John Spencer/DPE

Cabbage Tree Basin has significant environment values that are threatened by recreational activities, including the use of personal watercraft. Personal watercraft are not permitted in Cabbage Tree Basin. NPWS will work with the relevant waterways management agency to regulate activities on the waterways in the park to maintain recreational opportunities and to manage and impacts on environmental values.

Basic facilities allow for small boats to be launched off the beach at Bonnie Vale. These facilities are used by residents of Bundeena and Maianbar for emergency rescues and evacuations and by park visitors. Due to increased use and environmental management issues, the boat launching facility has been reconfigured.

Horse riding will be permitted along designated management trails and tracks in the western section of Garawarra State Conservation Area (see Figure 9). One section of track currently authorised for horse riding is very steep and eroded. It is proposed to create an alternative route of a more suitable grade, making use of an existing informal track and a short section of new track. When the new track is available the previous route will be closed to horse riding. Horse riding in other areas of the parks is not permitted and will be managed accordingly.

Figure 12 Horse riding routes in Garawarra SCA

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 metres of people and they must not be flown over or above people, including at beaches, parks, ovals and roads. Due to the high visitation in the parks, the recreational use of drones in the parks is restricted, and not permitted in designated drone exclusion areas. Information about any drone exclusion areas that apply in the parks is available on the NPWS website. Commercial use of drones in the parks may be permitted with written consent from NPWS.

Abseiling and rock climbing are not permitted in the parks. There is a very high safety risk from these activities on the erodible sandstone. Rock climbing and abseiling can also damage vegetation and rock features.

3.6 Educational activities and scientific research

The parks provide educational opportunities for primary age students through to research opportunities for PhD students. The proximity of the parks to Sydney and Wollongong presents an outstanding opportunity for general environmental education.

The Department of Education's Royal National Park Environmental Education Centre provides a range of environmental education activities. This centre is the most heavily used environmental education centre in New South Wales, catering to approximately 7,000 students and teachers each year from schools in the south-eastern part of the Sydney metropolitan area. Activities run by the centre are fully booked every year.

Additionally, NPWS runs an education program in Royal National Park catering for school-aged students. This program educates young generations about the importance of the

environment and cultural values, with programs including cultural appreciation and scientific studies for senior science students. Schools also organise their own excursions in the parks.

Photo 22 Discovery activity, Royal National Park. Peter Taseski/DPE

The diversity of species and habitats, availability of data collected over many years and accessibility of the parks to many research institutions means these parks are highly valued by scientists and teachers. Utilisation of the parks for scientific research has been a feature of its history and is an ongoing and expanding use today.

3.6.1 Management considerations and opportunities

Educational services are a major visitor attraction to the parks and increase community awareness of management issues and appreciation of nature. Support of educational programs will continue to be a priority for the parks.

There are opportunities to improve the interpretation of the parks' natural and cultural values and make this information more accessible to park visitors. Opportunities include park signage, tours and programs and the use of digital technologies.

The parks' accessibility to scientific research institutions in Sydney and Wollongong, diverse cultural heritage and variety of natural habitats result in scientists regularly applying for access for scientific research and demonstration purposes. Scientific organisations are encouraged to collect data and undertake research to inform NPWS about park values and support management of the parks. Formal agreements are required between researchers and NPWS and data must be provided to NPWS.

3.7 Group and commercial visitor activities

Organised group activities can provide opportunities for people who would otherwise not be able to experience the parks, and can promote environmental understanding and support for conservation. Commercial tourism increases the opportunity for public participation in nature-based activities and provides opportunities for professional instruction in the safety and minimal impact aspects of various recreational pursuits. Large groups can, however, impact on the environment and other park visitors.

Non-commercial, large-scale organised group activities in the parks may require consent under the National Parks and Wildlife Regulation. All commercial operators must be licensed and generally this is managed via a Parks Eco Pass. All activities must be consistent with the management principles of the parks and be compatible with the natural and cultural heritage values of the parks. Applications are assessed in accordance with relevant NPWS policies and procedures.

A number of commercial tourism operators are licensed to operate in the parks, providing a range of tours, recreational and educational activities, and visitor services such as a shuttle bus between transport links and major precincts in the parks. Several NPWS buildings are leased to commercial operators for the provision of visitor services and there are further opportunities for commercial visitor facilities and services (see section 4).

3.7.1 Management considerations and opportunities

There are opportunities for additional commercial tourism operations in the parks, providing tours, recreational and educational activities, and visitor services. There are particular opportunities for cultural tourism to be developed and operated by the Aboriginal community (see also 3.1.1). Storage facilities may be required to support some operations and NPWS will consider enabling these facilities at Zone 2 visitor nodes and within Zone 3 visitor precincts.

3.8 Volunteer activities

The NPWS values, encourages and actively promotes opportunities for people to volunteer in the parks. A range of volunteers continue to make significant contributions to wildlife conservation and the management of other park values (see Box 1) and there is potential for these programs to expand through enhanced volunteer recruitment and training. Volunteers associated with the surf clubs in the parks provide a significant service to park visitors.

4. Park infrastructure and services

4.1 Infrastructure in the parks

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 and sewage mains, toilets, work depots and associated 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.

Building assets

Royal National Park contains a significant number of building assets, including buildings used for park management purposes; and a range of buildings currently used (or with the potential to be used) for facilities for park visitors.

Park management operations are coordinated from the NPWS Royal Area Office and field depot located off Farnell Avenue in Royal National Park, and a smaller field depot located in at Bonnie Vale. Other supporting infrastructure includes a vehicle compound and material storage compounds.

There are a number of houses or residences of various types, uses and history in Royal National Park. In general, these houses were built to accommodate staff working in the park. These accommodation assets have been assessed using performance and relevance measures, providing an evidence-base for the development of short-stay accommodation (see section 3.2) and implementation of prioritised maintenance programs to manage the assets (NPWS Asset Stewardship Strategy).

Other major NPWS building assets in Royal National Park include the Audley Dance Hall, Audley Boatshed and the Garie Surf Club. Several buildings are already leased to provide visitor services and other buildings have the potential to be leased for a range of visitor services. Purposes that may be considered include all purposes identified in Section 151A of the National Parks and Wildlife Act, with preferred purposes being those listed in Table 7.

