NSW NATIONAL PARKS & WILDLIFE SERVICE

Kemps Creek Nature Reserve

Planning Considerations

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Cover photo: Shale/Gravel Transition Forest, Kemps Creek Nature Reserve. Darren Roberts

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How to use this document

This planning considerations report outlines the matters considered in preparing the Kemps Creek Nature Reserve Plan of Management, including the park's 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 document also read the plan of management. The plan of management describes the desired outcomes for the park's values and actions that National Parks and Wildlife Service (NPWS) proposes to undertake to achieve these outcomes. It also sets out the recreational and other activities that are permitted in the park and any requirements to undertake these activities, including whether consent must be sought from NPWS to undertake them.

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

- the values of the park (e.g. new threatened species)
- management approaches (e.g. new pest management techniques)
- new programs.

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

Acknowledgments

Kemps Creek Nature Reserve is within the land of the Cabrogal People of the Darug Nation.

This planning considerations report was prepared by staff of NPWS.

Contact us

For more information about this planning consideration report or Kemps Creek Nature Reserve, contact the NPWS Cumberland Area at npws.cumberland@environment.nsw.gov.au; Scheyville Road, Scheyville NSW 2756; or by telephone on 02 4580 2750.

Acknowledgment of Country

The park covered in this plan is part of an ancient landscape which includes the Aboriginal people. The area now known as Kemps Creek Nature Reserve, and the surrounding lands and watercourses, have traditionally been under the care of the Cabrogal People of the Darug Nation. Aboriginal people have a deep spiritual and cultural connection to this Country. Their ancestors have lived here for thousands of years and, in doing so, form part of this living landscape.

Connections to Country and the significance of this park to Aboriginal peoples — past, present and future — are acknowledged and respected in this plan. The role of Aboriginal people in identifying traditional connections and custodians for this place is acknowledged and supported.

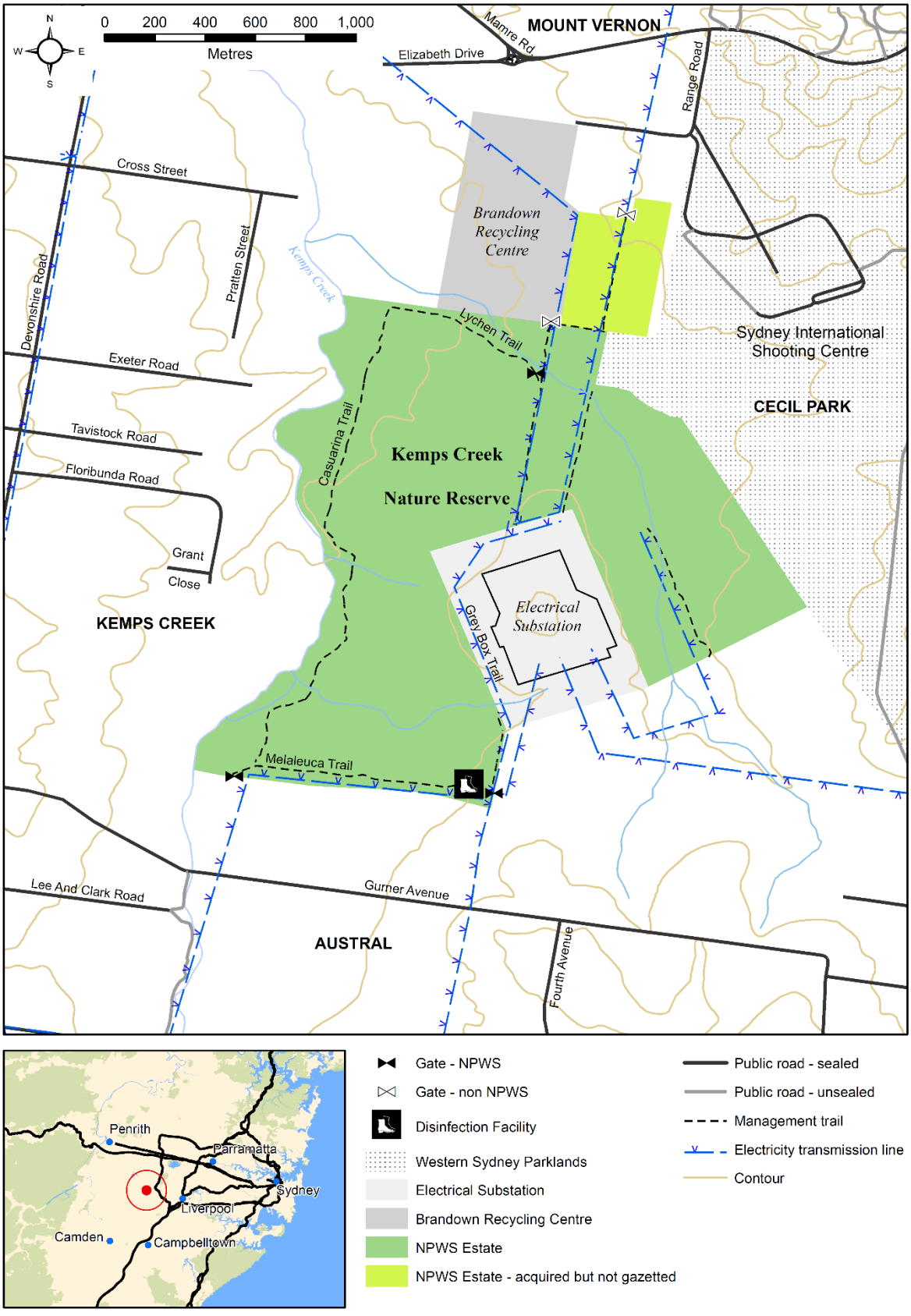

Figure 1 Map of Kemps Creek Nature Reserve

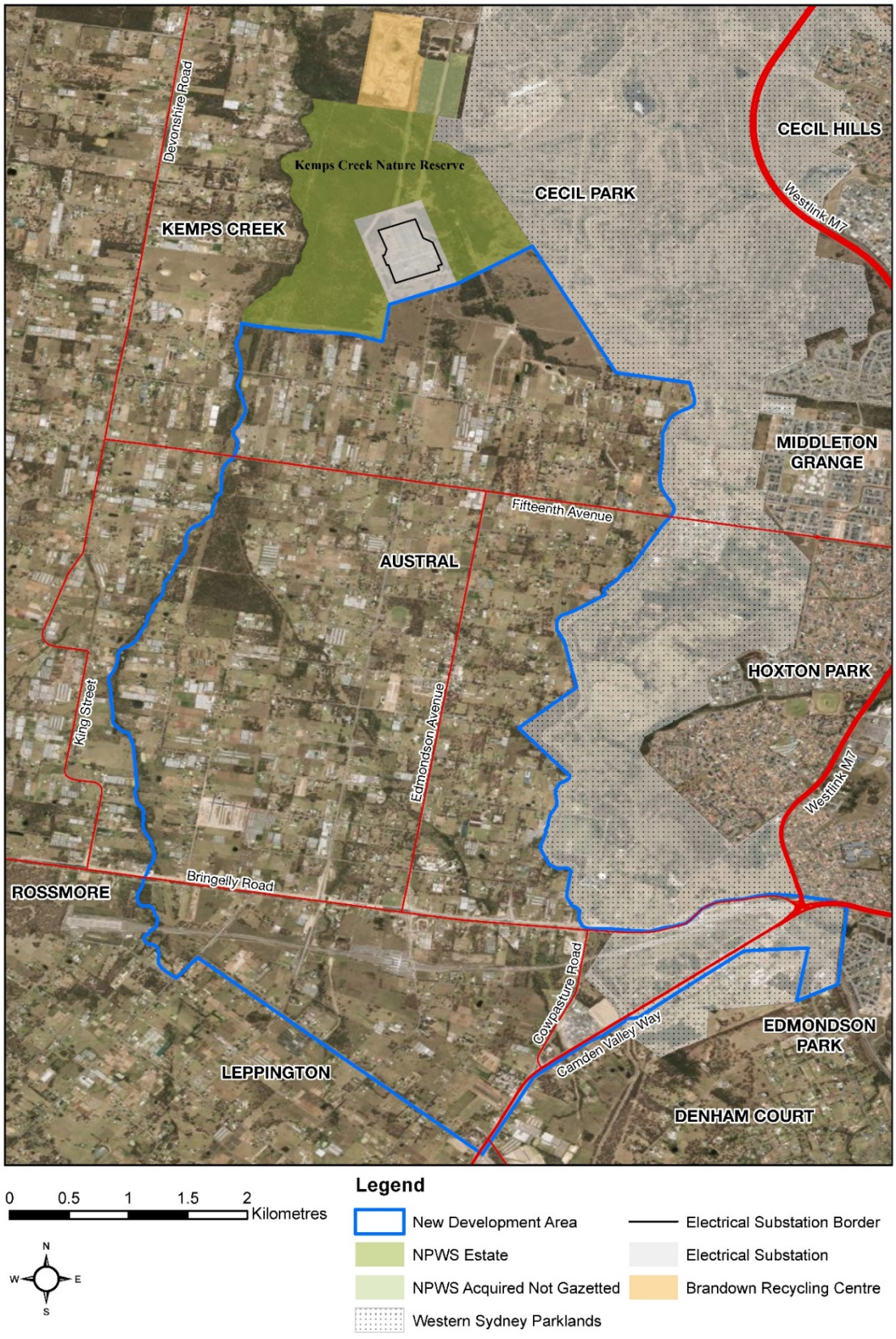

Figure 2 Satellite image showing Kemps Creek Nature Reserve and surrounding land uses

1. Kemps Creek Nature Reserve

Kemps Creek Nature Reserve, named after the adjoining Kemps Creek, is in the suburb of Cecil Park, approximately 12 kilometres west of Liverpool and 38 kilometres west of the Sydney Central Business District. The park covers 197.43 hectares. See Figure 1.

