NSW NATIONAL PARKS & WILDLIFE SERVICE

Doodle Comer Swamp Nature Reserve

Draft Planning Considerations

environment.nsw.gov.au

Cover photo: Doodle Comer Swamp. Genevieve Wright/DPIE

This document is a draft for public comment. The provisions in the final plan may differ from the provisions of this draft document.

Published by:

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

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

ISBN 978-1-922431-04-2
EES 2020/0198
June 2020

Find out more about your environment at:

www.environment.nsw.gov.au

Contents

1. Doodle Comer Nature Reserve 1
2. Protecting the natural environment 1
   - 2.1 Ephemeral wetlands 1
   - 2.2 Geology and landform 3
   - 2.3 Native plants 4
   - 2.4 Native animals 6
   - 2.5 Weeds and pest animals 9
   - 2.6 Fire 11
   - 2.7 Climate change 12
3. Looking after our culture and heritage 13
   - 3.1 Aboriginal heritage 13
   - 3.2 Doodle Comer Aboriginal Place 14
   - 3.3 Shared heritage 14
4. Providing for visitor use and enjoyment 15
5. NPWS infrastructure and services 16
6. Non-NPWS infrastructure and services 16

Appendices 17

- Appendix A Legislation and policy 17
- Appendix B Scientific plant and animal names 18
- Appendix C Vegetation classes and communities in the park 19
- Appendix D Description of threatened ecological communities in the park 21
- Appendix E Pests and weeds in the park 23

Abbreviations 24

References 25

List of tables

Table 1 Threatened ecological communities in the reserve 6
Table 2 Threatened animals in the reserve 7

List of figures

Figure 1 Map of Doodle Comer Swamp Nature Reserve vi
Figure 2 Vegetation formations in the reserve 6

How to use this document

This planning considerations document outlines the matters considered in preparing the Doodle Comer Swamp Plan of Management, including the reserve's key values, management principles and management considerations. Further information is provided in the appendices, including an outline of relevant legislation (Appendix A) and scientific names for common names of species (Appendix B).

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

This planning considerations document 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

Doodle Comer Swamp Nature Reserve is in the traditional Country of the Wiradjuri People. This plan of management was prepared by staff of NPWS.

Contact us

For more information about this plan of management or Doodle Comer Nature Reserve, contact the NPWS Riverina Highlands Area at riverinahighlands.npws@environment.nsw.gov.au, PO Box 472, Tumut NSW 2720 or by telephone on 02 6947 7000.

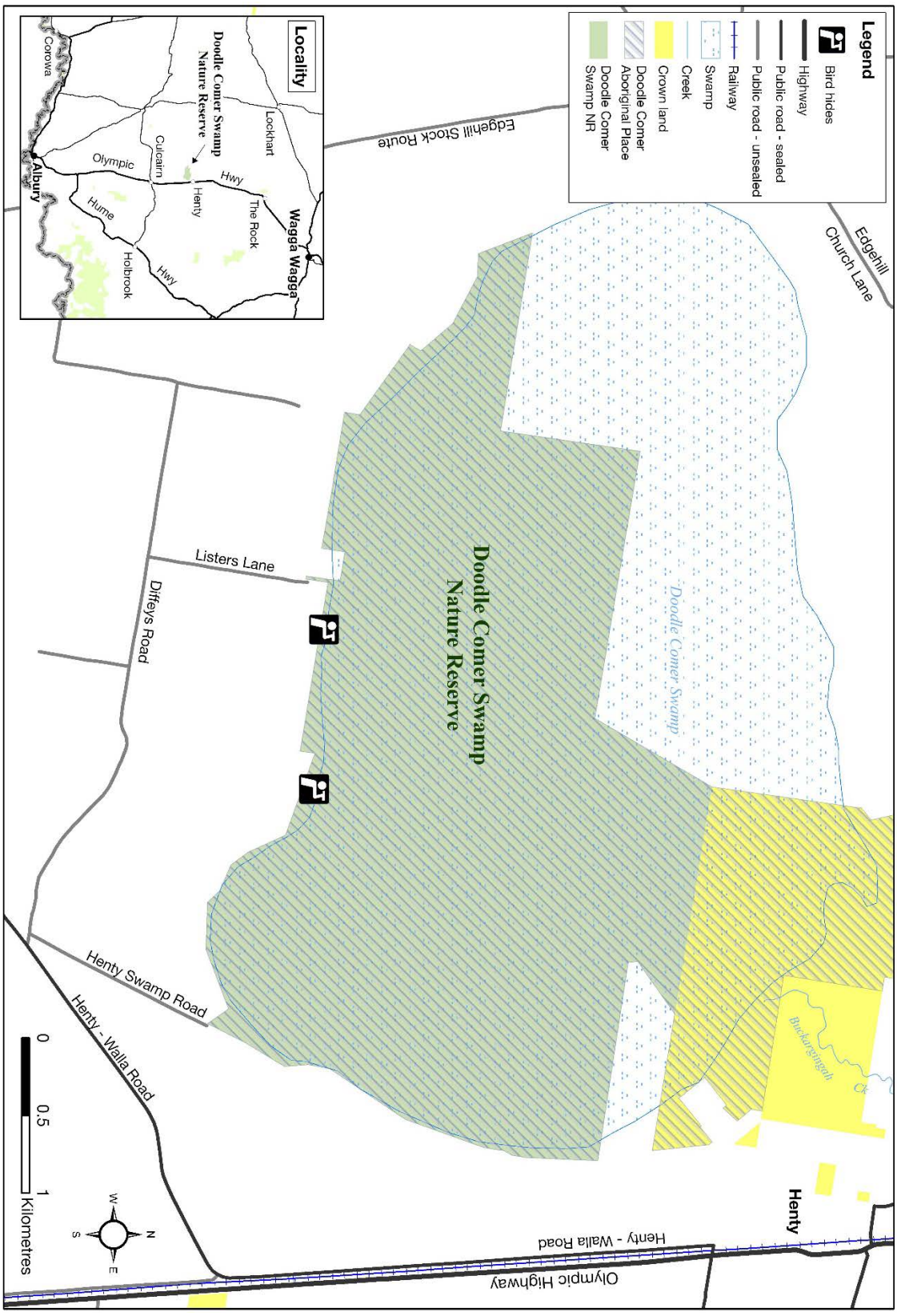

Figure 1 **Map of Doodle Comer Swamp Nature Reserve**

1. Doodle Comer Nature Reserve

Doodle Comer Nature Reserve ('the reserve') is located in southern NSW, bordering the township of Henty, midway between Wagga Wagga and Albury.