Table 7 Building infrastructure assets in Royal National Park

Building	Current purpose	Proposed/potential purpose
Audley boatshed	Boat and bicycle hire facility	Facility to enable recreational activities; function centre
Audley Dance Hall and Commonwealth Pavilion	Restaurant, cafe or kiosk and function centre	Restaurant, cafe or kiosk and function centre; educational activities
Bonnie Vale cabins		To be progressively removed
Burning Palms Rangers Hut	NPWS management use	NPWS management use
Burning Palms Surf club	Surf life saving club	Surf life saving club
Carlotta Residence	Staff accommodation	Staff accommodation

Building	Current purpose	Proposed/potential purpose
Cottage on Simpson's Hotel site	No current use	Potential visitor accommodation; cafe or kiosk; education or cultural centre
Cottages (see Table 5)	Visitor accommodation	Visitor accommodation
Garawarra Farm	Not currently leased	Aboriginal cultural activities; educational activities
Garie Surf Safety Centre (Buildings 1 and 2)	Surf life saving club	Surf life saving facilities; accommodation for park visitors; restaurant, cafe or kiosk; conference and training facility; caretaker accommodation
Gogerleys Cottage	No current use	
RFS Sutherland Fire Control Centre (East Heathcote)	Fire control centre	Fire control centre
South Era Surf club	Surf life saving club	Surf life saving club
Telford Recreation Centre	Recreational and educational activities; conference centre	Recreational and educational activities; conference centre
Wattamolla kiosk	Cafe or kiosk	Cafe or kiosk

Other infrastructure and services

The Sydney Water supply network provides water to the NPWS office and workshop, the Audley and Bonnie Vale precincts and the picnic area at Warumbul. Water in other locations in the parks, including Garie and Wattamolla precincts, is supplied by tank water from local catchments. The potability of these local water supplies cannot be guaranteed. The Audley complex and Bonnie Vale are connected to town sewer. All other areas in the parks have on-site sewage treatment plants, compositing toilets or portable toilets with waste taken out of the park.

The NSW electricity grid is the primary source of power for the parks (see section 5) with overhead powerlines entering Royal National Park alongside Farnell Avenue and supplying the workshop, NPWS office and Audley. Bonnie Vale Camping Area is supplied by overhead powerlines that run between Maianbar and Bonnie Vale. Generators provide power at Garie Surf Life Saving Centre and Wattamolla. The Youthworks camps at Deer Park and Rathane are powered via underwater cables from the north side of Port Hacking.

Waste removal in the parks is a significant management cost. Visitors are encouraged to take all waste out of the parks.

Public roads provide access to key entry points for the parks and a number of locations in Royal National Park (see Figure 2). Sealed park roads provide access to additional key destinations in Royal National Park including areas in the Audley precinct, the Bonnie Vale camping area, Wattamolla (Wattamolla Road), Garie (Garie Road) and the Youthworks camps (Warumbul and Rathane roads) at Gogerleys Point. An unsealed park road provides access to Garawarra Farm.

A network of management trails provides management access across the parks (see Figure 2). Vehicle use of management trails is only available for purposes authorised by NPWS, including uses authorised under section 153 of the National Parks and Wildlife Act. Gates provide access to management trails for park management and other authorised purposes and allow for closure of sections of the park as required. Entry to the management trail

network is mostly via public roads, or secure access via Crown land. A reserve access strategy has been prepared to pursue legal access to the parks where required.

Boundary management trails are critical in the management of fire in the parks and provide strategic access points to neighbouring properties and facilitate on-ground works. Management trails in the parks are regularly maintained by grading, regrowth spraying, and erosion and sediment control works.

Toll boxes at park entry points and key destinations support collection of park-use fees and provision of visitor information in Royal National Park.

There are several disused quarries in Royal National Park that are closed for extraction. Bush regeneration has occurred at several of the sites.

A number of helipads, generally cleared grassy areas, are maintained in the parks for helicopter access during fire management and emergency situations. The former sports field in Royal National Park at Waterfall was previously licensed to Sutherland Shire Council but is now used as a helipad for fire management and emergency services purposes.

Dam infrastructure exists at Lake Toolooma on Heathcote Creek in Heathcote National Park, Goondera Brook in Royal National Park and Wilson's Creek in Garawarra State Conservation Area.

Photo 23 Lake Toolooma in Heathcote National Park. John Spencer/DPE

4.1.1 Management considerations and opportunities

Many of the management trails in the parks are identified as strategic or tactical fire trails. Under the *Rural Fires Act 1997* the relevant Bush Fire Management Committees' fire access and fire trail plans identify access requirements for fire suppression and management purposes, including on lands managed by NPWS. In implementing works to establish and maintain trails at the prescribed fire trail standards, NPWS will ensure these works are carried out in a manner that minimises impacts on the parks' environment, including their

natural and cultural heritage values. The construction of any new trails identified in these plans will require an appropriate level of heritage and environmental assessment and will be subject to the requirements of the National Parks and Wildlife Act.

The site of a former NPWS workshop at Audley provides powered, secure storage and road access and is well located to service management operations and may also provide opportunities to support commercial tour operations in Audley and surrounds (e.g. for storage facilities).

There is a fenced compound near the boundary of the park at Loftus. The compound is within the designated mountain biking area and is identified as a potential Zone 3 visitor node (Temptation Creek) with potential for intensification of visitor use and the provision of visitor facilities. This area is potentially accessible from the Princes Highway and may be investigated for the provision of visitor facilities and services including an alternative access to the park, amenities such as toilets and car parking, and facilities to support commercial tourism operations (e.g. storage facilities and bus pick up/set down). Use of the area for these purposes would be subject to environmental impact assessment and detailed precinct planning.

Due to their proximity to large centres of population, the parks are vulnerable to vandalism and other criminal activities, particularly dumping and burning of stolen cars. Large sections of the park have been closed to vehicles at night for many years. Vandalism to gates and cutting of boundary fences is an issue for the parks as it facilitates unauthorised access, which can impact on park values and neighbouring property and assets.

Vehicle entry fees to Royal National Park are currently collected at toll booths at the main entrances to the park. There is potential to use other technologies and locations for the collection of vehicle entry fees and modify or remove this infrastructure, although there are significant limitations to the available technology due to the lack of mobile phone reception in many areas of the park. Toll booths may need to remain for assisting with visitor management and safety during peak times and fire management operations.

Sea level rise and coastal erosion pose a risk of damage to infrastructure in low-lying coastal areas, such as Bonnie Vale. Locations, assets and values at risk from coastal erosion and sea level rise will be identified and assessed, and appropriate management actions will be determined. Precinct plans for any of the coastal visitor precincts will consider coastal protection works and will apply risk management principles in the design and location of any new and upgraded facilities and amenities. Environmentally friendly bank stabilisation measures will be applied where necessary to protect eroding riparian areas.

Photo 24 Facilities at Bonnie Vale are threatened by sea level rise. John Spence/DPE

5. Non-park infrastructure and services

The parks contain infrastructure and other assets, owned and operated by other organisations or individuals, that are not related to use or management of the parks. This includes public utility infrastructure (e.g. transmission lines, water pipelines and sewer mains), weather stations, navigational facilities, a fire control centre and the coastal cabins (Appendix G). Access is required for the use, operation, maintenance and repair of this infrastructure. A range of non-NPWS uses also occur in the parks.