The first 129.4 hectares of the park was reserved on 7 March 2003, with a further 68.03 hectares added to the eastern side on 17 December 2010. On 30 March 2017, 14.48 hectares adjoining the north-east of the park was acquired as compensatory habitat for the development of the Western Sydney orbital and will be added to the park when gazetted.

The park is bounded by Kemps Creek to the west (the boundary is the centre of the creek). The rural residential area of Kemps Creek is on the western side of the creek. To the north of the park is the Brandown Quarry, Waste and Recycling Centre. To the east of the park is the Sydney International Shooting Centre, part of the Cecil Park Precinct of Western Sydney Parklands. The southern part of the park surrounds a Transgrid electricity substation.

The park is located within the Western Sydney Priority Growth Area. The lands to the south of the park are currently used for mixed purposes, including market gardening and horticultural enterprises. These lands are being progressively developed for low-density residential housing and will form part of the new precincts of Austral and Leppington North. The new development area (see Figure 2) is planned to provide enhanced regional shopping opportunities, increased employment and cultural and community facilities, a new Leppington train station, 3 neighbourhood centres, new primary and high schools and employment centres. These lands will support 17,350 new dwellings and an estimated population of 54,300 people (NSW Planning and Infrastructure 2012). The Western Sydney International (Nancy-Bird Walton) Airport, which is expected to be completed around 2026, is approximately 10 kilometres away.

Photo 1 **NPWS sign, Kemps Creek Nature Reserve. Darren Roberts**

The park is also part of the Western Sydney Parklands, a 5,280-hectare urban parkland system providing an area of open space for recreation and conservation, major built recreation precincts and infrastructure projects stretching 27 kilometres from Quakers Hill in the north to Leppington in the south. The parklands are largely ex-grazing land with isolated pockets of remnant native vegetation. Kemps Creek Nature Reserve protects one of the larger remnants in the parklands corridor. The parklands seek to provide a diverse range of recreational and cultural learning experiences, integrated with the natural and cultural values of the land.

The parklands are managed under the *Western Sydney Parklands Plan of Management 2030* (WSPT 2018), which includes the following objectives for Kemps Creek:

- a desired future character – to be a conservation and ecological resource for the parklands and the broader Western Sydney community
- a key objective – conserve and maintain a vital link in the parklands ecological corridor.

The park lies on the Cumberland Plain within the Sydney Basin Bioregion, protecting an important area of Wianamatta Shale vegetation on the Cumberland Plain. The park, and some adjacent vegetated lands, are identified as ‘priority conservation lands’ under the Cumberland Plain Recovery Plan (see Box 1). Priority conservation lands are the highest priority for future efforts to conserve the biodiversity of the Cumberland Plain.

The park has also been identified in the *Cumberland Plain Conservation Plan* (DPE 2022), which is a strategic plan to deliver long-term conservation outcomes for Western Sydney. The Cumberland Plain Conservation Plan’s vision is to support Western Sydney’s biodiversity and growth by supporting the delivery of infrastructure, housing and jobs for Western Sydney in a planned and strategic way that also protects and maintains important biodiversity.

The park is located within the areas of the Gandangara Local Aboriginal Land Council, Greater Sydney Local Land Services and Liverpool City Council.

Box 1: The Cumberland Plain Recovery Plan

The *Cumberland Plain Recovery Plan* (DECCW 2010a) provides for the long-term survival and protection of the threatened biodiversity of the Cumberland Plain. The recovery plan identifies 'priority conservation lands', which are the largest, most intact remnants of 20 different threatened ecological communities, populations and species on the Cumberland Plain. These lands cover approximately 26,000 hectares and are the highest priority for future efforts to conserve the threatened biodiversity of the Cumberland Plain. The recovery plan identifies priorities and opportunities to protect up to 40% of the remaining threatened ecological communities in Western Sydney. Kemps Creek Nature Reserve and some adjacent forested land have been identified as priority conservation lands (see Figure 3).

A key objective of the *Cumberland Plain Recovery Plan* is to deliver best practice management for identified priority conservation lands and threatened species, populations and ecological communities that are endemic to the Cumberland Plain or primarily distributed on the Cumberland Plain. Best practice guidelines for the management and restoration of bushland on the Cumberland Plain have been developed (DEC 2005a).

Photo 2 **Cumberland Plain Woodland critically endangered ecological community with a native blackthorn understorey. S Cottrell/Australian Botanic Garden Mount Annan**

2. Protecting the natural environment

2.1 Geology, landform and hydrology

Kemps Creek Nature Reserve lies on the Cumberland Plain, a sub-region of the Sydney Basin Bioregion. The Cumberland Plain extends west from Parramatta to the Hawkesbury–Nepean River and from Windsor in the north to Thirlmere in the south (NPWS 2002a). The area is gently undulating with fertile soils, contrasting with the surrounding rugged sandstone plateaus, and has been the focus of agricultural development since European settlement in 1788. It has been increasingly developed for residential and associated uses and is now the most highly developed area in the Sydney Basin Bioregion (NPWS 2002b).

Kemps Creek Nature Reserve occupies part of the floodplain of Kemps Creek and adjacent low-lying land. It has a low relief, ranging between approximately 50 and 60 metres above sea level, with very gentle slopes and poor drainage. The highest elevation in the park is to the north-west of the Transgrid substation.

The geology of the park is largely Bringelly Shale, the upper-most unit of the Triassic-aged Wianamatta Group of sedimentary rocks. Some quaternary alluvium occurs along Kemps Creek (Clark & Jones 1991). Wianamatta Group shales are marine-derived, and groundwaters associated with them are often saline.

Photo 3 Kemps Creek, Kemps Creek Nature Reserve. Darren Roberts

The active floodplain adjacent to Kemps Creek and the ephemeral watercourse in the north-east of the park contain the South Creek soil profile, which consists of alluvial soils of deep brown to yellow sandy clays and loams of generally low fertility. These soils are often waterlogged for months after heavy rain. They have high erosion potential, and stream bank erosion is common in these areas.

The park's higher ground contains the Blacktown soil profile, which consists of shallow to moderately deep, hard setting, mottled texture contrast soils (Bannerman & Hazelton 1990). These soils are poorly drained with relatively low fertility.

Kemps Creek is within the South Creek subcatchment of the Hawkesbury–Nepean River catchment. Kemps Creek has its headwaters in the suburb of Leppington and flows generally north before joining South Creek near Luddenham. Kemps Creek Nature Reserve lies to the east of Kemps Creek, with the boundary of the park following the surveyed centreline of the creek. An ephemeral creek flows generally north through the eastern section of the park, joining Kemps Creek just north of the park. This creek retains standing water at times. Other drainage lines enter the park from the south and drain towards Kemps Creek in the south-west of the park.

2.1.1 Management considerations and opportunities

Soils with impeded drainage (such as the soil profiles found in Kemps Creek Nature Reserve) aid the growth and reproduction of the soil-borne pathogen, phytophthora (*Phytophthora* spp.) (DSE 2008). Phytophthora has been recorded in the park and has been associated with dieback of native vegetation (see Box 2). It cannot be eradicated from the park, but further spread within the park or beyond it should be prevented as far as possible. Also, due to the instability of the soil profiles, illegal access has the potential to increase erosion and in turn the further spread of phytophthora.

The South Creek catchment (which includes Kemps Creek) is regarded as one of the most seriously degraded subcatchments in the Sydney region. Hydrological and sediment regimes have been dramatically altered in the catchment due to clearing of vegetation and increasing urbanisation (Rae 2007).

Stormwater runoff from market gardens, horticultural enterprises and other rural and residential lands upstream of the park can contain weeds, pathogens, phosphates, pesticide residues, fertilisers, fuels, surfactants, motor oil, animal faeces, litter and industrial waste. This stormwater runoff makes its way into Kemps Creek and the park. Stormwater runoff negatively impacts the native vegetation because of the poor water quality and drainage in the park. Illegal dumping of rubbish also pollutes Kemps Creek and the riparian corridor. There is a high density of weeds in the riparian corridor of Kemps Creek and other water courses due to increased nutrients and the transport of weed seeds (see Section 2.2.3). The development occurring to the south of the park is likely to further increase issues with stormwater runoff.

A small number of weirs and dams have been built on Kemps Creek, including the section of Kemps Creek within the park. Many of these structures existed at the time the park was reserved. Alterations to the creek have altered the hydrology of the creek and have encouraged sections of stagnated water and increased siltation, which causes turbidity, increased nutrients and changed oxygen levels. In the past a number of these weirs have been removed by NPWS staff with permission from Department of Fisheries.

The Brandown recycling and waste centre adjoining the northern boundary of the park is licensed for extractive activities and waste (non-putrescible) disposal. The facility operates under licence conditions and undertakes regular dust and water quality monitoring.

Maintaining the current condition of flows and water quality in Kemps Creek is a management priority for the park.

Box 2: Phytophthora in the park

Phytophthora is a soil-borne water mould that infects many plant species and may contribute to plant death where there are other stresses present, such as waterlogging, drought or wildfire (NSW SC 2002). It may be dispersed in flowing water, from infected roots to roots of healthy plants and by vehicles, animals and walkers. Phytophthora cannot be eradicated from an area once it has become infested.

In 2008, phytophthora was confirmed in the south-west corner of Kemps Creek Nature Reserve and adjacent private lands. The species present in the park are *Phytophthora personii*, from Western Australia and not previously recorded in New South Wales, and an undescribed species not previously recorded in Australia (DPI 2008). The pathogenicity of the 2 species recorded from the park is not well known, but they should be assumed to be pathogenic (BGT 2008b).