Doodle Comer Swamp Nature Reserve was reserved on 21 January 2011 and is 1099 hectares. The reserve was formerly the private property Doodle Cooma West, acquired by the NSW National Parks and Wildlife Service (NPWS) in 2010 with financial assistance from the Commonwealth Government. The reserve protects much of Doodle Comer Swamp, an ephemeral wetland ecosystem of high conservation value.

Doodle Comer Swamp is a terminal lake, that is, it has no outflows to external water bodies such as rivers or the ocean. It is formed in a broad and shallow depression fed by Buckargingah Creek. This creek rises in the hills 15 kilometres east of the swamp and draws on a catchment of about 85 square kilometres. The lake floor is approximately 240 metres above sea level.

The reserve lies within the NSW South Western Slopes Bioregion (Thackway & Cresswell 1995). See Box 1. The South Western Slopes Bioregion is one of the mostly poorly conserved bioregions in New South Wales, with 2.28% under conservation tenures (NPWS 2003), about half of which are reserved under the *National Parks and Wildlife Act 1974* (NPW Act). The bioregion has been heavily cleared for agriculture, including cropping and grazing, and these are the primary land uses surrounding the reserves.

The reserve is bounded by cleared cropping country to the south and contiguous swamp on the remaining boundaries. Land use in the surrounding district is predominantly agricultural, including cropping, and sheep and cattle grazing. Henty and the surrounding region has a population of 1237 people (ABS 2017).

The bioregion has a sub-humid climate characterised by hot summers and no dry season. Mean monthly temperatures at nearby Wagga Wagga range from maximums of 12.8–31.9°C and minimums of 2.8–16.4°C. Mean annual rainfall at Henty is 591 millimetres.

2. Protecting the natural environment

2.1 Ephemeral wetlands

Doodle Comer Swamp Nature Reserve encompasses about half of the greater Doodle Comer Swamp (see Figure 1). The swamp is listed in the Commonwealth's *National Directory of Important Wetlands* and is one of only five such wetlands in the NSW South Western Slopes Bioregion. Doodle Comer Swamp is the largest wetland of its type in southern New South Wales (OEH 2014a). See Box 2.

The greater Doodle Comer Swamp is about 2000 hectares and is comprised of the nature reserve, Crown lands and private land. Over 1000 hectares of Doodle Comer Swamp is within the nature reserve. 45 hectares of the reserve sits above the swamp's high water mark (see Figure 1).

The swamp is an ephemeral wetland and inundates intermittently depending on rainfall in the catchment. Annual flows in Buckargingah Creek are highly variable. The wetland can have periods where it is dry for five years or more, as well as periods where it is inundated for several years. The previous landowner indicated the swamp is inundated for as many as six in 10 years. Once flooded, the duration of inundation is affected by factors such as

seasonal variation in evaporation rates and the volume of inflows. Inundation can occur for extended periods where water depth is 1.5 metres or more.

Doodle Comer Swamp's high conservation value as a wetland is enhanced by its substantially unaltered flow regime, which is in contrast to most wetlands in inland NSW which are regulated. Alteration to the natural flow regimes of rivers, streams and their floodplains and wetlands is listed as a key threatening process (NSW SC 2002) under the *Biodiversity Conservation Act 2016* (BC Act). Buckargingah Creek is an unregulated stream and is not subject to significant water extraction for agriculture.

Management considerations and opportunities

Most of the swamp's catchment has been subject to land clearing and land uses such as cultivation and grazing. These factors have influenced and continue to influence the swamp's ecological condition through factors such as increased nutrient levels, water turbidity and groundwater recharge, with the resulting threat of salinisation.

The long-term conservation of the wetland's high conservation values depends on protecting and enhancing the entire Doodle Comer Swamp, fringes, catchment and the natural flow regime of Buckargingah Creek. The plan of management aims to protect hydrological flows into the broader wetland as well as the nature reserve.

As such, NPWS will seek to engage with adjoining landholders and champion the protection of natural stream flows in the catchment. This will require NPWS to monitor development activities in the wider catchment and be vigilant in engaging with other land and water management agencies to protect the natural hydrology.

Photo 1 **Doodle Comer Swamp Nature Reserve when inundated. Di Thompson**

Box 1. What is the South Western Slopes 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. The NSW South Western Slopes Bioregion covers about 10% of New South Wales (NPWS 2003). Doodle Comer Swamp Nature Reserve is situated in the Lower Slopes Subregion of the bioregion. This subregion contains large areas of Quaternary alluvium (water-deposited soils), and features undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial fans (fan-shaped deposits of sediment by streams).

2.2 Geology and landform

Doodle Comer Swamp contains the NSW (Mitchell) landscape called Murrumbidgee-Tarcutta Lakes, Swamps and Lunettes (DECC 2002). This landscape was not represented in the National Reserve System until acquisition of the reserve. The landscape features plain swamps with Quaternary river and lake sediments. Soils are heavy, cracking and self-mulching grey clays. The swamp is bordered on the south east by a lunette of fine aeolian (windblown) sand.

Soil fertility is moderately high. Similar swamps in this landscape are prone to sodicity (loss of cohesion) and salinity, a common cause of tree death in such swamps. The reserve's soils are limited in richness by some localised sodicity. Maintaining fringing vegetation communities, protecting the swamp's natural hydrology and improving the aquatic vegetation should protect and improve soil health in the reserve. Improving the wetland's native vegetation and seed bank are also important.

There are several granite outcrops in the swamp. Such outcrops are a feature of the Lachlan Fold Belt and are formed by sediment being layered down over time, but not long enough to cover some protruding rock formations. These geological features are considered unique where they extrude from the swamp floor and are a part of the reserve's Aboriginal cultural values (see Section 3).

Box 2. Wetlands in New South Wales

Wetlands are areas that remain wet long enough for their plants and animals to have adapted and become dependent on the moist conditions for at least part of their life cycle.

In New South Wales, wetlands make up about 6% of the State (OEH 2017b). They are found along the coast, in the mountains, in large cities, on inland rivers and in the arid far west.

Wetlands are important to communities across the state, and home to a unique range of native plants and animals. Ephemeral wetland communities are more challenged by impacts because the tentative ecological life cycles operating between wet and dry regimes are more easily broken.

The major threats to wetlands in New South Wales are river regulation and water diversion or extraction, development and catchment disturbance, pest animals and weeds, and climate change.

The *NSW Wetlands Policy* promotes the sustainable conservation, management and wise use of wetlands in New South Wales and the need for all stakeholders to work together to protect wetland ecosystems and their catchments.

There are 12 wetlands in New South Wales recognised for their international significance and listed under the Ramsar Convention. To date, wetlands are the only habitat type in the world to have a dedicated international convention.