5.1 Non-NPWS infrastructure

TransGrid (the operator and manager of the NSW high voltage transmission network) has a high voltage electricity transmission line traversing the eastern side of Heathcote National Park from north to south.

Network operators Ausgrid and Endeavour Energy have powerlines traversing the parks. Endeavour Energy powerlines traverse Heathcote National Park (east of the TransGrid high voltage line) and cross the Garawarra State Conservation Area. Ausgrid overhead powerlines run adjacent to Farnell Avenue in Royal National Park, supplying the NPWS workshop, office and the Audley precinct. The powerlines are underground in the Audley precinct. Ausgrid powerlines supply the Bonnie Vale precinct.

There are powerlines owned by Railcorp (supplying the main southern train line) in Royal National Park and Garawarra State Conservation Area.

There are several telecommunications facilities in the parks, some of which are co-located on existing or NPWS-owned structures (e.g. facility at Garawarra Farm); while others are independent structures (e.g. Telstra telecommunications tower at Grays Point). The communication facilities include commercial mobile phone and data providers as well as government radio communications sites used by agencies such as Police, Ambulance and Rural Fire Service. The owner of a telecommunications structure is responsible for maintaining an asset protection zone around the compound if required. A telecommunication tower at Waterfall on Railcorp land is accessed via management trails in Royal National Park.

A major transport corridor of the Princes Highway, Princes Motorway (M1) and railway separates Heathcote National Park from Royal National Park and Garawarra State Conservation Area. Public roads provide access to park entry points in each of the parks. The main road entrance to Royal National Park is Farnell Avenue in the north, with other entrances at Waterfall in the west and near Otford in the south. Six public roads dissect the park with Farnell Avenue, Sir Bertram Stevens Drive, Lady Wakehurst Drive and McKell Avenue all maintained by Transport NSW, while Bundeena Drive and Maianbar Road are maintained by Sutherland Shire Council. Wattamolla Road and Garie Beach Road are part of the national park but are maintained by Transport NSW.

Garawarra State Conservation Area is traversed by Cawleys Road, which crosses the Princes Motorway via a bridge and provides access for park management vehicles and NSW Trains to the Illawarra Railway.

Sydney Water maintains a road (known as the Pipeline Road) through Heathcote National Park to service its water pipeline coming from Woronora Dam. There is currently no formal easement for this road or for the pipeline. A short road, running off Pipeline Road, provides access to the Civil Aviation Authority's air navigation facility at Sarahs Knob.

The Rural Fire Service's Sutherland Fire Control Centre at East Heathcote occupies land in Royal National Park under a lease from NPWS.

Several trig stations (fixed surveying points) are located in the parks, including Garie Trig in Royal National Park which is accessible via a park management trail.

5.1.1 Management considerations and opportunities

All non-NPWS infrastructure and use of the parks by third parties requires authorisation to lawfully occupy and use the land. Generally, this authorisation is managed by leases, licences and easements. These instruments define the minimum requirements for ensuring the protection of the natural and cultural values of the parks. NPWS maintains a public register which identifies leases, easements and rights of way granted under the National Parks and Wildlife Act. The register also lists licences granted under section 153D of this Act.

New infrastructure can only be constructed on park pursuant to authorisation under the National Parks and Wildlife Act (e.g. sections 153 and 153D) and following an environmental impact assessment under the *Environmental Planning and Assessment Act 1979*.

NPWS will seek removal of all redundant infrastructure and rehabilitation of disturbed sites and access roads that are no longer required, except where other relevant considerations, such as environmental impact, justify leaving them in situ.

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

NPWS has protocols in place with the main infrastructure owners (TransGrid, Ausgrid, Endeavour and Sydney Water) that govern maintenance of their infrastructure, to ensure environmental impact is minimised. These protocols establish agreed methods of maintenance and a streamlined approval process. Entities without a protocol are required to consult with NPWS to determine whether an environmental impact assessment needs to be completed before carrying out maintenance works. Operators 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.

Mobile phone service is poor in many areas within the parks, including Audley and areas along the coast. Establishment, maintenance and operation of telecommunications infrastructure has the potential to adversely impact natural and cultural values and visual amenity. New telecommunications facilities can only be constructed on reserved land where specific statutory criteria in the National Parks and Wildlife Act have been satisfied (including the requirement that there is no feasible alternative location outside of park).

The public roads traversing the parks require regular maintenance. It is often necessary to stockpile materials and equipment to support these works in accessible roadside areas that may be within the park. When necessary, NPWS will enable temporary storage of road maintenance materials and equipment in suitable areas in the parks.

Where existing roads occur outside of defined road reserves or easements, NPWS will work with the relevant local council or road management agency to resolve the discrepancy.

5.2 Non-NPWS uses

Trains to Royal National Park station were discontinued in 1991. Volunteers of The South Pacific Electric Railway Co-Operative Society operate the Sydney Tramway Museum at Loftus and run trams to the park along the disused railway line. The tram service, which commenced in May 1993, usually operates on Wednesdays and Sundays and occasional extra days.

There are parcels of non-NPWS land, some with infrastructure, that are completely or partially surrounded by the parks or have no other feasible access to their properties other than through NPWS lands. These properties include the water reservoir off Maianbar Road (managed by Sydney Water), a small number of residential properties adjoining Royal National Park, and a former cemetery on Crown land in the recent addition to Heathcote National Park which is managed by Wollongong Council (see Appendix G).

Six hectares of Heathcote National Park is within the 'Woronora Special Area'. These special areas are declared under Schedule 1 of the *Water NSW Act 2014* to protect drinking water supplies. WaterNSW and NPWS jointly manage the special areas guided by the *Special Areas Strategic Plan of Management 2015* which outlines the agency's respective responsibilities (WaterNSW & OEH 2015) (see also 1.1.1).

Exploration for minerals and petroleum (including gas), as well as mining and petroleum production, are permissible uses within state conservation areas. A coalmining lease currently applies over part of Garawarra State Conservation Area.

Photo 25 Pipeline Trail in Heathcote National Park. Nick Cubbin/DPE

5.2.1 Management considerations and opportunities

There are opportunities for additional commercial tourism operations in the parks, providing tours, recreational and educational activities, and visitor services (see 3.7.1).

Access via the parks to properties completely or partially surrounded by the parks, or where there is no other feasible access, is required. NPWS will facilitate access across NPWS land in accordance with Part 12 of the National Parks and Wildlife Act.

NPWS will work with WaterNSW to manage access to NPWS estate where it affects the Woronora Special Area and its managed access roads, including the Woronora Access Road, to ensure access is in keeping with management of the Woronora Special Area.