Surveys undertaken by NPWS in 2009 and 2021 confirmed that phytophthora was also further north and east in the park than previously recorded. In 2016 additional surveys were undertaken, which confirmed that phytophthora had spread further throughout the park.

There is a 500-metre long linear zone of dead trees in the south-west corner of the park where phytophthora and high nutrient levels have been found. Other trees in the south-west corner of the park and heading north following the drainage lines are also showing indications of stress. This is likely to be from the nutrient plume in the water table.

In the absence of specific guidelines for the management of the species of phytophthora present in the park, best practice guidelines for the management of *Phytophthora cinnamomi* have been applied. Strict quarantine measures and access controls have been implemented in the park, including:

- closing the park to public access and permitting access for essential management and authorised research only
- closing the park to all access after rain
- controlling the direction of vehicle travel within the park (from the south-east corner of the park in an anti-clockwise direction on the management trails to the vehicle disinfection bay in the south-west corner of the park).

A vehicle disinfection bay and secure lockup for disinfectant has been constructed near the southern entry to the park, and a phytophthora hygiene strategy has been prepared and implemented (see Appendix C).

In Western Australia, potassium phosphonate (also referred to as phosphite) is used to protect susceptible plant species or vegetation communities and to retard the spread of the pathogen. It is proposed to trial the application of phosphite within the park.

Photo 4 **NPWS sign notifying visitors that phytophthora is present and NPWS officer using disinfection bay. Darren Roberts**

2.2 Native plants and animals

2.2.1 Native plants

In 2003 it was estimated that only 12% of the original extent of pre-European settlement native vegetation cover on the Cumberland Plain remained as intact bushland (Tozer 2003). Native vegetation on the plain continues to be subject to significant impacts and pressures, with bushland remnants becoming increasingly fragmented and degraded. Many of the vegetation communities of the Cumberland Plain are considered under threat of extinction.

One hundred and three native plant species have been identified in Kemps Creek Nature Reserve (NSW BioNet Atlas search 2019).

The vegetation communities of the park have not been surveyed in detail, but the vegetation of the broader Cumberland Plain has been mapped (Tozer 2003). Five native vegetation communities have been mapped within the park, all of which are components of an endangered or critically endangered ecological community listed under the *Biodiversity Conservation Act 2016*. There are also components of a critically endangered ecological community listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. See Figure 3 and Table 1. More than 87% of the vegetation within the park is recognised as a component of a threatened ecological community.

A description of the threatened ecological communities and the associated vegetation types mapped within the park is provided at Appendix D.

Twenty-three hectares of the park (more than 12%) has been cleared of trees and shrubs and is now disturbed grassland. Many of these grasslands have the potential to be returned to Cumberland Plain vegetation communities through assisted regeneration.

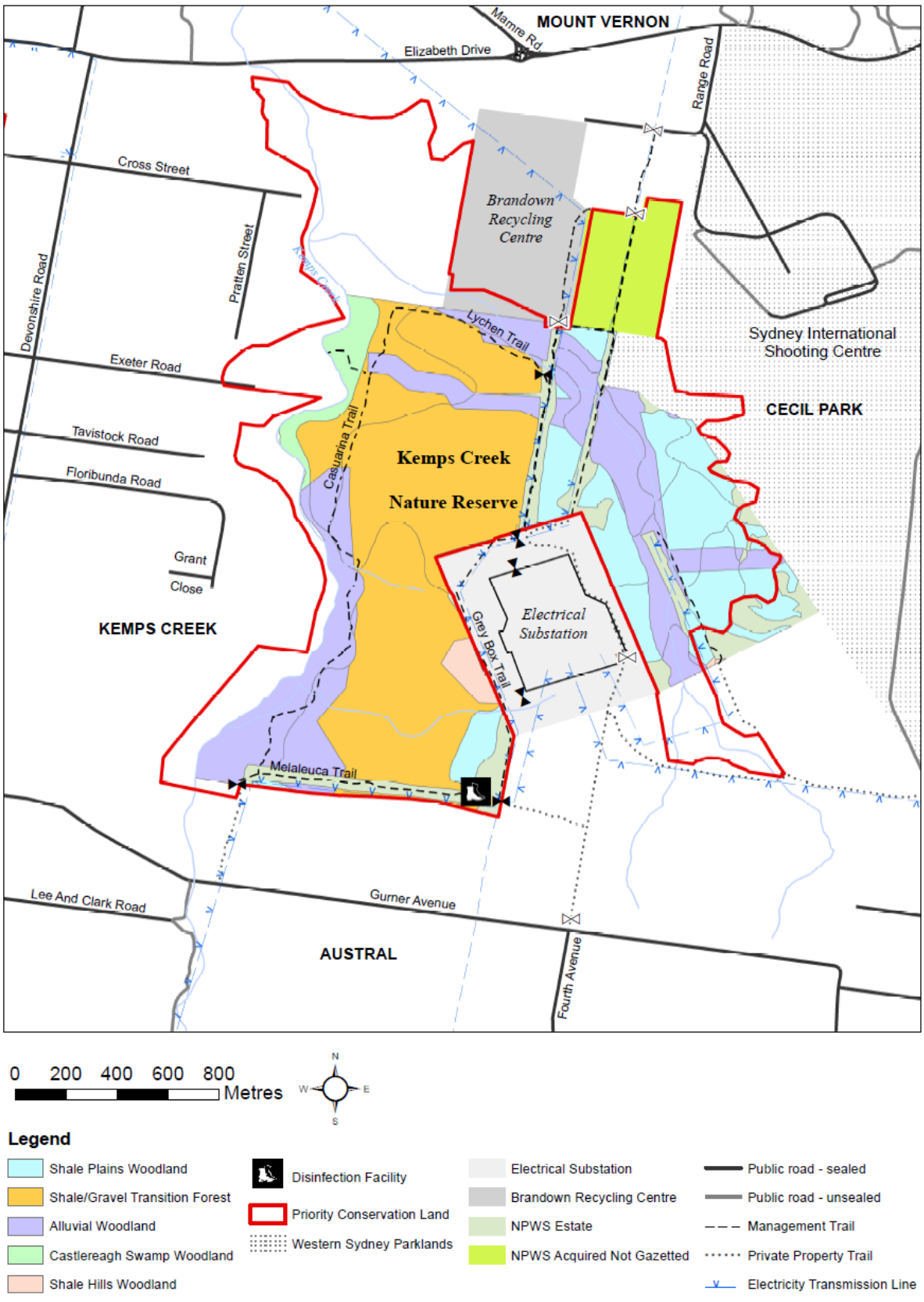

Figure 3 Vegetation map of Kemps Creek Nature Reserve

Table 1 Threatened ecological communities in the park

Vegetation type (Tozer 2003)	BC Act status and TEC name	EPBC Act status and TEC name
Shale/Gravel Transition Forest	EEC: Shale Gravel Transition Forest in the Sydney Basin Bioregion	CEEC: Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest
Alluvial Woodland	EEC: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	–
Castlereagh Swamp Woodland	EEC: Castlereagh Swamp Woodland Community	–
Shale Hills Woodland	CEEC: Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC: Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest
Shale Plains Woodland	CEEC: Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC: Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest

EEC = endangered ecological community; CEEC = critically endangered ecological community.

BC Act = *Biodiversity Conservation Act 2016*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*.

Dillwynia tenuifolia, listed as vulnerable under the Biodiversity Conservation Act, has been recorded in the park's Shale/Gravel Transition Forest (Leary 2007). *D. tenuifolia* occurs mainly on the Cumberland Plain, and an endangered population of this species is located about one kilometre north-west of the park, near the southern limit of the species' distribution. The extent of *D. tenuifolia* within Kemps Creek Nature Reserve is not known.

The spiked rice-flower*,* a shrub listed as endangered under both the Biodiversity Conservation Act and Environment Protection and Biodiversity Conservation Act, has been recorded in the nearby Western Sydney Regional Park and may occur within Cumberland Plain Woodland critically endangered ecological community in the park. A recovery plan has been prepared for this species (DEC 2005b).

Other threatened flora recorded within a 5-kilometre radius of the park are shown in Table 2. The presence and distribution of these species in the park is unknown. A native plant survey is required to update and increase knowledge of species diversity and abundance in the park.

The park becomes a temporary wetland following a flooding event, with important microflora and fungi assemblages appearing in the park. Survey work is required to better understand the species that are in these assemblages.

The long-term ecological viability of the park may be dependent on increasing its size and maintaining and improving connectivity with other vegetated remnants in the region, particularly in a north–south and east–west direction. The park directly adjoins other vegetated lands, identified as priority conservation lands under the *Cumberland Plain Recovery Plan* (see Box 1), which may make useful additions to the park (DECCW 2010b).

The park is also connected to more-distant vegetated areas on the Cumberland Plain. For example, the narrow riparian corridor along Kemps Creek has been identified as an important link to Rossmore and the vegetated hilly country of Denham Court and Varroville in the Campbelltown Local Government Area (NPWS 1997) (see Figure 2).

There are also connections to vegetated areas within the Western Sydney Parklands. A key objective of the *Western Sydney Parklands Plan of Management 2030* (WSPT 2018) is to

increase bushland biodiversity by enhancing existing habitats and creating linkages between existing core habitats to secure a biodiversity corridor along the length of the parklands. The parklands plan identifies a bushland corridor extending from the park through the Sydney International Shooting Centre, which would improve linkages with the park.