Doodle Comer Swamp is not a Ramsar site, but has been recognised as a nationally important wetland through listing on the *National Directory of Important Wetlands*. The swamp's listing occurred because it is a good example of a wetland type occurring within the bioregion.

2.3 Native plants

The vegetation of Doodle Comer Swamp Nature Reserve was surveyed between 2010 and 2014 (OEH 2016b). This work provides a baseline for future planning in the reserve, noting that individual projects and proposals will require site-specific vegetation assessment and verification.

Most of the native vegetation in the reserve is characteristic of the ephemeral wetland. These vegetation communities are dependent on ephemeral and unaltered flows of freshwater.

A total 154 plant species have been recorded in the reserve, of which only approximately 50% are native. Forbs (herbaceous plants other than grasses) make up 52% of the flora, followed by grasses (28%), shrubs (6%), trees (6%), and sedges and rushes (5%) (OEH 2016b). One threatened plant, austral pillwort, has been recorded in the reserve (see Box 3).

Native vegetation formations in Doodle Comer Swamp Nature Reserve (Figure 2) include:

- freshwater wetlands (66% of the reserve)
- forested wetlands (30%)
- grasslands (1%)
- grassy woodlands (0.5%)
- non-native (2.5%).

Several threatened ecological communities are present in the reserve, found wholly within the grassy woodland vegetation formation which encompasses only 0.5% of the reserve (see Table 1 and Figure 2). A description of native vegetation communities in the reserve is included in Appendix C and a description of threatened ecological communities in Appendix D.

Management considerations and opportunities

Surveys of aquatic vegetation were undertaken in 2016 when the swamp was inundated to more than one metre depth (Davidson 2017). The aquatic vegetation in the parts of the swamp which were less than 0.7 metre deep was generally healthy and relatively diverse. However, tall emergent vegetation was absent in depths greater than one metre. This type of vegetation is known to grow in similarly deep waters nearby and was probably lost as a consequence of past grazing and the extended dry period of the Millennium Drought from 2001 to 2009.

Reintroduction of tall emergent aquatic plants, such as common reed, would provide multiple ecological benefits, including to:

- enhance water quality within the wetland by stabilising the wetland floor and reducing wave action in the large, open central parts of the swamp
- provide feeding, nesting and shelter habitat for many species of waterbirds
- minimise the spread of weeds on the wetland floor during dry periods
- filter the initial flush of turbid water when flooding first occurs
- reduce the potential for algal blooms by capturing available nutrients in the water column.

Reintroduction of common reed will be trialled in a small area of the wetland and monitored. It is likely that these reintroductions would become self-regenerating, expanding and contracting in response to wet and dry periods. If reintroduction is successful it will be expanded to other parts of the wetland.

Much of the lakebed is covered in a forested wetland community, dominated by river red gum. Extensive stands of river red gum regrowth have established at the high water mark of the swamp following the removal of livestock grazing. Many of these stands are very dense and lack structural diversity, occurring in previously cleared country. Competition for resources is often strong in such stands and can prevent recruitment of new plants and lead to negligible growth rates. This can delay the development of habitat features characteristic of healthy red gum forests critical to their flora and fauna, such as spreading crowns, hollow-bearing trees, structural diversity and coarse woody debris.

Ecological thinning refers to 'the reduction of stem density to improve the ecological health of a forest with adequate fallen timber retained to improve habitat and structure for animals and plants' (Cunningham et al. 2009, in OEH 2014c). Reduction of stand density reduces competition between the retained trees, promotes growth of those retained trees to a mature and old-growth stage and increases growth of understorey plants, loads of coarse woody debris and provides gaps for sapling recruitment.

A trial of ecological regrowth thinning is proposed to manage some regrowth stands in the reserve. One stand that could be suitable for a thinning trial occurs between Listers Lane and Henty Swamp Road. The trial is to be approved via suitable environmental impact assessment and endorsement by an Environment, Energy and Science botanist. Large-scale thinning trials are occurring in the river red gum forests of the Barmah-Millewa area along the Murray River in Barmah and Murray Valley national parks (OEH 2014c).

Box 1. Austral pillwort – an endangered plant

A population of the austral pillwort was recorded in the reserve in 2014 (OEH 2016b). This plant is listed as endangered under the Biodiversity Conservation Act.

Austral pillwort is a semi-aquatic fern, resembling a small, fine grass. It grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud, as this is when it is most conspicuous. The species is probably ephemeral, appearing after soil has been wetted by rain or flooding.

Extant populations of the plant are known from only a few locations in southern New South Wales. A threat to this species in the reserve is competition from other grasses. Given this plant's persistence in the swamp following massive impacts to its habitat, an initial conservation action based on botanical advice will be to improve natural conditions within the swamp. Should further actions be necessary, the statewide *Saving our Species* program team will be consulted.

Table 1 Threatened ecological communities in the reserve

Common name (short title)	BC Act status	EPBC Act status	Area in reserve (ha)	% of reserve
Inland Grey Box Woodland	E	E	5.3	0.5
Sandhill Pine Woodland	E		0.7	0.07
White Box – Yellow Box – Blakely's Red Gum Woodland	E	CE	0.4	0.03

Notes on status: E = endangered; CE = critically endangered.