NPWS and the relevant mining authority work together to ensure that exploration and production proposals in state conservation areas comply with all statutory requirements, including any necessary environmental impact assessments and approvals. WaterNSW and NPWS, as joint managers of the Special Area, work within the Department of Planning framework to provide input into decision making for mining activities.

Lands categorised as state conservation areas are reviewed by the Minister for Environment and Heritage, in consultation with the Minister responsible for the *Mining Act 1992*, every 5 years. These reviews aim to assess whether there is still a need for mining or exploration activity. If there is no longer a need, a state conservation area can be upgraded and recategorised as national park. A review of state conservation areas occurred in 2020 and no change was recommended to the categorisation of Garawarra State Conservation Area.

6. 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

- *National Parks and Wildlife Act 1974* and NPW Regulation
- *Environmental Planning and Assessment Act 1979*
- *Heritage Act 1977*
- *Biodiversity Conservation Act 2016*
- *Biosecurity Act 2015*

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*
- Building Code of Australia

NPWS policies and strategies

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

- Park management policies – www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/park-policies
- Regional pest management strategies – www.environment.nsw.gov.au/topics/animals-and-plants/pest-animals-and-weeds
- Fire management strategies - www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/fire/fire-management-strategies

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

Appendix B Vegetation formations and communities

NSW Formation	NSW Vegetation Class	NSW Plant Community Type	Threatened ecological community	Area (ha)
Dry sclerophyll forests	Coastal Dune Dry Sclerophyll Forest	Coastal Sand Apple – Bloodwood Forest		45
		Coastal Sand Bangalay Forest	Bangalay Sand Forest of the Sydney Basin Bioregion	12
	Bangalay Sand Forest of the Sydney Basin Bioregion	Coastal Enriched Sandstone Dry Forest		315
		Sydney South Exposed Sandstone Woodland		4,365
		Coastal Sandstone Foreshores Forest		6
		Coastal Sandstone Riparian Forest		128
		Coastal Sandstone Gully Forest		4,399
		Southern Sydney Sheltered Forest	Southern Sydney Sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	670
		Sydney Ironstone Bloodwood – Silvertop Ash Forest	Duffys Forest Ecological Community in the Sydney Basin Bioregion**	202
		Sydney Hinterland Exposed Sandstone Woodland		1
Forested wetlands	Coastal Floodplain Wetlands	Coastal Alluvial Bangalay Forest	River-flat Eucalypt Forest on Coastal Floodplains of the Sydney Basin Bioregion**	18
		Estuarine Swamp Oak Forest	Swamp oak floodplain forest of the Sydney Basin Bioregion	5
		Coastal Swamp Paperbark – Swamp Oak Scrub	Swamp oak floodplain forest of the Sydney Basin Bioregion	5

NSW Formation	NSW Vegetation Class	NSW Plant Community Type	Threatened ecological community	Area (ha)
	Coastal Swamp Forests	Riverflat Paperbark Swamp Forest	Swamp sclerophyll forest on Coastal Floodplains of the Sydney Basin Bioregion	1
	Eastern Riverine Forests	Coastal Sandstone Riparian Scrub		54
Freshwater wetlands	Coastal Freshwater Lagoons	Coastal Freshwater Wetland	Sydney freshwater wetlands in the Sydney Basin Bioregion	20
		Estuarine Reedland	Swamp oak floodplain forest of the Sydney Basin Bioregion	5
		Coastal Sand Swamp Scrub	Sydney freshwater wetlands in the Sydney Basin Bioregion	1
		Coastal Lagoon Fringing Scrub	Sydney freshwater wetlands in the Sydney Basin Bioregion	10
	Coastal Heath Swamps	Coastal Upland Damp Heath Swamp	Coastal Upland Swamp	83
		Coastal Upland Wet Heath Swamp	Coastal Upland Swamp	134
Grasslands	Maritime Grasslands	Beach Spinifex Grassland		0.5
		Coastal Headland Grassland	Themeda Grassland on seacliffs and coastal headlands in the Sydney Basin Bioregion	115
Heathlands	Coastal Headland Heaths	Coastal Headland Clay Heath		27
		Coastal Sand Tea-tree – Banksia Scrub		17
		Coastal Clifftop Marsh		0.5
	Sydney Coastal Heaths	Coastal Foredune Wattle Scrub		16
		Coastal Headland Banksia Heath		117
		Coastal Headland Cliffline Scrub		89
		Coastal Sandstone Heath – Mallee		5,282
		Coastal Sandstone Rock Plate Heath		60

NSW Formation	NSW Vegetation Class	NSW Plant Community Type	Threatened ecological community	Area (ha)
		Sydney Hinterland Dwarf Apple Heath — Woodland		49
	Wallum Sand Heaths	Coastal Sandplain Heath	Eastern suburbs banksia scrub **	165
Rainforests	Littoral Rainforests	Coastal Dune Littoral Rainforest	Littoral Rainforest in the Sydney Basin Bioregion	4
		Coastal Escarpment Littoral Rainforest	Littoral Rainforest in the Sydney Basin Bioregion	23
		Coastal Headland Littoral Thicket	Littoral Rainforest in the Sydney Basin Bioregion	127
	Northern Warm Temperate Rainforests	Coastal Sandstone Gallery Rainforest		6
		Coastal Warm Temperate Rainforest		269
	Subtropical Rainforests	Illawarra Escarpment Subtropical Rainforest	Illawarra Subtropical Rainforest in the Sydney Basin Bioregion	2
Saline wetlands	Mangrove Swamps	Estuarine Mangrove Forest		20
	Saltmarshes	Estuarine Saltmarsh	Coastal saltmarsh in the Sydney Basin Bioregion	12
	Seagrass Meadows	Seagrass Meadows		5
Wet sclerophyll forests	North Coast Wet Sclerophyll Forests	Coastal Escarpment Littoral Rainforest		1
		Coastal Enriched Sandstone Moist Forest		35
		Coastal Sand Littoral Forest	Kurnell Dune Forest in the Sutherland Shire	6
		Illawarra Escarpment Bangalay-Banksia Forest		220
		Illawarra Escarpment Blackbutt Forest		1011
		Illawarra Escarpment Blue Gum Wet Forest		131

NSW Formation	NSW Vegetation Class	NSW Plant Community Type	Threatened ecological community	Area (ha)
		Coastal Flats Tall Moist Forest		42
	Northern Hinterland Wet Sclerophyll Forests	Coastal Shale-Sandstone Forest		138
		Sydney Foreshores Shale Forest		175
		Sydney Turpentine – Ironbark Forest	Sydney Turpentine – Ironbark forest	6

Source: OEH 2016a,b.