Photo 5 **Alluvial Woodland, Kemps Creek Nature Reserve. Darren Roberts**

Table 2 **Threatened plant species recorded in or within a 5-kilometre radius of Kemps Creek Nature Reserve**

Name	BC Act status	EPBC Act status
Recorded in park		
Dillwynia tenuifolia	Vulnerable	
Recorded within 5 km of the park		
White-flowered wax plant[1]	Endangered	Endangered
Sydney bush-pea	Endangered	Vulnerable
Nodding geebung	Endangered	Endangered
Spiked rice-flower	Endangered	Endangered
Downy wattle	Vulnerable	Vulnerable
Juniper-leaved grevillea	Vulnerable	
Small-flower grevillea	Vulnerable	Vulnerable
Willlow gum	Endangered	Vulnerable
Marsdenia viridiflora subsp. *viridiflora*	Endangered	

Source: NSW BioNet Atlas search 2019 and Leary (2007).

[1] = This species is unlikely to occur within the park as there is no suitable habitat.

BC Act = *Biodiversity Conservation Act 2016*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*.

2.2.2 Native animals

The native mammals of the Cumberland Plain have suffered serious decline, with small to medium-sized ground-dwelling mammals most affected. The park provides native animal habitat in an area where suitable habitat is limited and fragmented. It conserves species representative of the native animals that once occurred across the wider Cumberland Plain. It also contains one of the best remaining examples of woodland bird communities within Western Sydney (NPWS 1997).

A systematic vertebrate fauna survey identified 56 species of native birds, 11 mammals (including 8 bat species), 11 reptiles, 6 amphibians and 1 mollusc in the park (Leary 2007). Eight threatened animal species listed under the Biodiversity Conservation Act have been recorded in the park and a further 23 threatened animal species have been recorded nearby and may occur in the park from time-to-time (see Table 3).

Table 3 Threatened animal species recorded in or within a 5-kilometre radius of Kemps Creek Nature Reserve

Common name	BC Act status	EPBC Act status
Recorded in the park		
Mollusc		
Cumberland Plain land snail	Endangered	
Birds		
Flame robin	Vulnerable	
Little eagle	Vulnerable	
Speckled warbler	Vulnerable	
Varied sittella	Vulnerable	
Mammals		
Greater broad-nosed bat	Vulnerable	
Grey-headed flying-fox	Vulnerable	Vulnerable
Southern myotis	Vulnerable	
Recorded within 5 km of the park		
Birds		
Australian painted snipe	Endangered	Endangered
Black bittern	Vulnerable	
Black falcon	Vulnerable	
Black-chinned honeyeater	Vulnerable	
Brown treecreeper	Vulnerable	
Diamond firetail	Vulnerable	
Dusky woodswallow	Vulnerable	
Gang-gang cockatoo	Vulnerable	
Hooded robin	Vulnerable	
Swift parrot	Endangered	Critically endangered
Little lorikeet	Vulnerable	

Common name	BC Act status	EPBC Act status
Masked owl	Vulnerable	
Spotted harrier	Vulnerable	
Square-tailed kite	Vulnerable	
White-bellied sea-eagle	Vulnerable	
Mammals		
Eastern bentwing-bat	Vulnerable	
Eastern freetail-bat	Vulnerable	
Eastern false pipistrelle	Vulnerable	
Koala	Vulnerable	Vulnerable
Eastern coastal free-tailed bat	Vulnerable	
Large bent-winged bat	Vulnerable	
Little bent-winged bat	Vulnerable	
Yellow-bellied sheathtail bat	Vulnerable	

Source: Leary (2007),NSW BioNet Atlas search 2019.

BC Act = *Biodiversity Conservation Act 2016*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*.

The ground-dwelling speckled warbler was not observed during the fauna survey, however, there is a record for this species from 1993 in the NSW BioNet Atlas. It depends on leaf litter, tussock grasses, shrubs or fallen timber for breeding and foraging habitat, typically building a nest in a slight hollow in the ground or the base of a low, dense plant. The significance of the park as breeding and foraging habitat for the speckled warbler is unknown. A targeted survey is needed to determine whether the park still supports this species (Leary 2007).

The 56 birds observed during the survey are species typical of open grassy Cumberland Plain Woodlands, but with a few notable observations. The most notable bird observation was of a single flame robin during summer. This is an extremely unusual observation since it is thought to be a rare winter and autumn visitor although it has been suspected that some over summer populations may occur within the Cumberland Plain. Other notable observations were of 2 woodland species thought to be declining – the varied sittella and the white-winged chough. The varied sittella depends on ground cover, fallen timber, logs and leaf litter. Loss of these habitat features has been implicated in the decline of the species (NSW SC 2010c).

Nine species of micro-bat and the grey-headed flying-fox were confirmed or tentatively identified as foraging within the park (Leary 2007). The majority of the micro-bats are predominately tree-hollow roosting, therefore, the large, old hollow-bearing trees within the park should be protected and conserved through the management of weeds, fire, hydrological changes and firewood collection.

Kemps Creek Nature Reserve protects important habitat for the endangered and regionally endemic Cumberland Plain land snail. The Cumberland Plain land snail primarily inhabits Cumberland Plain Woodland critically endangered ecological community, living under bark litter, leaves, logs or loose soil around grass clumps. Occasionally it shelters under rubbish. Dumped car bodies in the park are providing alternative habitat for this species.

A native animal survey is required to update and increase knowledge of species diversity and abundance in the park.

Photo 6 Flame robin (male), a threatened bird recorded in the park. Lachlan Copeland/DPE

2.2.3 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* (OEH 2016a). 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 (OEH 2013).

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

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

No immediate specific threat abatement actions are required for *Dillwynia tenuifolia* under the *Saving our Species* program. All threatened native animals in the park have been identified under the *Saving our Species* program as best assisted by addressing threats such as habitat loss or degradation within a landscape.

The *Cumberland Plain Recovery Plan* (DECCW 2010a) is the formal NSW recovery plan for 20 threatened species, populations and ecological communities that inhabit the Cumberland Plain, including the Cumberland Plain land snail, *Dillwynia tenuifolia* and all the threatened ecological communities known from Kemps Creek Nature Reserve (see Box 1). Also, the *Cumberland Plain Conservation Plan* (DPE 2022) includes mitigation measures to minimise the risk of the spread of phytophthora due to construction activities for urban development or major infrastructure corridors adjacent to threatened ecological communities, which specifically includes Kemps Creek Nature Reserve.

Key threats to native plants and animals in the park include:

- pests and weeds
- fire (see Box 3)
- climate change (see Box 4)
- excess nutrients from stormwater runoff and neighbouring properties
- phytophthora (see Box 2)
- illegal activities.

Specific threats to some threatened species have also been identified including:

- *Dillwynia tenuifolia*
  - removal or thinning of the canopy and repeated slashing
- spiked rice-flower
  - mowing, grazing or spraying
  - slashing along fire trails
  - changed hydrology and soil movement
- speckled warbler
  - habitat clearance, in particular the processes associated with habitat clearance (e.g. edge effects and disturbance in small fragments)
  - processes or actions that reduce the complexity of ground cover (e.g. grazing by rabbits and livestock and invasion by exotic perennial grasses)
  - predation by cats, dogs and foxes
  - exclusion from habitat by overabundant noisy miners
- varied sittella
  - small-scale clearing for fence lines and road verges
  - rural tree decline, loss of paddock trees and connectivity
  - ‘tidying up’ on farms
  - firewood collection
  - dominant noisy miners
- Cumberland Plain land snail
  - removal of logs and loss of ground habitat (the removal of dead wood and dead trees has been listed as a key threatening process under the Biodiversity Conservation Act [NSW SC 2003b])
- threatened bats such as the greater broad-nosed bat and at least 30 other native animals dependent on hollows
  - loss of hollow-bearing trees (this has been listed as a key threatening process under the Biodiversity Conservation Act [NSW SC 2007]).

The agricultural landscape around Kemps Creek Nature Reserve currently allows for the movement of native animal species. However, this will change over time due to urban and industrial development in the area. Animals will be increasingly confined to the creek lines, and the park will become a very important wildlife refuge and corridor in the future. The planned Western Sydney International (Nancy-Bird Walton) Airport and associated infrastructure, such as transport corridors are also likely to impact the park's values, including the likelihood of increased wildlife strikes.

High nutrient levels have been detected in the soil and water in the south-west part of the park and adjacent areas (Sydney Environmental and Soil Laboratory 2008). Vegetation dieback is occurring within the area of the park where these high nutrient levels have been recorded.

The source of the nutrients in the park is yet to be determined, but the park lies downstream of market gardens and other horticultural enterprises where fertilisers are used. The soil fungus phytophthora is also known to be present in the south-west part of the park (see Box 2).

Investigation of the issue has concluded that excess nutrients are contributing to, if not the sole cause of, the decline and death of native trees in the area. The most likely causes are direct (nitrate poisoning) and indirect (root disease), and the causes appear to be related to water flow from a neighbouring property (Sydney Environmental and Soil Laboratory 2008).

The park's vegetation and habitats are being affected by the illegal creation of new trails and unauthorised use of trails by vehicles, motorbikes and mountain bikes (see Section 5).

Due to the changing land use in the vicinity of Kemps Creek Nature Reserve, some of the threats to the park's values may decline (e.g. excessive nutrient runoff from neighbouring properties; pollution caused by illegal dumping of rubbish, building materials and chemicals; and some weeds and pest species). However, new threats are likely to emerge and impact the plants and animals in the park.

Changes to the hydrology in the area will potentially impact the frequency, duration and quality of inundation events, and this may affect the vegetation communities and microflora and fungi within the park.