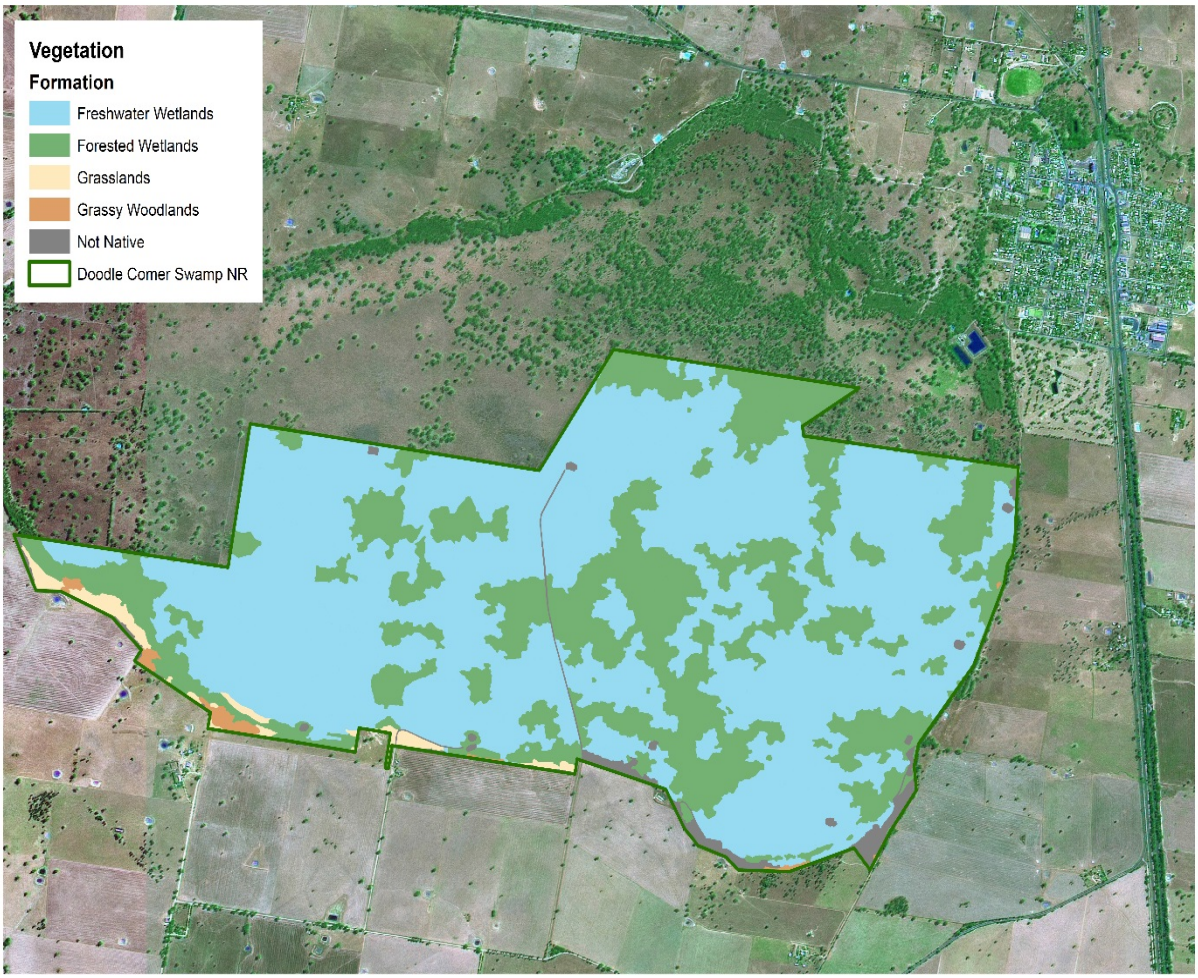

Figure 2 Vegetation formations in the reserve

2.4 Native animals

Doodle Comer Swamp is recognised as a nationally significant wetland and, when inundated, provides foraging and breeding habitat for waterbirds, amphibians, reptiles, fish and invertebrates. Waterbirds, including various ducks, ibis, spoonbills and terns have been observed in their thousands (OEH 2016b). Records include large breeding colonies of great cormorants.

When dry, the swamp provides habitat for the endangered bush stone-curlew (see Box 4). The reserve's river red gum woodlands provide habitat for arboreal mammals and birds.

A total 37 species of native animal have been formally recorded in the reserve (*BioNet* 2019), however, anecdotal evidence suggests that many more species occur, particularly

waterbirds during periods of inundation. A total of eight threatened species listed under the BC Act have been recorded close to or in the reserve (see Table 2), including incidental records on the NSW wildlife database *BioNet* and during vegetation surveys (OEH 2016b).

Table 2 Threatened animals in the reserve

Common name	Scientific name	BC Act status	EPBC Act status
Bush stone-curlew	*Burhinus grallarius*	E	
Black-chinned honeyeater	*Melithreptus gularis gularis*	V	
Brolga	*Grus rubicunda*	V	
Flame robin	*Petroica phoenicea*	V	
Grey-crowned babbler	*Pomatostomus temporalis temporalis*	V	
Little eagle	*Hieraaetus morphoides*	V	
Superb parrot	*Polytelis swainsonii*	V	V
White-bellied sea-eagle	*Haliaeetus leucogaster*	V	

Notes on status: E = endangered; V = vulnerable.

Management considerations and opportunities

Improving our knowledge of the reserve's native animals is key to managing them. A waterbird survey during the next substantial flood event would improve NPWS records and understanding of the wetlands. This would then be followed by regular monitoring of suitable subsequent flooding events. This could include partnering with external research organisations.

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 2013b). Conservation projects under the program in the local government area (with potential relevance to the reserve) include projects aimed at securing in the wild the swift parrot and Sloane's froglet.

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 Commonwealth 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 park.

Box 4. Bush stone-curlew – an endangered bird

The bush stone-curlew is a ground-dwelling bird that rarely flies. It has a distinctive drawn-out 'weeloo' wailing call, often heard at night.

The bush stone-curlew is found in all mainland states. Numbers have drastically declined in south east Australia leading to its endangered listing in New South Wales. The Riverina is one of its strongholds in New South Wales.

There have been numerous records of the bird in and around Doodle Comer Swamp Nature Reserve. The reserve provides suitable habitat when dry. The bird prefers areas with sparse ground cover, typically with short grass, few shrubs, dry leaf litter and fallen timber. It has been observed in dry open grassland croplands adjacent to woodlands.

It is largely nocturnal, feeding on insects and small vertebrates such as frogs, lizards, snakes and mice.

It nests on the ground in a scrape or small bare patch of ground, and breeds throughout the summer and spring. Both adults share the incubation and care for the young. As a ground dweller, it is particularly vulnerable to predation by introduced predators such as the red fox and feral cat.

Threats to the bush stone-curlew in the reserve include predation by the fox and cat, and an over-abundance of exotic grasses on the basin floor. Systematic native animal surveys, pest control programs and ensuring cattle grazing does not occur in an area if a nest is identified, are measures NPWS can implement to help protect this species.

Photo 2 Bush stone-curlews with chick. Ken Stepnell/DPIE

2.5 Weeds and pest animals

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

The *Biosecurity Act 2015* and its regulations provide specific legal requirements for the response, management and control of biosecurity risks, including weeds and pest animals. These requirements apply equally to public and privately-owned land. Under this framework, Local Land Services has prepared regional strategic weed management plans and regional strategic pest animal management plans for each of its 11 regions, including the *Murray Regional Strategic Weed Management Plan 2017–2022* (Murray LLS 2017) and *Murray Regional Strategic Pest Animal Management Plan 2018–2023* (Murray LLS 2018). These plans identify priority weeds and pest animals in each of the regions, plus the appropriate management response for the region (i.e. prevention/alert, eradication, containment or asset protection).

The NPWS regional pest management strategy for Southern Ranges Region (OEH 2012) identifies pest species and priority programs for Doodle Comer Nature Reserve. 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 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.

Appendix D lists pest animals and weeds which are known to occur in the reserves, as well as the status of each of these species.