** Status in the parks is unconfirmed.

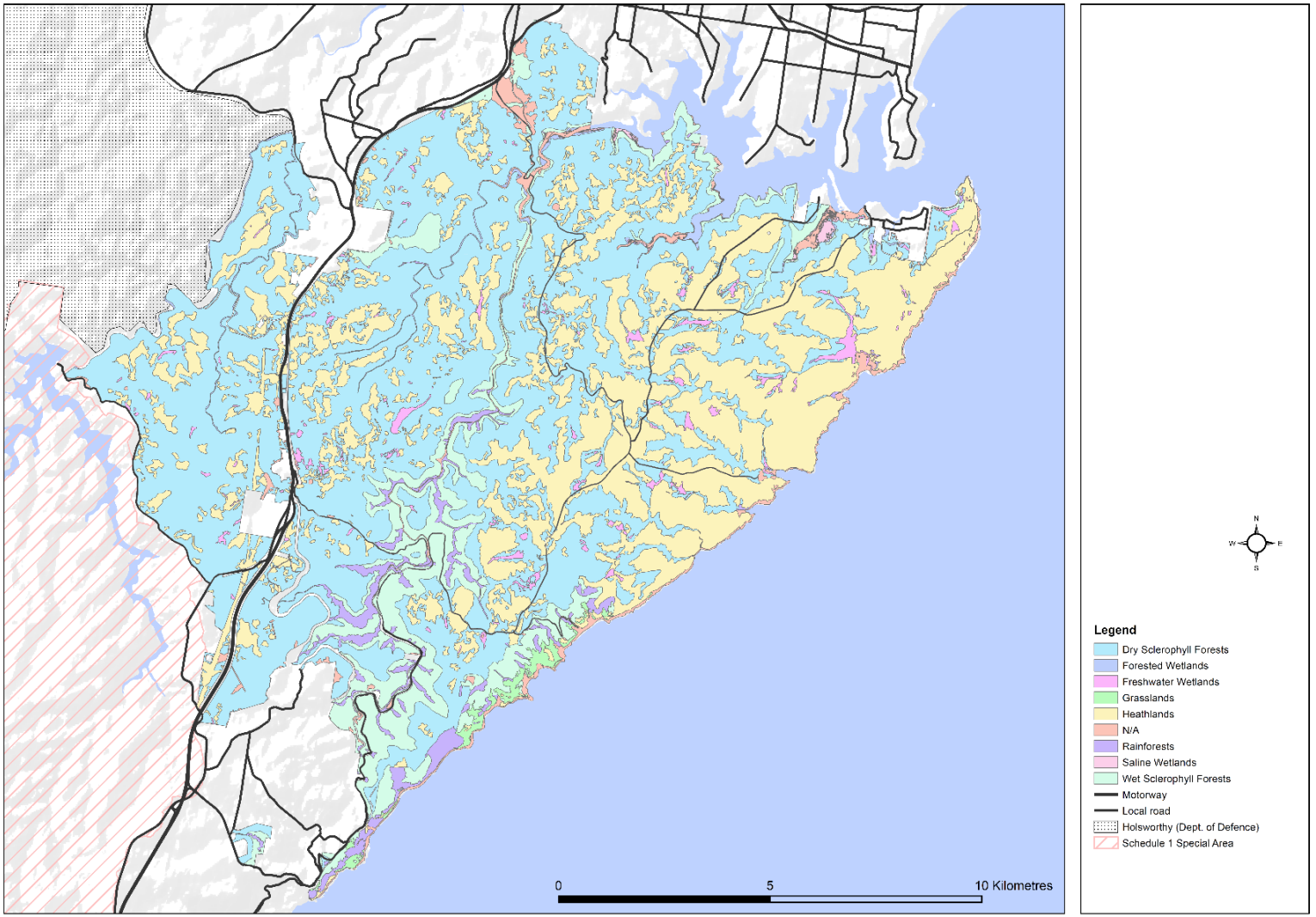

Figure 13 Vegetation formations in the parks

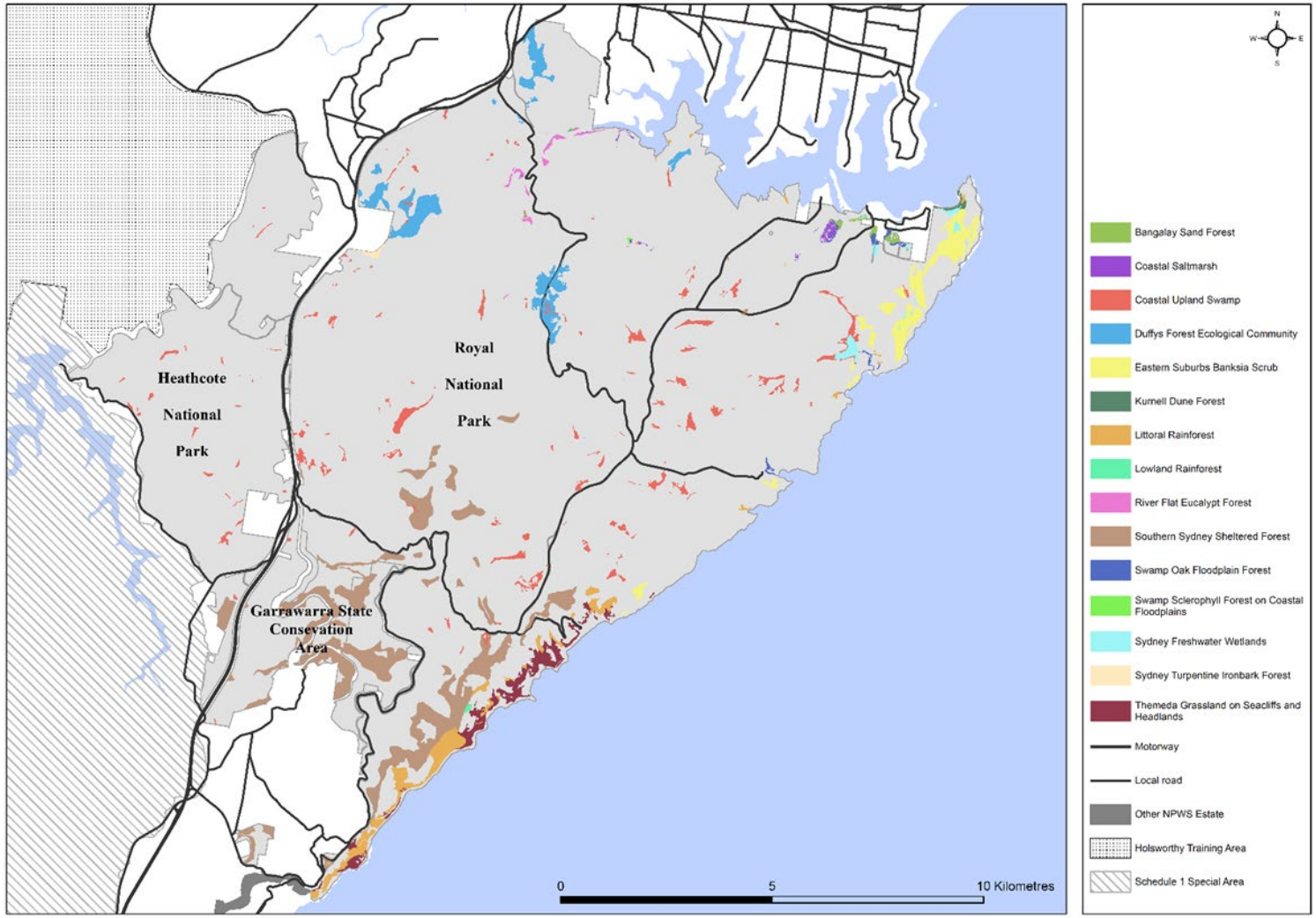

Figure 14 Threatened ecological communities in the parks

Appendix C Scientific plant and animal names

The following table is not a comprehensive list of all species known from the parks, rather it shows the scientific name for the common plant and animal names used in this plan. Scientific names for threatened fauna are listed in Appendix D, and feral animals and weeds are listed in Appendix F.

Common name	Scientific name
Plants	
Bauer's midge orchid	*Genoplesium baueri*
Buttercup doubletail	*Diuris aequalis*
Bynoe's wattle	*Acacia bynoeana*
Cabbage tree palm	*Livistona australis*
Camfield's stringybark	*Eucalyptus camfieldii*
Catalpa oak*	*Catalpa bignonioides*
Coast banksia	*Banksia integrifolia*
Coast groundsel	*Senecio spathulatus*
Coastal rosemary	*Westringia fruticosa*
Coastal wattle	*Acacia longifolia*
Deane's paperbark	*Melaleuca deanei*
Grass tree	*Xanthorrhoea* sp.
Leafless tongue orchid	*Cryptostylis hunteriana*
Lilly pilly	*Acmena smithii*
Magenta lilly pilly	*Syzygium paniculatum*
Moreton bay fig*	*Ficus macrophylla*
Nettled bottlebrush	*Callistemon linearifolius*
Paddleweed	*Halophila* sp.
Prickly bush-pea	*Pultenaea aristata*
Red cedar*	*Toona ciliata*
Ribbonweed	*Zostera capricornia*
Round-leafed wilsonia	*Wilsonia rotundifolia*
Scrub turpentine	*Rhodamnia rubescens*
Strapweed	*Posidonia australis*
Thick-leaf star-hair	*Astrotricha crassifolia*
Thick-lip spider-orchid	*Caladenia tessellate*
Villous mint-bush	*Prostanthera densa*
Woronora beard-heath	*Leucopogon exolasius*
Animals	
Frogs	
Freycinet's frog	*Litoria freycineti*

Common name	Scientific name
Green and golden bell frog	*Litoria aurea*
Stuttering frog	*Mixophyes balbus*
Birds	
Beautiful firetail	*Stagonopleura bella*
Chestnut-rumped heathwren	*Calamanthus pyrrhopygius*
Eastern bristlebird	*Dasyornis brachypterus*
Noisy miner	Manorina melanocephala
Southern emu-wren	*Stipiturus malachurus*
Sulphur-crested cockatoo	*Cacatua galerita*
Tawny-crowned honeyeater	*Gliciphila melanops*
Tawny grassbird	*Megalurus timoriensis*
Mammals	
Common ringtail possum	*Pseudocheirus peregrinus*
Common wombat	*Vombatus ursinus*
Eastern horseshoe bat	*Rhinolophus megaphyllus*
Eastern quoll	*Dasyurus viverrinus*
Euro	*Osphranter robustus*