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and pest animals. These requirements apply equally to public land and private 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: *Greater Sydney Strategic Weed Management Plan* (GS LLS 2017) and *Greater Sydney Strategic Pest Management Plan* (GS LLS 2018). These plans identify priority weeds and pest animals in each of the regions, plus the appropriate management response for the region (prevention/alert, eradication, containment or asset protection).

Box 3: Fire in the park

High-frequency fires have been listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000b). High-frequency fire is a particular threat to the threatened spiked rice-flower and the Cumberland Plain Woodland and River-flat Eucalypt Forest on Coastal Floodplains threatened ecological communities in the park (NSW SC 2000b). Inappropriate fire regimes may lead to local extinctions of species because the fragmented nature of vegetation on the Cumberland Plain limits recolonisation. Also, several of the park's threatened native animals, including the endangered Cumberland Plain land snail, require a complex ground cover of logs, bark and leaf litter. This ground layer is susceptible to fire; therefore, it is important to ensure that hazard reduction burns are in a mosaic pattern and the size of individual hazard reduction burns is small (less than 1 hectare).

The fire history of Kemps Creek Nature Reserve is not well known. Available records suggest that the area has been subject to high-intensity wildfires every 20 to 30 years. In 2001, fast-travelling and high-intensity fires crossed the Nepean River and burnt part of the park. There is no record of any other fires reaching the intensity and extent of these fires.

Under severe fire weather conditions, wildfires burning into the park from the west could potentially threaten properties on the eastern and southern boundaries. Electricity transmission lines within and adjacent to the park may be threatened by fire.

A fire management strategy that defines the fire management approach for the park has been prepared (OEH 2016b). The fire management strategy sets out fire regime guidelines for conservation of the park's vegetation communities.

NPWS cooperates with surrounding landowners, the Rural Fire Service and the relevant bush fire management committees on fire planning, fuel management and information sharing.

The NPWS regional pest management strategy for Metro South West Region identifies pest species and priority programs for Kemps Creek Nature Reserve (OEH 2012). The overriding objective of the pest management strategy is to minimise adverse impacts of introduced species on biodiversity and other park and community values while complying with legislative responsibilities. The strategy also identifies where other site-specific or pest-specific plans or strategies need to be developed to provide a more detailed approach. Reactive programs may also be undertaken in cooperation with neighbouring land managers in response to emerging issues.

The plant communities of the Cumberland Plain are particularly vulnerable to weed invasion due to their grassy understorey, relatively fertile soils and past agricultural uses. Weeds can occur in densities that displace native plants and lead to a decline in native species diversity and regenerative capacity (Benson 1992).

Thirty-nine weed species have been recorded in the park, including 10 declared Weeds of National Significance (see Appendix E). Many of the weed species present in the park have arrived as propagules via the river and creeks, or entered the park from neighbouring lands. The highest weed densities in the park occur in the vegetation communities associated with the creek lines, particularly Kemps Creek, and along the southern boundary of the park. Other sources of weeds include garden refuse dumped in the park and seed transported by vehicle tyres, the wind and birds. With increasing urbanisation of the surrounding area, garden escapees are an emerging threat to the park's natural values.

There are a number of weeds found along the park's creek lines and alluvial flats, including exotic vines and scramblers such as asparagus weeds, bridal creeper, moth vine, balloon vine and trad. Invasion and establishment of exotic vines and scramblers is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2006). The creek lines and associated alluvial flats of the park are important foraging areas for bats and birds, including several threatened species. The ability of animals to forage and nest in the trees in these riparian corridors is impeded by exotic vines and other weeds.

Several significant aquatic weeds also occur within Kemps Creek, including water hyacinth and alligator weed. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants, is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2010b). Alligator weed is abundant in Kemps Creek and on nearby land where there is a high incidence of nutrients. Alligator weed can cause serious environmental problems by covering the water surface and restricting water flows. It can also lead to algal blooms, create a favourable environment for mosquitoes to breed and displace native aquatic plants. A control program for alligator weed has been undertaken in the park.

Photo 7 Bridal creeper (left) and alligator weed (right), Kemps Creek Nature Reserve. Darren Roberts

Away from the riparian areas there is a low density of woody weeds such as African boxthorn, African olive, broad and narrow-leaved privet and Kei apple. Woody weeds in the understorey may prevent canopy trees re-establishing. The edges of native vegetation remnants are particularly prone to weed invasion, so maintaining this core habitat relatively weed free is a priority.

Invasion of native plant communities by African olive is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2010a). The *Cumberland Plain Recovery Plan* includes an action to develop and promote a landscape-scale response to African olive

invasion (DECCW 2010a). There has been a program to remove Kei apple in the park, and this will continue over the next 5 years.

Several exotic perennial grasses and herbs are found throughout much of the park, including African lovegrass and pampas grass. Invasion of native plant communities by exotic perennial grasses is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2003a). African lovegrass has also been identified as a threat to Cumberland Plain Woodland critically endangered ecological community (Sanders et al. 2016).

Feral predators and pest animals in the park include foxes, cats, dogs, rabbits, brown hares, fallow deer, pigs, black rats and house mice, goats and five bird species, including common starling and house sparrow (see Appendix E for extra details). Cats and dogs in the park tend to be domestic animals from nearby residential areas or animals abandoned in or adjacent to the park. Predation by the red fox, predation and hybridisation by feral dogs and predation by feral cats are listed as key threatening processes under the Biodiversity Conservation Act. Cats have a significant impact on the environment through predation of birds, reptiles, amphibians and small mammals and, along with dogs and common mynas, are likely to become an increasing issue in the park due to progressive urbanisation of the surrounding land.

Analysis of predator scats collected in the park revealed the presence of sugar glider and swamp wallaby from fox scats, and short-beaked echidna from dog scats (Leary 2007). The speckled warbler is susceptible to fox predation because it builds nests and forages on the ground.

Feral predators and pest animals also impact on native animals through competition for food resources and nesting sites, as well as physical and scent disturbance of habitat. Rabbits and hares occur within the park in relatively low numbers. Excessive grazing by rabbits may prevent regeneration of woodland species and have a deleterious impact on populations of the Cumberland Plain land snail and the speckled warbler. Their current impacts are considered too low to warrant control. Feral pigs have potential to cause significant damage to the park and have been illegally released into the park. A feral pig control program has been undertaken in the park.

Fallow deer and goats are also a concern. Fallow deer have been observed in the park, and goats are present on neighbouring lands.

Illegal grazing of cattle, sheep, goats and horses has occurred within the park. Grazing animals have the potential to further spread phytophthora.

Photo 8 **Rock dove (or feral pigeon), an introduced bird found in the park. Rosie Nicolai/DPE**

Photo 9 **Aerial view of Kemps Creek Nature Reserve and the surrounding area, with horticultural infrastructure in the foreground. Dave Hutchison/Park Air**

Box 4: Climate Change

Human-induced climate change is listed as a key threatening process under the Biodiversity Conservation Act (NSW SC 2000a), and habitat loss caused by human-induced greenhouse gas emissions is listed under the Environment Protection and Biodiversity Conservation Act 1999 (TSSC 2001). The following is a snapshot of the predicted changes to climate for Metropolitan Sydney (OEH 2014):

- Maximum temperatures are projected to **increase** in the near future (i.e. 2020–2039) by 0.3–1.0°C.
- Maximum temperatures are projected to **increase** in the far future (i.e. 2060–2079) 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 in the far future.
- Severe fire weather days are projected to **increase** in summer and spring in the far future.

The projected increases in temperature, number of hot days and severe fire weather days are likely to influence bushfire frequency and intensity across the Metropolitan Sydney Region and result in an earlier start to the bushfire season. Higher rainfalls in summer and autumn are likely to increase runoff at these times of year and accelerate soil erosion across the region. This in turn is likely to impact the stormwater system and, where capacity is reached, cause flooding (DECCW 2010c).

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

The potential impact of climate change on the park is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from introduced animals. Highly cleared and fragmented ecosystems such as those on the Cumberland Plain are likely to be at greater risk than more intact ecosystems. The location of Kemps Creek Nature Reserve in the Western Sydney Parklands ecological open space corridor is expected to improve the resilience of natural and cultural values of the park and the corridor.

3. Looking after our culture and heritage

3.1 Aboriginal culture and heritage

The park is within the land of the Cabrogal People of the Darug Nation, whose cultural boundaries are defined by landscape features and patterns of traditional use on Country. Further to the west, the Gundungurra People occupied the area leading to the Blue Mountains.

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

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.

Aboriginal people are likely to have visited this area to hunt and gather food, and they may have lived in and around the area due to the reliable water and frequent flooding of the park. Three Aboriginal sites have been recorded within the park (AHIMS search 2020). These sites provide a valuable insight into Aboriginal peoples' traditional lifestyles and interactions with the environment. The Aboriginal heritage within the park is important to present-day Aboriginal people.

In 2012, the area was assessed for evidence of Darug Aboriginal cultural heritage significance. Two undisturbed terrace areas above the lower lying swamp area were identified as being of potential cultural significance. These areas would have been ideal for camping and food gathering from the nearby waterways and wetlands. There was no evidence of stone tools (Muru Mittigar 2012). Ground surface visibility is low in many areas of the park due to vegetation cover, and the frequent flooding means that evidence may have been washed away or become obscured.

The presence of a large kurrajong tree in the eastern section of the park was also noted during the survey. This individual tree is significant to Aboriginal people as it is an example of a species that was traditionally very useful to Aboriginal people. The fibrous bark was used to make twine and fishing line; the seeds and roots of the plant were a popular, high-protein food; the inside of the seed pods were mixed into resin for use in canoes; and the seed pod casings were used in dances.