Weeds

The ephemeral nature of Doodle Comer Swamp influences the vegetation of the fertile basin floor. Many species are unable to survive when the wetland is inundated for long periods. For example, native swamp wallaby grass requires a regular drying phase to set new seed and total submergence is known to kill plants. Similarly, long inundation periods may kill exotic grasses.

Over 50% of plant species recorded in the reserve are weeds (i.e. plants that do not occur naturally in the reserve). These are predominantly pasture weeds associated with previous land uses and no priority weeds for the Murray Local Land Services region have been recorded in the reserve. In 2010, the vegetation of the swamp's basin floor was almost 100% exotic grasses. In 2014, following a three-year period of inundation, the cover of native grasses within the recovering vegetation had increased. At the time of last survey in 2016, the colonisation of the basin floor by native swamp wallaby grass and cane grass was relatively good and improving. As these native grass species expand throughout the swamp floor the opportunities for exotic grasses to establish reduce, however, if native grasses do not colonise a significant part of the basin it is likely that exotic grasses will remain and dominate (OEH 2016b). Continued monitoring of vegetation in the reserve will be undertaken to identify changes in species composition or shifts in the ratio of native and weed species cover.

The invasive nature of environmental weeds, their widespread occurrence in the broader landscape and the fact they compete with native species, requires their continued monitoring and management. The invasion of native plant communities by exotic perennial grasses is a key threatening process (NSW SC 2003) under the BC Act.

Excessive build-up of grass biomass can cause a decline in habitat values for bush stone-curlews (which prefer areas with sparse ground cover, typically with short grass, few shrubs, dry leaf litter and fallen timber) and prevents establishment of other native plants. Occasional livestock grazing is permitted under licence as a conservation tool to reduce biomass. This can serve a secondary function in controlling exotic grasses. Grazing is only permitted when soil conditions are dry, with appropriate approvals and monitoring by NPWS. Other biomass management tools include slashing and burning.

Pests

There are several pest animal species in the reserve that impact natural and heritage values. These include cat, red fox and rabbit. Pest control in the reserve will be undertaken in accordance with pest management strategies relevant to the reserve. The NPWS Southern Ranges Regional Pest Management Strategy identifies priority pest programs for the reserve and is updated periodically. Control of the red fox is a medium priority in the current strategy. A ground-baiting strategy is used in coordination with surrounding landholders and bait takes are recorded as a measure of fox activity. Predation by the European red fox is a key threatening process (NPWS SC 1998) under the BC Act.

Carp are present in the swamp when it is inundated. Carp feeding action increases turbidity and they can have detrimental impacts on water quality and native fish. The issue of carp will be monitored by NPWS in consultation with the relevant agency. NPWS will seek opportunities to participate in carp management programs within the swamp and its catchment.

Photo 3 **Doodle Comer Swamp. Photo: DPIE**

2.6 Fire

Fires, particularly wildfires, are a risk for the reserve because they have the potential to damage or kill mature hollow-bearing river red gums. Hollow-bearing trees provide animal habitat for threatened species such as the superb parrot and other native animals. They also can spread to neighbouring lands where life and property can be threatened.

There have been no recorded ignitions within the reserve. Lightning strikes and rural burn-off escapes are the two most common causes of fire in the local government area. Most dry storms occur between November and February. In December 2015, a grass fire originating from outside the reserve burnt about 59 hectares of the southern section of the reserve.

Fire may be used as a tool to reduce fuel loads in the reserve as part of a wider strategy to mitigate risk to surrounding properties and the town of Henty. NPWS maintains cooperative arrangements with surrounding landowners and the Rural Fire Service and is a member of the Hume Bush Fire Management Committee.

Accordingly, a draft fire management strategy has been prepared for the reserve. The strategy includes biodiversity thresholds of at least five years between fires in all vegetation communities. The background to fire management in NPWS reserves is outlined in Box 5.

Box 5. Fire in the reserve

Fire is a natural feature of many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can lead to loss of plant and animal species and communities, and high-frequency fires have been listed as a key threatening process under the BC Act.

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

A fire management strategy which defines the fire management approach is prepared for each reserve and is updated periodically (OEH 2013a). These strategies outline the recent fire history of the reserves, key assets within and adjoining the reserves including sites of natural and cultural heritage value, fire management zones and fire control advantages such as management trails and water supply points. The strategies also contain fire regime guidelines for conservation of the vegetation communities found in the reserves based on biodiversity thresholds. Fire management strategies are developed in consultation with local communities, bushfire management committees and rural fire brigades.

2.7 Climate change

The region will continue to experience rainfall variability, consistent with the presence of an ephemeral wetland, however more hot days are likely to increase drying rates (climate change predictions for the region are outlined in Box 6). This is likely to reduce the durations of inundation and may result in a contraction of the size of the wetland over time. These effects have the potential to degrade the wetland and affect waterbird breeding.

Isolated ecosystems, such as Doodle Comer Swamp Nature Reserve, are likely to be at greater risk than larger, connected ecosystems.

The challenge for NPWS is to adapt to the inevitable consequences of climate change and ensure that management is reflective of these changes. If the hydrological regime of the swamp were to change, NPWS has a responsibility to ensure that the integrity of the reserve's natural values and systems are maintained so that what emerges is also a natural viable ecosystem. Monitoring of the reserve's values and their response to management actions is essential in this task.

Box 6. Climate Change

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

Maximum temperatures are projected to **increase** in the near future by 0.4–1.0°C	Maximum temperatures are projected to **increase** in the far future by 1.6–2.5°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 1.3–2.4°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	Rainfall is projected to **increase** in summer and autumn
Average fire weather is projected to **increase** in summer spring in far future	Severe fire weather days are projected to **increase** in summer and spring in far future

Source: OEH 2014
Near future=2020-2039
Far future=2060-2079

3. Looking after our culture and heritage

Both Aboriginal and non-Aboriginal people place values on cultural and natural landscapes. These values may be attached to the landscape as a whole, or to parts of the landscape (e.g. a particular plant, animal or place). All landscapes contain the imprint of human use. On any given area of land, some historical activity will have taken place (DECCW 2010). Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land-use practices, and people continue to influence the land through agricultural and recreational use, cultural practices, the presence and spread of introduced plants and animals, and in some cases air and water pollution.

3.1 Aboriginal heritage

For 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'.

The cultural landscape of the reserve is part of Country of the Wiradjuri speaking nation that includes the three rivers: *Wambool* (Macquarie), *Galare* (Lachlan) and the *Murrumbidya* (Murrumbidgee).

Doodle Comer Swamp is 25 kilometres south of *Kengal* (The Rock), an area recognised for its association with *Biamai* (a sacred Creator in Wiradjuri culture), and *Mirrigan* (the dingo mob).