Feathertail glider	*Acrobates pygmaeus*
Large-footed myotis	*Myotis adversus*
Long-nosed bandicoot	*Perameles nasuta*
Mountain brushtail possum	*Trichosurus cunninghami*
Parma wallaby	*Macropus parma*
Platypus	*Ornithorhynchus anatinus*
Short-beaked echidna	*Tachyglossus aculeatus*
Southern myotis	*Myotis macropus*
Sugar glider	*Petaurus breviceps*
Swamp rat	*Rattus lutreolus*
Swamp wallaby	Wallabia bicolor
Insects	
Giant dragonfly	*Petalura gigantea*
Diseases and pathogens	
Chytrid fungus	*Batrachochytrium dendrobatidis*
Myrtle rust	Plant disease caused by the fungus *Austropuccinia psidii*
Phytophthora	*Phytophthora cinnamomi*

Common plant names from PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney, http://plantnet.rbgsyd.nsw.gov.au [05/08/16].

* Planted at Audley, Royal National Park.

Appendix D Threatened and significant animals

The following table lists threatened and significant animal species that have been recorded in the parks.

Common name	Scientific name	Status in parks	BC Act status	EPBC Act status
Frogs				
Giant burrowing frog	*Heleioporus australiacus*		V	V
Red-crowned toadlet	*Pseudophryne australis*		V	-
Reptiles				
Rosenberg's goanna	*Varanus rosenbergi*		V	-
Broad-headed snake	*Hoplocephalus bungaroides*		E	V
Birds				
Rose-crowned fruit-dove	*Ptilinopus regina*	ERV, DV	V	-
Black-browed albatross	*Thalassarche melanophris*		V	V
Black-winged petrel	*Pterodroma nigripennis*		V	-
Little shearwater	*Puffinus assimilis*		V	-
Australasian bittern	*Botaurus poiciloptilus*	SU	E	E
Black bittern	*Ixobrychus flavicollis*	SU	V	-
Spotted harrier	*Circus assimilis*		V	-
White-bellied sea-eagle	*Haliaeetus leucogaster*		V	C
Little eagle	*Hieraaetus morphnoides*		V	-
Square-tailed kite	*Lophoictinia isura*		V	-
Eastern osprey	*Pandion cristatus*		V	-
Sooty oystercatcher	*Haematopus fuliginosus*		V	-
Pied oystercatcher	*Haematopus longirostris*		E	-
Eastern curlew	*Numenius madagascariensis*		-	CE, C, J, K
Sooty tern	*Onychoprion fuscata*		V	-
Little tern	*Sternula albifrons*		E	C, J, K
Gang-gang cockatoo	*Callocephalon fimbriatum*		V	-
Little lorikeet	*Glossopsitta pusilla*		V	-
Swift parrot	*Lathamus discolor*		E	CE
Barking owl	*Ninox connivens*	PSD	V	-
Powerful owl	*Ninox strenua*		V	-
Eastern grass owl	*Tyto longimembris*	SU	V	-
Masked owl	*Tyto novaehollandiae*		V	-
Sooty owl	*Tyto tenebricosa*		V	-
Varied sittella	*Daphoenositta chrysoptera*		V	-