3.1.1 Management considerations and opportunities

Although the NSW Government has legal responsibility for the protection of Aboriginal sites and places, NPWS acknowledges the right of Aboriginal people to make decisions about their own heritage. As such, Aboriginal communities will be consulted and involved in the management of Aboriginal sites, places and related issues; and in the promotion and presentation of Aboriginal culture and history. The local Aboriginal community is supported to access Country to maintain, renew or develop cultural connections and practices. NPWS supports non-commercial cultural use of wild resources, such as medicinal plants and bush tucker, subject to NPWS policies and licensing.

3.2 Historic heritage

History has taken place across the landscape. This includes the history of the first Australians – Aboriginal people – and our **history** since European settlement. Cultural heritage comprises places and items that may have historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance. NPWS conserves the significant heritage features of NSW parks.

Heritage places and landscapes are made up of living stories as well as connections to the past that individuals and communities have inherited and wish to conserve for current and future generations. They can include natural resources, objects, customs and traditions.

South Creek and the other watercourses in the Kemps Creek area attracted the early settlers, and the first land grants were made in 1805 (Davies 2007). Kemps Creek was named after Anthony Fenn Kemp (1773–1868), who was granted 300 acres (120 hectares) of land on the eastern side of the creek in 1810 (Penrith City Local History n.d.). Kemp was a commissioned ensign in the New South Wales Corps who first arrived in Sydney in 1795 (National Centre of Biography 2013). South of Kemp's holding was a 2000-acre (800-hectare) property granted in 1817 to Barron Field (1786–1846), a judge of the Supreme Court of New South Wales under Governor Macquarie. Field named his property Hinchinbrook and the western portion of this property is now Kemps Creek Nature Reserve.

The area surrounding Kemps Creek was a farming and timber-getting area for the early settlers but remained sparsely populated throughout the 19th century (Davies 2007). In later years, most of the area surrounding the park was cleared for agriculture, including market gardening.

4. Providing for visitor use and enjoyment

The primary purpose of nature reserves is to conserve ecosystems, species, communities or natural phenomena. Research, educational use, nature study and enjoyment are appropriate uses where they do not conflict with conservation.

There are no visitor facilities provided in the park, and the park is currently closed to public access due to the significant risk of phytophthora spreading further within the park or beyond the park (see Box 2). In the immediate future, public access will continue to be restricted with research and educational opportunities supported under defined phytophthora protocols. In the medium- to long-term, NPWS will investigate opportunities for controlled public access to the park in ways that mitigate potential for spreading phytophthora. This will provide opportunities for visitors to appreciate a rare example of intact Cumberland Plain Woodland and to increase understanding of this critically endangered woodland and the environment generally. This use is consistent with the principles for the management of nature reserves.

The park provides valuable opportunities for research that could contribute to improved management of remnant vegetation communities. Collaboration with research and educational institutions could include:

- undertaking targeted plant surveys to determine the presence and extent of threatened species within the park
- undertaking targeted survey and research to assess the significance of the park as breeding and foraging habitat for the speckled warbler and other threatened birds such as the sedentary varied sittella and flame robin
- undertaking targeted fauna survey for frogs after spring/summer rain and in winter; and along creek lines for eastern long-necked turtle
- surveying in winter for robins
- surveying the mapped threatened ecological communities in the park additions (i.e. purchased not gazetted lands to the north of the park, see Figure 1) and identifying any site-based threats
- periodically monitoring fauna populations at the permanent sites established during the 2004 Vertebrate Fauna Survey, particularly after fires and pest management actions
- investigating the significance of the existing artificial habitat (e.g. car bodies) for the Cumberland Plain land snail and its possible retention until natural habitat is sufficiently restored.

There are also opportunities to undertake research to increase understanding of phytophthora, its impact on the environment and control methods (see Box 2). This could include undertaking surveys and mapping every 3–4 years or after a particularly wet year.

The Western Sydney Parklands, adjoining the park to the east, provide a range of recreational opportunities. By 2030, 470 hectares of the parklands are expected to be available for unstructured recreation and more than 400 hectares for sports and active recreation (WSPT 2018). Other nearby reserves offer recreational opportunities, including Blue Mountains National Park, Bents Basin State Conservation Area and several local council reserves. The proximity of these neighbouring areas and the wide range of recreational opportunities on offer reduces the recreational pressures on Kemps Creek Nature Reserve. However, the local population will significantly increase with the planned residential land releases in neighbouring precincts (see Figure 2) and the development of Western Sydney Airport. This will result in increasing pressure for green space and recreational opportunities in the area.

Photo 10 **Australian Botanic Garden Mount Annan staff on a site inspection at Kemps Creek Nature Reserve. Lyndal Kaye/DPE**

4.1 Management considerations and opportunities

Visitor access to the park will be assessed in light of the risks of spreading phytophthora. Education about the park and the impact of phytophthora on the environment are important so that park neighbours, local communities, and schools can appreciate the park and its values. This will also encourage cooperation in delivering park management programs.

The park is currently closed to public access due to the significant risk of further spreading the soil pathogen, phytophthora. Research and educational opportunities will continue subject to current phytophthora protocols. In the future, NPWS will investigate opportunities for controlled public access to the park.

The existing network of management trails in the park provides potential opportunities for bushwalking. If the park is opened to a broader range of visitors, the trails may require

upgrading to limit environmental impacts. Further investigation is also needed to determine the requirements for linking park trails through to the Western Sydney Parklands.

There is currently no public road access into the park. NPWS will seek to secure legal and practical access to the reserve to provide for management and public access needs. Council road reserves connect to Kemps Creek on the western edge of the reserve, however, there is no legal access in these locations. Access points at the end of Exeter Road and Tavistock Road are unsuitable for public or management access as they traverse low-lying swamp land and terminate at Kemps Creek (see Figure 1). The park also is bordered by private property or lands with restricted access, such as the Transgrid substation (see Section 5). Current NPWS access to the park is from a private road north of Fourth Avenue. This access is not secure and NPWS will investigate alternate access routes, including undertaking discussions with neighbouring landholders.

5. Park infrastructure and services

Management operations within the park, such as control of introduced species, fire management and research, require the use and maintenance of a number of management trails. Some trails within the park are also used for managing Transgrid and Endeavour Energy assets. The design, management and use of vehicle trails is an important consideration in the control of phytophthora (BGT 2008a). If trails are lower than surrounding phytophthora-infested areas, there is potential for the pathogen to be transported onto the trails in water runoff. The pathogen may then be spread by vehicle movements, particularly in wet conditions. Use of trails in wet conditions can also cause accelerated erosion and deep holes and ruts, which further aid the spread of phytophthora.

The management trails in the park are also an important fire management asset. Under the *Rural Fires Act 1997* the relevant bush fire management committee prepares a fire access and fire trail plan to identify required access for fire suppression and management purposes and their required standards. NPWS will implement appropriate trail construction and maintenance works to keep trails at the required standards and will ensure these works are carried out in a manner that minimises impacts on the park's environmental and cultural heritage values. The fire access and fire trail plan may identify the need for new fire trails in the parks. Construction of new trails will require an appropriate level of heritage and environmental assessment and may be subject to an amendment to the plan of management.

Fences have been installed along the boundary of the park, however, there are sections that are in poor condition and may need repairing. Vandalism of the gates and the post-and-cable fences is an ongoing issue. Entry into the park by grazing livestock is facilitated where boundary fences are misaligned from property boundaries. As fences deteriorate and require replacement, NPWS will work with neighbours to review the location of existing fence lines.

Photo 11 Boundary fencing and NPWS signage, Kemps Creek Nature Reserve. Darren Roberts

Boundary gates (see Figure 1) are strategically located to provide authorised access for park management, such as fire management. The gates also restrict public vehicle access to management trails to ensure the trails remain serviceable for park management activities and to reduce the spread of phytophthora. Restricting public vehicle access will also maintain visitor experiences for walkers if opportunities for these activities are provided in the future. Unauthorised access can have a negative impact on the environmental values of the park, on the experience of recreational users, and on neighbouring property and assets.

6. Non-park infrastructure and services

Kemps Creek Nature Reserve contains a variety of infrastructure or assets that are owned, operated and maintained by other parties. All non-NPWS uses require relevant authorisation to lawfully occupy and use the park. This ensures there is clarity around arrangements for access, period of occupation, management and maintenance responsibilities, and any associated fees or payments.

Electricity transmission lines, together with easements for access to these lines, traverse the park at several locations (see Figure 1). Transgrid manages electricity transmission lines in the park in accordance with a statewide easement and maintenance agreement (NPWS and Transgrid 2002). Endeavour Energy manages electricity transmission lines in the park in accordance with a protocol and consent under the National Parks and Wildlife Regulation 2019 (DECCW and Integral Energy 2009). These agreements enable inspection, maintenance and emergency works; and include standards for tree management, environmental precautions and liaison requirements.

Clearing of vegetation within these easements fragments the vegetation communities of the park and may impact threatened plant species. It can also act as an impediment to the movement of some fauna species.

If not adequately maintained, vehicle trails along these easements can have significant environmental impacts, including soil disturbance and erosion.

The cleared electricity easement running from Gurner Avenue through to the south-west corner of the park enhances opportunities for illegal access to the park.

Photo 12 Cleared electricity easements, Kemps Creek Nature Reserve. Darren Roberts

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 National Parks and Wildlife Regulation 2019
- Environmental Planning and Assessment Act 1979
- Heritage Act 1977
- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- Local Land Services Act 2013
- Rural Fires Act 1997

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

NPWS policies and strategies

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

- park management policies
- regional pest management strategies
- fire management strategies.