The natural habitat of the swamp provided an ideal camping area for the Wiradjuri with its sources of water and food. Dudal comer (or *cooma* as it is sometimes spelt) is said to mean 'sweet water' in Wiradjuri, with the first European property taking this name.

The diverse range of Aboriginal sites in the reserve and surrounding area, including burials, burial chambers, modified trees, artefact scatters, an ochre quarry and a stone quarry, attest to this traditional occupation.

Historic observations to the north west and east of Doodle Comer Swamp in 1825 and in 1843 indicate there were groups of between 50 and 100 Aboriginal people living in the local area. In the late 19th century there was an Aboriginal camp near Doodle Cooma homestead, and people crossed Buckargingah Creek in bark canoes (OEH 2017a).

Within the swamp there are several unique pink granite outcrops rising to 10 metres above the basin floor which form ideal viewing platforms. There is evidence of significant past Aboriginal use in and around these rock outcrops.

There are currently 14 recorded Aboriginal sites in the reserve (Aboriginal Heritage Information Management System, accessed August 2019). Aboriginal sites are places with evidence of Aboriginal occupation or places that are related to other aspects of Aboriginal culture. They are an important in the culture of local Aboriginal people and as evidence of Aboriginal history.

Doodle Comer Swamp is part of a larger network of swamps and lagoons across the Riverina that formed a significant part of the cultural landscape, sustaining the Wiradjuri with an extensive range of resources for thousands of years (Government Notices 2016).

3.2 Doodle Comer Aboriginal Place

In 2016 Doodle Comer Aboriginal Place was declared under section 84 of the NPW Act. Doodle Comer Aboriginal Place is about 1333 hectares and covers the entire reserve and several Crown land lots adjoining the reserve's northern boundary (see Figure 1).

Doodle Comer Swamp forms an important part of the cultural landscape for Wiradjuri Aboriginal people, including connections with Country.

Aboriginal places are a way of legally recognising and protecting Aboriginal cultural heritage on public and private lands. An Aboriginal place is defined in the NPW Act as a place that is or was of special significance with respect to Aboriginal culture.

The Aboriginal cultural values of Doodle Comer, which are significant to the Wiradjuri and associated Aboriginal people today, include the rich natural environment, the local historic record of Aboriginal occupation, and sites associated with traditional Aboriginal activities.

Aboriginal people have cultural associations and connections to Country in the reserve. While the NSW Government has legal responsibility for the protection of Aboriginal sites and places, NPWS acknowledges the right of Aboriginal people to make decisions about their own heritage. Aboriginal communities will be consulted and involved in the management of Aboriginal sites, places and related issues; and in the promotion and presentation of Aboriginal culture and history.

The management of Doodle Comer Aboriginal Place is consistent with the objectives of managing Doodle Comer Swamp Nature Reserve. NPWS will work with the Aboriginal community to protect and celebrate Aboriginal stories and ensure ongoing connection to Country for Wiradjuri Aboriginal People and management of the Doodle Comer Aboriginal Place.

NPWS will establish arrangements with the Aboriginal community for involvement in reserve management and support the community to access Country.

3.3 Shared heritage

History has taken place across the landscape. This includes the history of the first Australians, Aboriginal people, and our shared 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 and reserves.

Doodle Comer Swamp Nature Reserve was formerly part of a private property called Doodle Cooma West that was used for grazing and cropping. The first European explorer to record the area was Major Thomas Mitchell in 1835. The first settlers arrived around 1850.

Henty was called Doodle Cooma until 1886 when its name changed to Henty, after a Henry Henty of Gerogery (a town south of Henty).

There are no listed built items or landforms of heritage value located in the reserve and therefore no specific objective or action relating to this theme.

4. Providing for visitor use and enjoyment

The primary purpose of nature reserves is to conserve ecosystems, species, communities or natural phenomena. They differ from national parks in that there is no requirement to provide for visitor use in nature reserves. Research, educational use, nature study and enjoyment are appropriate uses where they do not conflict with conservation.

Prior to reservation the land now occupied by Doodle Comer Swamp Nature Reserve was private land with no public access. Recreational use was limited to water sports with permission of the landholder.

The main attraction to the reserve is the wetland, especially when inundated. The wetland provides ideal opportunities for birdwatching from the water or surrounding higher ground. Visitation in the reserve is oriented towards low-key, self-reliant, passive, nature-based activities. This use is consistent with principles for the management of nature reserves.

Public vehicle access is provided by two roads to the south of the reserve: Henty Swamp Road and Listers Lane (see Figure 1). Interpretive signs and bird hides are located near these access points.

In addition to these facilities, there is the opportunity to form and maintain an unmarked walking route along the wetland. An unmarked route is consistent with a Class 6 (AS 2156) walking track.

Photo 4 **Canoeing in Doodle Comer Swamp. DPIE**

Wiradjuri People have many stories about birds from their connection and use of such wetlands within Country. Celebration and connection with this culture will be offered as an important component of the visitor experience at Doodle Comer Swamp Nature Reserve. NPWS will, in consultation with the Aboriginal community, combine Wiradjuri cultural history and knowledge of the local wetlands into the visitor experience.

The reserve is close to Henty and most visitation is likely to proceed from this location. There are benefits to the Henty community to promote the reserve from town. In consultation with the Henty community, NPWS will add European cultural history and knowledge of the local wetlands into visitor experience materials.

5. NPWS infrastructure and services

Although not required to under the *Dividing Fences Act 1991*, NPWS encourages a cooperative approach towards sharing fencing responsibilities. NPWS has provided fencing material to neighbours to support boundary fencing. Current fences are generally in good condition and this will be monitored over time.

Boundary gates are located at strategic locations to allow for authorised access during reserve management activities such as fire management, and pest and weed control.

There are two public access points from Henty Swamp Road and Listers Road, with signs at the entrances.

There are internal fences left over from the land's previous use. These fences pose a risk to native animals and are no longer required. Internal fences no longer required will be identified and removed.

6. Non-NPWS infrastructure and services

There are no non-NPWS infrastructure or services in Doodle Comer Swamp Nature Reserve, and therefore no actions relating to this section in the plan of management.

The Henty Sewage Treatment Plant is outside the reserve on the outskirts of Henty on adjoining Crown land. It operates under a NSW Environment Protection Authority licence, issued under the *Protection of Environment Operations Act 1997*. Effluent is discharged after treatment to an effluent re-use storage dam. If the dam becomes full it overflows to the swamp outside the reserve, where it eventually evaporates. Release of pollutants and exceedance of discharge limits to the environment are considered a low risk to the reserve's values (GHSC 2013).