Common name	Scientific name	Status in parks	BC Act status	EPBC Act status
Dusky woodswallow	*Artamus cyanopterus*		V	-
Scarlet robin	*Petroica boodang*		V	-
Mammals				
Koala	*Phascolarctos cinereus*		V	V
Spotted-tailed quoll	*Dasyurus maculatus*		V	E
Eastern pygmy-possum	*Cercartetus nanus*		V	-
Greater glider	*Petauroides volans*		E	V
Grey-headed flying-fox	*Pteropus poliocephalus*		V	V
Large-eared pied bat	*Chalinolobus dwyeri*		V	V
Southern myotis	*Myotis macropus*		V	-
Greater broad-nosed bat	*Scoteanax rueppellii*		V	-
Little bent-winged bat	*Miniopterus australis*		V	-
Large bent-winged bat	*Miniopterus orianae oceanensis*		V	-
New Holland mouse	*Pseudomys novaehollandiae*		-	V
New Zealand fur-seal	*Arctocephalus forsteri*		V	-
Australian fur-seal	*Arctocephalus pusillus doriferus*		V	-
Insects				
Giant dragonfly	*Petalura gigantea*		E	-
Recorded but now considered locally extinct, suspected species loss, or no recent confirmed records				
Green and golden bell frog	*Litoria aurea*	SSL	E	V
Bush stone-curlew	*Burhinus grallarius*	LE	E	-
Terek sandpiper	*Xenus cinereus*	NCRR	V	C, J, K
Broad-billed sandpiper	*Limicola falcinellus*	NCRR	V	C, J, K
Eastern ground parrot	*Pezoporus wallicus wallicus*	LE	V	-
White fronted chat	*Epthianura albifrons*	NCRR	V	-
Regent honeyeater	*Heleioporus australiacus*	ERV, DV, NCRR	CE	CE
Speckled warbler	*Pseudophryne australis*	PSL	V	-
Eastern false pipistrelle	*Fallsistrellus tasmaniensis*	NCRR	V	-

Source: DPIE 2020a and modified by reference to DECCW 2011a. Where DECCW 2011a found species were ‘aviary escapees’ they have been removed from the table.

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

Legal status: V = vulnerable; E = endangered; CE = critically endangered, C = CAMBA, J = JAMBA, K

Status in parks (DECCW 2011a):

Vagr = Vagrant. Species for which there are fewer than 5 reliable records and which are outside their currently accepted normal distribution.

ERV = Extremely rare visitor. Species for which there are fewer than 5 records and/or have not been confidently recorded within the last 25 years but are within their currently accepted normal distribution.

DV = Declining visitor.

LE = Locally extinct. Species that once sustained local populations in the parks.

SU = status uncertain.

SSL = Suspected species loss. Species that once sustained local populations in the parks. Considered to no longer have established resident populations.

PSL = Peripheral species loss. Species that only ever used the survey area as peripheral or marginal habitat and due to changes in habitat within the survey area coupled with loss of higher quality habitat elsewhere are today unlikely to use the survey area anymore, except perhaps during extremely unusual circumstances.

NCRR = No confirmed recent records (i.e. last 25 years).

No annotation= Species which have been recorded on several occasions, often by more than one observer.

Appendix E Key threatening processes

The following table lists the key threatening processes that have been identified as applying in the parks.

Common name	BC Act	EPBC Act
Aggressive exclusion of birds from woodland and forest habitat by abundant noisy miners, *Manorina melanocephala*	KTP	KTP
Alteration of habitat following subsidence due to longwall mining	KTP	
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP	
Anthropogenic climate change	KTP	KTP
Bushrock removal	KTP	
Clearing of native vegetation	KTP	KTP
Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus*	KTP	KTP
Competition and habitat degradation by feral goats, *Capra hircus*	KTP	KTP
Competition from feral honey bees, *Apis mellifera*	KTP	
Death or injury to marine species following capture in shark control programs on ocean beaches	KTP	
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	KTP	KTP
Forest eucalypt dieback associated with overabundant psyllids and bell miners	KTP	
Herbivory and environmental degradation caused by feral deer	KTP	
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP	
Importation of red imported fire ants *Solenopsis invicta*	KTP	KTP
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	KTP	KTP
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP
Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP
Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	KTP	
Introduction of the large earth bumblebee *Bombus terrestris*	KTP	
Invasion and establishment of exotic vines and scramblers	KTP	
Invasion and establishment of scotch broom *Cytisus scoparius*	KTP	
Invasion and establishment of the cane toad *Bufo marinus*	KTP	KTP
Invasion of native plant communities by African olive *Olea europaea* subsp. *cuspidata*	KTP	
Invasion of native plant communities by *Chrysanthemoides monilifera*	KTP	
Invasion of native plant communities by exotic perennial grasses	KTP	
Invasion of the yellow crazy ant, *Anoplolepis gracilipes* into NSW	KTP	
Invasion, establishment and spread of lantana *Lantana camara*	KTP	

Common name	BC Act	EPBC Act
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP
Loss of hollow-bearing trees	KTP	
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP	
Predation and hybridisation by feral dogs, *Canis lupus familiaris*	KTP	
Predation by *Gambusia holbrooki* (plague minnow or mosquito fish)	KTP	
Predation by the European red fox *Vulpes Vulpes*	KTP	KTP
Predation by the feral cat *Felis catus*	KTP	KTP
Predation, habitat degradation, competition and disease transmission by feral pigs, *Sus scrofa*	KTP	KTP
Removal of dead wood and dead trees	KTP	

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

Appendix F Weeds and feral animals

The following table summarises key information on weeds and feral animals in the parks at the time of publication of this plan. Current information on the status of weeds and feral animals and whether they have a threat abatement plan can be found on the Department's website. Further pest information on the parks is also available in the relevant NPWS weeds and feral animal management strategy. The Local Land Services Act declares certain animals to be pests.