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

Appendix B Scientific plant and animal names

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

Common name	Scientific name
Plants	
Blackthorn	*Bursaria spinosa*
Broad-leaved apple	*Angophora subvelutina*
Broad-leaved (red) ironbark	*Eucalyptus fibrosa*
Cabbage gum	*Eucalyptus amplifolia*
Downy wattle	*Acacia pubescens*
Drooping red gum	*Eucalyptus parramattensis* subsp. *parramattensis*
Forest red gum	*Eucalyptus tereticornis*
Gorse bitter pea	*Daviesia ulicifolia*
Grey box	*Eucalyptus moluccana*
Juniper-leaved grevillea	*Grevillea juniperina* subsp. *juniperina*
Kurrajong	*Brachychiton populneus*
Narrow-leaved (red) ironbark	*Eucalyptus crebra*
Narrow-leaved paperbark	*Melaleuca linariifolia*
Native blackthorn	*Bursaria spinosa*
Nodding geebung	*Persoonia nutans*
Peach heath	*Lissanthe strigosa*
Prickly beard heath	*Leucopogon juniperinus*
Prickly-leaved paperbark	*Melaleuca nodosa*
Rough-barked apple	*Angophora floribunda*
Small-flower grevillea	*Grevillea parviflora* subsp. *parviflora*
Spiked rice-flower	*Pimelea spicata*
Spotted gum	*Corymbia maculata*
Swamp oak	*Casuarina glauca*
Sydney bush-pea	*Pultenaea parviflora*
Thin-leaved stringybark	*Eucalyptus eugenioides*
Wattles	*Acacia* spp
White dogwood	*Ozothamnus diosmifolium*
White feather honeymyrtle	*Melaleuca decora*
White-flowered wax plant	*Cynanchum elegans*
Willow gum	*Eucalyptus scoparia*
Woollybutt	*Eucalyptus longifolia*
Animals	
Mollusc	

Common name	Scientific name
Cumberland Plain land snail	*Meridolum corneovirens*
Reptiles	
Eastern long-necked turtle	*Chelodina longicollis*
Birds	
Australian painted snipe	*Rostratula australis*
Black bittern	*Ixobrychus flavicollis*
Black falcon	*Falco subniger*
Black-chinned honeyeater	*Melithreptus gularis gularis*
Brown treecreeper	*Climacteris picumnus victoriae*
Diamond firetail	*Stagonopleura guttata*
Dusky woodswallow	*Artamus cyanopterus cyanopterus*
Flame robin	*Petroica phoenicea*
Gang-gang cockatoo	*Callocephalon fimbriatum*
Hooded robin	*Melanodryas cucullata cucullata*
Little eagle	*Hieraaetus morphnoides*
Little lorikeet	*Glossopsitta pusilla*
Masked owl	*Tyto novaehollandiae*
Noisy miner	
Speckled warbler	*Chthonicola sagittata*
Spotted harrier	*Circus assimilis*
Square-tailed kite	*Lophoictinia isura*
Swift parrot	*Lathamus discolor*
Varied sittella	*Daphoenositta chrysoptera*
White-bellied sea-eagle	*Haliaeetus leucogaster*
Mammals	
Koala	*Phascolarctos cinereus*
Short-beaked echidna	*Tachyglossus aculeatus*
Sugar glider	*Petaurus breviceps*
Swamp wallaby	*Wallabia bicolor*
Flying mammals	
Eastern bentwing-bat	*Miniopterus schreibersii oceanensis*
Eastern coastal free-tailed bat	*Micronomus norfolkensis*
Eastern false pipistrelle	*Falsistrellus tasmaniensis*
Eastern freetail-bat	*Mormopterus norfolkensis*
Greater broad-nosed bat	*Scoteanax rueppellii*
Grey-headed flying-fox	*Pteropus poliocephalus*
Large bent-winged bat	*Miniopterus orianae oceanensis*

Common name	Scientific name
Little bent-winged bat	*Miniopterus australis*
Southern myotis	*Myotis macropus*
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*

Common plant names from PlantNET (The NSW Plant Information Network System), Royal Botanic Gardens and Domain Trust, Sydney, accessed 5 August 2016, http://plantnet.rbgsyd.nsw.gov.au.

Appendix C Hygiene strategy for movement in and out of the known phytophthora areas within Cumberland Area

The following protocols **must** be undertaken by **anyone** entering Kemps Creek Nature Reserve to prevent the spread of phytophthora.

Phytophthora is a serious plant pathogen that invades the roots of susceptible plants causing root rot that inhibits the plant's ability to process nutrients. Death is often associated with other stresses to native trees such as insect attack, changes to drainage, drought, weed growth and possibly lack of fire. Phytophthora is spread in contaminated soil and so is easily spread in soil adhering to footwear, tools and machinery. The following procedures aim to prevent the spread of this pathogen into areas where the disease does not occur in order to protect our native vegetation.

Protocols have been adapted from those developed by Brett Summerell, Royal Botanic Gardens, Sydney (November 2003).

Procedures

Before you leave the workplace/depot:

1. All vehicles should be equipped with phytophthora wash-down kits. These contain:
    a. one rectangular bucket
    b. a 4-litre spray unit
    c. one scrubbing brush
    d. one bottle of commercial disinfectant / methylated spirits (commercial disinfectant mixing rate as per label, methylated spirits 70% solution, bleach 1 part to 4 parts solution)
    e. one bottle of water (for diluting disinfectant).
2. Allow sufficient time to implement wash-down procedures at the end of your task.
3. If the tasks will result in your clothing being seriously soiled, take a change of clothes.

In the park

1. Where there is information regarding the distribution of the pathogen, always work in areas known to be free of the pathogen before working in infected areas.
2. Where possible avoid wet or boggy areas.
3. Minimise soil disturbance on the sites. That is, soil dug is placed next to the excavation site, not dispersed across a larger area.
4. Bag all weedy material and soils that have been disturbed. Do not drag plants through the bush with exposed roots and adhering soil. The bags need to be robust enough to ensure that they are not damaged moving through the vegetation.

Before leaving the park

Plant and equipment

Preliminary wash-down:

1. Remove (brush/scrape) any excess dirt from all plant and equipment (**note:** for vehicles remember tyres, wheel arches, undercarriages, axels, foot wells etc.).

2. Spray all plant and equipment with the disinfection solution (**note:** for vehicles remember tyres, wheel arches, undercarriages, axels, foot wells etc.). Ensure that items are adequately drenched to ensure penetration.

Final wash-down:

1. All vehicles are then to proceed directly to an approved car wash facility where they are to be thoroughly washed down using high-pressure washers and then re-sprayed with disinfectant. (NPWS approved wash facility is Bents Basin SCA).

Personal belongings

1. Remove (brush/scrape) any excess dirt from boots and then spray with disinfectant solution; adequately drench to ensure penetration.
2. If clothing is seriously soiled remove and place in plastic bag and seal for washing.

Firefighting equipment

1. All firefighting equipment, such as hoses and drip torches, must be disinfected after each use. Bleach should not be used on hoses, however, they can be sprayed with commercial disinfectant. If you do not have time to disinfect before leaving the site, ensure that all items are promptly disinfected when completing the final wash-down of the vehicle.

Appendix D Description of threatened ecological communities in the park

The following are listed as threatened ecological communities under the Biodiversity Conservation Act (BC Act).

This information is based on *The Native Vegetation of the Sydney Metropolitan Area Volume 2: Vegetation Community Profiles* (OEH 2016c), unless otherwise indicated. The 5 native vegetation types that have been mapped within the park are described below each of the threatened ecological community that they are a component of, as outlined in Table 1 and shown on Figure 3.

Shale Gravel Transition Forest in the Sydney Basin Bioregion

BC Act status: endangered ecological community

Shale Gravel Transition Forest is an open eucalypt forest with an understorey that may vary between dense shrubs and a low sparse shrub cover with an abundant ground cover of grasses. Typically, the canopy includes broad-leaved ironbark along with a wide variety of other eucalypts depending on location. The taller paperbark may be prominent above a lower open shrub layer of blackthorn and gorse bitter pea. The ground cover is a mix of grasses, sedges and herbs. It is associated with shale-influenced sandy soils that support a component of ironstone gravels.

Past clearing has significantly depleted the original extent. Remnants persist in the Sydney Metropolitan area in small, isolated patches surrounded by urban land use. This introduces significant threats from weed invasion, rubbish dumping, inappropriate mowing and high-frequency fires.

This community is also listed as a critically endangered ecological community under the Commonwealth Environment Protection and Biodiversity Conservation Act.

Shale/Gravel Transition Forest vegetation type is a component of this threatened ecological community.

Shale/Gravel Transition Forest vegetation type

Shale/Gravel Transition Forest is the most extensive vegetation type in the park, occupying approximately 83 hectares (42%) of the park. The community is found in the core areas of the park not associated with streams and creek lines.

Typically, Shale/Gravel Transition Forest is an open forest community dominated by grey box and broad-leaved (red) ironbark with thin-leaved stringybark and forest red gum also present. Spotted gum occurs in patches in the west of the park and paperbarks are common in the community. A sparse shrub layer is often present and typically includes native blackthorn, gorse bitter pea, peach heath, prickly beard heath, *Dillwynia sieberi* and white dogwood. A native grass and herb layer is common and often diverse.

In the park, this community is in relatively good condition, with low densities of ground weeds.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

BC Act status: endangered ecological community

River-Flat Eucalypt Forest is an open eucalypt forest that forms narrow ribbons alongside streams and creeks that drain the Cumberland Plain. Typically, the canopy includes one of either rough-barked apple or broad-leaved apple and one or both of forest red gum and cabbage gum.

The understorey is characterised by an occasional sparse to open small tree stratum of paperbark and wattles. A sparse lower shrub layer features blackthorn at most sites. The ground layer is characterised by an abundant cover of grasses with small herbs and ferns.