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

- *Environment Protection and Biodiversity Conservation Act 1999*

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/regional-pest-management-strategies
- 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 Scientific plant and animal names

The following table shows the scientific name for common plant and animal names used in this plan. See Appendix E for pest animals and weeds.

Common name	Scientific name
Plants	
Austral pillwort	*Pilularia novae-hollandiae*
Cane grass	*Eragrostis australasica*
Common reed	*Phragmites australis*
River red gum	*Eucalyptus camaldulensis*
Swamp wallaby grass	*Amphibromus nervosus*
Birds	
Great cormorant	*Phalacrocorax carbo*
Swift parrot	*Lathamus discolor*
Frogs	
Sloane's froglet	*Crinia sloanei*

Common plant names from PlantNET (The NSW Plant Information Network System), Royal Botanic Gardens and Domain Trust, Sydney, http://plantnet.rbgsyd.nsw.gov.au [03/07/19].

Appendix C Vegetation classes and communities in the park

Class name	Vegetation community description
Inland floodplain shrublands	Canegrass (*Eragrostis australasica*) swamp, tall grassland, wetland of drainage depressions, lakes and pans of the inland plains (578 hectares on reserve). Distributed throughout western NSW in the arid and semi-arid zones. Not threatened overall but most areas have been subjected to grazing and trampling by stock and feral animals.
Inland floodplain swamps	Swamp grassland wetland of the Riverine Plain (117 hectares on reserve). Grassland and forbland dominated by blowngrass (*Lachnagrostis filiformis*), Dutton wallaby grass (*Austrodanthonia duttoniana*) and billy button (*Pycnosorus globosus*). Occurs on grey cracking clay in swamps and depressions. More restricted than other grassland types in the region.
Inland floodplain swamps	Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid climatic zone (27 hectares on reserve). Moist herbland containing a mix of sedges, forbs, grasses and free-floating or attached water plants. Some areas have been cleared for cropping or horticulture in New South Wales, but a large proportion remains. Altered flooding regimes are the main threat to this community in New South Wales.
Inland floodplain shrublands	Lignum (*Muehlenbeckia florulenta*) shrubland wetland of the semi-arid plains (0.14 hectare on reserve).
Inland riverine forests	River red gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW (318 hectares on reserve). Tall woodland with trees averaging about 20 m high dominated by river red gum (*Eucalyptus camaldulensis*). Shrubs are absent or rare. This community is restricted in extent and is poorly presented in reserves. Mainly cleared in New South Wales and susceptible to weed invasion, burning or pig damage.
Inland riverine forests	River red gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes subregion of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (12.5 hectares on reserve). Very tall open forest dominated by river red gum with trees averaging about 25 m high and a canopy cover of about 40%. Mainly distributed along the Murray and Murrumbidgee Rivers in New South Wales.
Riverine plain grasslands	Plains grass grassland on alluvial, mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion (14 hectares on reserve). Tussock grassland dominated by the grass species plains grass (*Austrostipa aristiglumis*). Occurs on dark grey, self-mulching clays and clay loam soils in slightly low-lying areas of floodplains and alluvial plains. Often containing a high

	proportion of annual exotic species in spring. Poorly represented in reserves.
Floodplain transition woodlands	Western grey box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (five hectares on reserve). Tall woodland to 25 m high dominated by western grey box (*Eucalyptus microcarpa*). An endangered ecological community.
Floodplain transition woodlands	White cypress pine woodland on sandy loams in central NSW wheatbelt (0.7 hectares on reserve). Tall or mid-high woodland to about 18 m high dominated by white cypress pine (*Callitris glaucophylla*). An endangered ecological community.
Floodplain transition woodlands	Western grey box – white cypress pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (0.5ha on reserve). An endangered ecological community.
Floodplain transition woodlands	Yellow box – river red gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion (0.5ha on reserve). Tall woodland usually about 20 m high dominated by yellow box (*Eucalyptus melliodora*) usually with river red gum (*Eucalyptus camaldulensis*).

Source: Adapted from the Plant Community Type Identification Tool (PCT Id Tool).

Common names from PlantNET (The NSW Plant Information Network System), Royal Botanic Gardens and Domain Trust, Sydney, http://plantnet.rbgsyd.nsw.gov.au [03/07/2019].

Appendix D Description of threatened ecological communities in the park

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

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community (EEC)

Inland Grey Box Woodland EEC includes those woodlands in which the most characteristic tree species, inland grey box (*Eucalyptus microcarpa*), is often found in association with bimble or poplar box (*E. populnea* subsp*. bimbil*), white cypress pine (*Callitris glaucophylla*), kurrajong (*Brachychiton populneus*), bulloak (*Allocasuarina luehmannii*) or yellow box (*E. melliodora*), and sometimes with white box (*E. albens*). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 metres tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey.

This community is also listed as endangered under the EPBC Act.

Potential threats to this community within the reserve include:

- grazing by domestic stock
- degradation of the local and broader landscape including soil acidification, salinisation, erosion scalding and loss of connectivity
- illegal firewood collection
- inappropriate fire regimes
- competition of native understorey with invasive grasses and other weeds
- invasion and establishment of weed species changing community structure and floristic composition
- over-abundant native herbivores (e.g. macropods) and introduced herbivores (e.g. feral goats and rabbits) leading to loss of floristic structure and ecological function
- aggressive exclusion of small woodland birds from over-abundant noisy miners.

Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions EEC

Sandhill Pine Woodland EEC is the name given to the ecological community dominated by white cypress pine (*Callitris glaucophylla*). Sandhill Pine Woodland is characterised by an open tree stratum, which may be reduced to isolated individuals or may be absent as a result of past clearing. The tree layer is dominated by white cypress pine, either in pure stands or with a range of other less abundant trees or tall shrubs. The structure and species composition of the community varies depending on disturbance history and temporal variability in rainfall.

Potential threats to this community within the reserve include:

- lack of regeneration partly due to isolation and predation by grazers – white cypress pine seed production is intermittent and successful recruitment is dependent on good

seasonal conditions (e.g. above average rainfall), otherwise seedlings may be short lived

- competition from invasive grasses, Paterson's curse and other weeds causing a change in species composition
- grazing in areas where there is regeneration by rabbits, hares and native herbivores
- inappropriate fire regimes – white cypress pine is highly fire sensitive and vulnerable to too-frequent fire
- impacts associated with climate change such as an increase in the frequency of fires, or a change in species structure and composition
- disturbance and damage caused by the illegal removal of timber for firewood collection.

White Box – Yellow Box – Blakely's Red Gum Woodland EEC

White Box – Yellow Box – Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: white box (*Eucalyptus albens*), yellow box (*E. melliodora*) and Blakely's red gum (*E. blakelyi*). Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and ground layers are rare. Modified sites include the following:

- Areas where the main tree species are present, ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species.
- Sites where the trees have been removed and only the grassy ground layer and some herbs remain.