Feral animals

Common name	Scientific name	KTP	NSW TAP	Priority GSLLS	Declared pest
Black rat	*Rattus rattus*	N	N	N	N
Cat	*Felis catus*	Y	N	Y	N
Common myna	*Sturnus tristis*	N	N	Y	N
Common starling	*Sturnus vulgaris*	N	N	N	N
Wild dog (dingo and feral dog)	*Canis lupus dingo, Canis lupus familiaris*	Y	N	Y	Y
Eurasian blackbird	*Turdus merula*	N	N	N	N
Red fox	*Vulpes vulpes*	Y	Y	Y	Y
Goat	*Capra hircus*	Y	N	Y	N
House mouse	*Mus musculus*	N	N	N	N
House sparrow	*Passer domesticus*	N	N	N	N
Mallard	*Anas platyrhynchos*	N	N	N	N
Pig	*Sus scrofa*	Y	N	Y	N
Rabbit	*Oryctolagus cuniculus*	Y	N	Y	Y
Red deer	*Cervus elaphus*	Y	N	Y	N
Red-whiskered bulbul	*Pycnonotus jocosus*	N	N	N	N
Rusa deer	*Cervus timorensis*	Y	N	Y	N
Spotted turtle-dove	*Streptopelia chinensis*	N	N	N	N

Priority GSLLS = priority pest in the Greater Sydney Local Land Services area

Priority weeds

Common name	Scientific name	KTP	NSW TAP	Priority GSLLS	WONS
Arum lily	*Zantedeschia aethiopica*	N	N	Y[5]	N
Asparagus fern	*Asparagus aethiopicus*	Y	N	Y[3]	Y
Alligator weed	*Alternanthera philoxeroides*	N	N	Y[4]	N
Bitou bush	*Chrysanthemoides monilifera* subsp. *rotundata*	Y[1]	Y	Y[3]	Y
Blackberry	*Rubus fruticosus agg.*	N	N	Y[3]	Y

Common name	Scientific name	KTP	NSW TAP	Priority GSLLS	WONS
Boneseed	*Chrysanthemoides monilifera* subsp. *monilifera*	Y[1]	N	Y[3]	Y
Coolatai grass	*Hyparrhenia hirta*	Y[1]	N	Y[5]	N
Crofton weed	*Salix* spp.	N	N	Y[5]	N
Fireweed	*Senecio madagascariensis*	N	N	Y[3]	N
Formosa lily	*Lilium formosanum*	N	N	Y[5]	N
Green cestrum	*Cestrum parqui*	N	N	Y[4]	N
Holly-leaved senecio	*Senecio glastifolius*	N	N	Y[4]	N
Japanese honeysuckle	*Lonicera japonica*	Y[1]	N	Y[5]	N
Lantana	*Lantana camara*	Y[1]	N	Y[3]	Y
Ludwigia	*Ludwigia peruviana*	N	N	Y[4]	N
Madeira vine	*Anredera cordifolia*	Y[1]	N	Y[3]	N
Mistflower	*Ageratina riparia*	N	N	Y[5]	N
Moth vine	*Araujia sericifera*	Y[1]	N	Y[5]	N
Mother-of-millions	*Bryophyllum* spp.	Y[2]	N	Y[5]	N
Pampas grass	*Cortaderia jubata*	Y[1]	N	Y[5]	N
Prickly pear	*Opuntia* spp.	N	N	Y[3]	Y
Privet spp	*Ligustrum* spp.	N	N	Y[5]	N
Sea spurge	*Euphorbia paralias*	N	N	Y[4]	N
Senegal tea	*Gymnocoronis spilanthoides*	N	N	Y[4]	N
Senna	*Senna pendula*	N	N	Y[5]	N
Trad	*Tradescantia fluminensis*	N	N	Y[5]	N
Tree of heaven	*Ailanthus altissima*	N	N	Y[5]	N
Potato vine	*Acetosa sagittata*	Y[1]	N	Y[5]	N
Willow	*Salix* spp.	N	N	Y[3]	Y
Yellow water poppy	*Hydrocleys nymphoides*	N	N	Y[4]	N

Source: RPMS

Priority GSLLS = priority pest in the Greater Sydney Local Land Services area:

1 Declared key threatening process under the Biodiversity Conservation Act.

2 Declared key threatening process under the Environment Protection and Biodiversity Conservation Act.

3 Statewide priority weed under the *Biosecurity Act 2015*.

4 Regional priority weed (GSLLS 2017).

5 Other weed of regional concern.

Appendix G Third-party infrastructure/operations

All non-NPWS infrastructure and use of the parks by third parties requires authorisation to lawfully occupy and use the land. Generally, this infrastructure and use is managed by leases, licences and easements. The table below may not be a comprehensive list of all third-party interests.

Site or asset	Use or purpose	Park
Infrastructure		
Royal National Park Environmental Education Centre	Environmental education centre operated by NSW Department of Education	Royal
Sutherland Fire Control Centre	Fire control operations	Royal
Land parcel known as 'Telford'	Operation of Youthworks Conference Centre	Royal
Navigational facility	Navigational beacon and control building	Heathcote
Cabins – South Era, Little Garie, Burning Palms, Bulgo, Bonnie Vale, Bald Hill	Casual recreational use; a small number are for surf club purposes	Royal
Boat moorings in South West Arm Creek	Boat mooring	Royal
Loftus tram shed	Access to shed by Tram Museum	Royal
Weather stations at Audley and Wattamolla	Bureau of Meteorology weather stations	Royal
Automatic weather station, Providential Head	Air Services Australia automatic weather station	Royal
Weather station, Garawarra Farm	Sydney University weather station (rainfall)	Royal
Weather station, Garawarra Farm	Rural Fire Service weather station	Royal
Life buoys/Angel rings – various locations	Surf safety	Royal
Trig stations	Garie trig	Royal
Access		
In-holding south of Waterfall	Legal access by Wollongong City Council to Lot 4/DP840501	Heathcote
Youthworks Port Hacking Conference Centres	Access across NPWS land to Youthworks Port Hacking Conference Centres	Royal
Cullen Lane, Maianbar; Simpson Road, Bundeena	Access across NPWS land to private properties	Royal
Telecommunication tower at Waterfall (Railcorp land)	Access across NPWS land to tower on Railcorp land	Royal
Camp Coutts, Waterfall	Access across NPWS land to Camp Coutts scout camp	Heathcote
Utilities		
Water supply pipeline	Sydney Water supply pipeline to Bundeena and Maianbar, reservoir and access tracks	Royal

Site or asset	Use or purpose	Park
Water supply pipeline	Sydney Water supply pipeline from Woronora Dam, associated access tracks and water pH buffering plant	Heathcote
Dingo Tunnel	Sydney Water	Heathcote
Sewer mains	Sydney Water	Heathcote, Garawarra, Royal
330kv powerline	TransGrid	Heathcote, Garawarra
11kv powerline Bonnie Vale to Maianbar	Ausgrid	Royal
11Kv powerline supplying Helensburgh	Endeavour Energy	Garawarra
Powerline	Railcorp	Royal
Telecommunications tower at Grays Point	Telstra	Royal

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More information

- Aboriginal Places Policy
- Audley master plan
- Department of Planning and Environment
- Drones in Parks Policy
- Key threatening processes
- Local Land Services Act
- Regional pest management strategies
- Register of leases, easements and rights of way
- Royal National Park, Heathcote National Park and Garawarra State Conservation Area Plan of Management
- Wattamolla master plan