Threats are severe. The community has been extensively cleared in the past for agriculture, with subsequent urban consolidation now adjoining most remnants in the study area. Most stands are threatened by a diverse and abundant cover of invasive weeds of which small-leaved privet and bridal creeper are very common. While the threat of urban clearing is minimised by the occurrence of remnants within flood zones, alteration of drainage patterns, water pollutants and increased sedimentation remain threats.

Alluvial Woodland vegetation type is a component of this endangered ecological community.

Alluvial Woodland vegetation type

Alluvial Woodland occupies around 50 hectares of the park. The community is found along the southern section of Kemps Creek and its floodplain, and the minor creek lines and depressions in the northern and eastern parts of the park.

The most common canopy species is forest red gum. A stratum of small trees is common, often including dense stands of swamp oak and paperbarks. Swamp oak is normally a coastal estuarine species, and the presence of this salt-tolerant species is an indicator of the brackish subsoil water characteristic of the Wianamatta Group shale. A shrub layer is usually evident in Alluvial Woodland but is often sparse and dominated by blackthorn. A dense ground cover is often present, dominated by grasses.

In the south-west of the park along Kemps Creek, this community is heavily infested with weeds and often displays a very high density of ground weeds (Leary et al. 2005).

Castlereagh Swamp Woodland Community

BC Act status: endangered ecological community

This community is characterised by a moderate to dense cover of paperbark trees of which white feather honeymyrtle, narrow-leaved paperbark and prickly-leaved paperbark are most common. They may be joined by various small eucalypt trees. In older stands these eucalypts form a sparse emergent layer. In the Sydney area, eucalypt species include drooping red gum, ironbark (including narrow-leaved ironbark) and woollybutt.

A wide variety of other eucalypt species may be included, and these reflect the transition from the surrounding dry woodland communities. The ground layer may be damp or covered by water depending on the time of year and season. This encourages a diversity of grasses and a dense cover of water-loving herbs and sedges.

The threats facing this community are high because the community occurs in small patches and is naturally rare. The primary threats include:

- weed invasion related to nutrient enrichment from surrounding urban and rural areas

- direct destruction for hobby farm, rural and residential development
- clay and shale extraction (NSW SC 1999).

Additional threatening processes include sedimentation, rubbish dumping, recreational vehicles and trail bikes.

Castlereagh Swamp Woodland vegetation type is a component of this endangered ecological community.

Castlereagh Swamp Woodland vegetation type

Castlereagh Swamp Woodland occupies about 5.6 hectares along the poorly drained northern section of Kemps Creek, where it is influenced by the presence of tertiary alluvium. Castlereagh Swamp Woodland is one of the rarest native vegetation communities on the Cumberland Plain, with only around 600 hectares remaining intact.

The community is dominated by medium to dense stands of paperbark. Other trees present include cabbage gum and broad-leaved apple. The shrub layer is poorly developed but tends to have patches of blackthorn throughout. The ground stratum is often dense and diverse and includes species tolerant of waterlogged conditions.

In the park, dense weed infestations have replaced native shrub and ground cover in this community

Cumberland Plain Woodland in the Sydney Basin Bioregion

BC Act status: critically endangered ecological community

The gentle topography associated with the shale plains of Western Sydney carries an open grassy woodland dominated by grey box, forest red gum and ironbark (narrow-leaved and broad-leaved ironbark) and is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs.

Past clearing for agriculture has removed extensive stands of this woodland, resulting in permanent loss and fragmentation. Remnants are threatened by continued urban and industrial expansion. Frequent mowing and grazing, inappropriate fire regimes, weed invasion and artificial enrichment from water runoff also impact the community (NSW SC 2009).

Shale Plains Woodland and Shale Hills Woodland vegetation types are components of this critically endangered ecological community. It is also listed as a critically endangered ecological community under the Commonwealth Environment Protection and Biodiversity Conservation Act.

Shale Plains Woodland

Shale Plains Woodland is the most extensive vegetation community in the eastern section of the park, occupying about 31 hectares and bordering Alluvial Woodland. A very small area has also been mapped in the south-west corner of the park.

The dominant canopy trees include grey box and forest red gum, with thin-leaved stringybark and spotted gum occurring less frequently. The shrub layer is usually dominated by blackthorn while the ground layer is generally associated with grasses.

Around one-third of the community within the park has a canopy cover of less than 10% due to past clearing and disturbance.

Shale Hills Woodland

This community is limited to around 2.4 hectares adjoining the south-west boundary of the Transgrid substation and less than 0.1 hectares on the south-east boundary of the park.

Shale Hills Woodland is similar to Shale Plains Woodland, particularly in terms of its understorey layer. Shale Hills Woodland tends to be located on elevated and sloping terrain, while Shale Plains Woodland occupies flat, undulating terrain.

The canopy is dominated by grey box and forest red gum and a small tree layer is often present, including canopy species and occasional wattles. The understorey is dominated by blackthorn. The ground layer is similar to that of Shale Plains Woodland.

In the park most of this community still supports canopy cover of greater than 10%.

Appendix E Pests and weeds in the park

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

Pest animals

Common name	Scientific name	KTP	NSW TAP	Declared pest
Mammals				
Black rat	*Rattus rattus*	No	No	No
Brown hare	*Lepus capensis*	No	No	No
Cattle	*Bos taurus*	No	No	No
Domestic cat	*Felis catas*	Yes	No	No
Domestic dog	*Canis familiaris*	Yes	No	Yes
European rabbit	*Oryctolagus cuniculus*	Yes	No	Yes
Fallow deer	*Dama dama*	Yes	No	No
Goat	*Capra hircus*	Yes	No	No
Horse	*Equus caballus*	No	No	No
House mouse	*Mus musculus*	No	No	No
Pig	*Sus scrofa*	Yes		No
Red fox	*Vulpes vulpes*	Yes	Yes	Yes
Sheep	*Ovis aries*	No	No	No
Birds				
House sparrow	*Passer domesticus*	No	No	No
Common starling	*Sturnus vulgaris*	No	No	No
Common myna	*Sturnus tristis*	No	No	No
Rock dove	*Columba livia*	No	No	No
Spotted turtle dove	*Streptopelia chinensis*	No	No	No

KTP = key threatening process listed under the *Biodiversity Conservation Act 2016*.

NSW TAP = threat abatement plan prepared under the *Biodiversity Conservation Act 2016*.

Priority weeds

Common name	Scientific name	KTP	NSW TAP	WONS
Woody weeds				
African boxthorn	*Lycium ferocissimum*	No	No	Yes
African olive	*Olea europa* ssp. *cuspidata*	Yes[1]	No	No
Box elder	*Acer negundo*	No	No	No
Camphor laurel	*Cinnamomum camphora*	No	No	No
Cassia	*Senna pendula*	No	No	No
Crofton weed	*Ageratina adenophora*	No	No	No
Green cestrum	*Cestrum parqui*	No	No	No
Kei apple	*Dovyalis caffra*	No	No	No
Ochna	*Ochna serrulata*	No	No	No
Privet (broad-leaved)	*Ligustrum lucidum*	No	No	No
Privet (narrow-leaved)	*Ligustrum sinense*	No	No	No
Stinking Roger	*Tagetes minuta*	No	No	No
St John's wort	*Hypericum perforatum*	No	No	No
Tree of heaven	*Ailanthus altissima*	No	No	No
Willow	*Salix fragilis*	No	No	Yes
Exotic perennial grasses and herbs				
African lovegrass	*Eragrostis curvula*	Yes[1]	No	Yes
Arum lily	*Zantedeschia aethiopica*	No	No	No
Couch	*Cynodon dactylon*	No	No	No
Giant reed	*Arundo donax*	No	No	No
Kikuyu	*Pennisetum clandestinum*	No	No	No
Mistflower	*Ageratina riparia*	No	No	No
Mother of millions	*Bryophyllum delagoense*	Yes[2]	No	No
Pampas grass	*Cortaderia selloana*	Yes[1]	No	No
Pellitory	*Parietaria judaica*	No	No	No
Prickly pear	*Opuntia stricta*	No	No	Yes
Rhodes grass	*Chloris gayana*	No	No	No
Wild cotton	*Gomphocarpus fruticosus*	No	No	No
Exotic vines and scramblers				
Asparagus weeds (ground and climbing)	*Asparagus aethiopicus* and *A. plumosus*	Yes[1]	No	Yes
Balloon vine	*Cardiospermum grandiflorum*	Yes[1]	No	No
Blackberry	*Rubus fruticosus* agg.	No	No	Yes

Common name	Scientific name	KTP	NSW TAP	WONS
Bridal creeper	*Asparagus asparagoides*	Yes[1]	No	Yes
Lantana	*Lantana camara*	Yes[1]	No	Yes
Moth vine	*Araujia sericifera*	Yes[1]	No	No
Morning glory	*Ipomoea indica*	Yes[1]	No	No
Trad	*Tradescantia fluminensis*	No	No	No
Aquatic weeds				
Alligator weed	*Alternanthera philoxeroides*	No	No	Yes
Long-leaf willow primrose	*Ludwigia longifolia*	No	No	No
Water hyacinth	*Eichhornia crassipes*	No	No	Yes

1 = key threatening process (KTP) listed under the *Biodiversity Conservation Act 2016*.

2 = key threatening process listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

NSW TAP = NSW threat abatement plan.

WONS = declared Weed of National Significance.

Data sources: weeds.org.au and environment.nsw.gov.au

More information

- Department of Planning and Environment
- Fire management strategies
- Kemps Creek Nature Reserve Plan of Management
- Key threatening processes
- Local Land Service Act
- Park policies
- Regional pest management strategies
- Regional Pest Management Strategy 2012-2017: Metro South West Region

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