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as critically endangered under the EPBC Act.

Potential threats to this community within the reserve include:

- degradation of remnants by non-native plant species, including noxious weeds, exotic pasture species and environmental weeds
- degradation of remnants by feral pest animals resulting in the loss or modification of habitat and predation of native fauna that are part of the community
- degradation by over-grazing and trampling by introduced and native herbivores resulting in losses of plant species and structural diversity (simplification of the understorey and ground layer and suppression of overstorey regeneration), erosion and other soil changes (e.g. loss of cryptogams, increased nutrient status)
- illegal harvesting of firewood (either living or standing dead, including material on the ground) and collection of on-ground woody debris
- invasion of remnants by noisy miner (*Manorina melanocaphala*), displacing small native birds and leading to tree health decline
- altered fire regimes
- tree death from over-abundant leaf eating insects and other factors.

Appendix E Pests and weeds in the park

The following table summarises key information on pests 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	RSMP
Cat	*Felis catus*	Y	N	Y
Common carp	*Cyprinus carpio*	N	N	Y
Red fox	*Vulpes vulpes*	Y	Y	Y
Rabbit	*Oryctolagus cuniculus*	Y	N	Y

Weeds

Common name	Scientific name	KTP	NSW TAP	RSMP	WONS
Noogoora burr	*Xanthium occidentale*	N	N	N	N

Notes for tables:

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

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

RSMP = regional priority identified in the Murray Regional Strategic Pest Animal Management Plan (Murray LLS 2018) or the Murray Regional Strategic Pest Animal Management Plan (Murray LLS 2018).

WONS = Weed of National Significance.

Abbreviations

BC Act	*Biodiversity Conservation Act 2016*
EEC	Endangered ecological community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
NPWS	National Parks and Wildlife Service
NSW	New South Wales

References

ABS 2017, *2016 Census Data*, Australian Bureau of Statistics, Canberra, www.abs.gov.au/websitedbs/D3310114.nsf/Home/Census?OpenDocument&ref=topBar

Davidson I 2017, Investigation and advice about the wetland vegetation community and its management on Doodle Comer Swamp Nature Reserve, unpublished report for National Reserves and Wildlife Service, Tumut.

DECC 2002, *Description for NSW (Mitchell) Landscapes Version 2*, Department of Environment and Climate Change, Sydney.

DECCW 2010, *NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales*, Department of Environment, Climate Change and Water, Sydney, http://climatechange.environment.nsw.gov.au/Impacts-of-climate-change/2010-NSW-climate-impact-reporting.

GHSC 2013, *Greater Hume Pollution Incident Response Management Plan*, Henty Sewage Treatment Plant, Greater Hume Shire Council.

Govt Notices 2016, Gazettal Notice Doodle Comer Aboriginal Place, NSW Government Gazette No 82 of 14 October 2016, pg 2769.

Murray LLS 2017, *Murray Region Strategic Weed Management Plan 2017–2022*, Murray Local Land Services, www.lls.nsw.gov.au/__data/assets/pdf_file/0004/722632/20170626-Murray-Regional-Weed-Mgmt-Plan_for-web.pdf.

Murray LLS 2018, *Murray Region Strategic Pest Animal Management Plan 2018–2023*, Murray Local Land Services, www.lls.nsw.gov.au/__data/assets/pdf_file/0019/820801/Murray-Regional-Strategic-Pest-Animal-Plan-2018-23_FINAL_web_reduced.pdf.

NPWS 2003, *The Bioregions of New South Wales: Their biodiversity, conservation and history*, National Parks and Wildlife Service, Sydney, www.environment.nsw.gov.au/bioregions/Bioregions.htm.

NSW SC 1998, Final Determination to list predation by the European Red Fox Vulpes Vulpes as a Key Threatening Process under the Threatened Species Conservation Act, NSW Scientific Committee, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/1996-1999/predation-by-the-european-red-fox-vulpes-vulpes-key-threatening-process-listing.

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

NSW SC 2002, Final Determination to list alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands as a Key Threatening Process under the Threatened Species Conservation Act, NSW Scientific Committee, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/alteration-to-the-natural-flow-regimes-key-threatening-process-listing.

NSW SC 2003, Final Determination to list invasion of native plant communities by exotic perennial grasses as a Key Threatening Process under the Threatened Species Conservation Act, NSW Scientific Committee, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-

2003/invasion-of-native-plant-communities-by-exotic-perennial-grasses-key-threatening-process-listing

OEH 2012, Regional Pest Management Strategy 2012–17, Southern Ranges Region: a new approach for reducing impacts on native species and park neighbours, Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, www.environment.nsw.gov.au/pestsweeds/RegionPestManagement.htm.

OEH 2013a, *Living with Fire in NSW National Parks: A strategy for managing bushfires in national parks and reserves 2012–2021*, revised edition, Office of Environment and Heritage, Sydney, www.environment.nsw.gov.au/fire/120690livfire.htm.

OEH 2013b, Saving our Species, Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, www.environment.nsw.gov.au/savingourspecies/about.htm.

OEH 2014a, Doodle Comer Swamp Nature Reserve Statement of Management Intent, Office of Environment and Heritage, Sydney.

OEH 2014b, *Murray Murrumbidgee Climate Change Snapshot*, Office of Environment and Heritage, Sydney.

OEH 2014c, Public Environment Report, Ecological Thinning Trial in NSW River Red Gum Forests, Office of Environment and Heritage, Sydney.

OEH 2016a, *Biodiversity Conservation Program,* Office of Environment and Heritage, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/programs-legislation-and-framework/biodiversity-conservation-program

OEH 2016b, Doodle Comer Nature Reserve Vegetation Survey 2010–2014, unpublished report by the Office of Environment and Heritage, Queanbeyan.

OEH 2017a, *Doodle Comer Aboriginal Place*, http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=5063514

OEH 2017b, *Wetlands*, http://www.environment.nsw.gov.au/wetlands/RiversAndWetlands.htm

PCT Id Tool, Office of Environment and Heritage, Plant Community Identification Software, http://www.environment.nsw.gov.au/research/PlantCommunityIDsoftware.htm.

Thackway R & Cresswell I 1995, *An Interim Biogeographic Regionalisation for Australia: A framework for establishing the national system of reserves*. Australian Nature Conservation Agency, Canberra, www.environment.gov.au/system/files/resources/4263c26f-f2a7-4a07-9a29-b1a81ac85acc/files/ibra-framework-setting-priorities-nrs-cooperative-program.pdf.