NSW GOVERNMENT

Office of Environment & Heritage

NSW National Parks & Wildlife Service

Regional Pest Management Strategy 2012–17: Metro South West Region

A new approach for reducing impacts on native species and park neighbours

The New South Wales National Parks and Wildlife Service (NPWS) is part of the Office of Environment and Heritage (OEH). Throughout this strategy, references to NPWS should be taken to mean NPWS carrying out functions on behalf of the Director General of the Department of Premier and Cabinet, and the Minister for the Environment.

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Published by:

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ISBN 978 1 74293 622 2
OEH 2012/0371
August 2013

This plan may be cited as:

OEH 2012, *Regional Pest Management Strategy 2012–17, Metro South West Region: a new approach for reducing impacts on native species and park neighbours*, Office of Environment and Heritage, Sydney.

Cover photo: rusa deer (R Ali/OEH)

Summary

The NPWS regional pest management strategies aim to minimise adverse impacts of pests on biodiversity, protected areas and the community. The strategies achieve this through identifying and focusing on the highest priority programs, ensuring that actions are achievable and deliver measurable outcomes.

Metro South West Region incorporates a diverse area of greater Sydney managing 34 conservation reserves. This regional strategy prioritises specific pest management programs into critical, high, medium and lower categories. Some critical priorities for pest management in Metro South West Region include:

- controlling cane toads at Taren Point to prevent infestation of Towra Point Nature Reserve
- reducing deer herbivory in Royal National Park
- protecting water storages for the populations of Sydney and Blue Mountains
- controlling wild dogs in the Nattai Reserves
- removing bitou bush in coastal reserves
- limiting African olive invasion of Cumberland Plain Woodland.

The pest management priorities for Metro South West Region align with state and local priorities under the *Noxious Weeds Act 1993* and the *Rural Lands Protection Act 1998.* Priorities also align with the NSW Invasive Species Plan and take on a whole-of-landscape cooperative approach to implementation.

The Region maintains a proactive wild dog management program through wild dog management plans, collaboration with Livestock Health and Pest Authorities and local partnerships. While minimising the impact of wild dogs on livestock, the Region is also conserving dingo populations in core areas of reserves.

In the major water storage catchments for Sydney and the Blue Mountains (referred to as Special Areas) the Region is undertaking pest control on a number of species. In particular, feral pigs and cattle are controlled under joint management with Sydney Catchment Authority.

Since 2007 the Region has been successful in implementing or participating in a number of significant conservation-based pest management programs. These include:

- a collaborative eradication program targeting cane toads in the Taren Point industrial area
- ongoing deer control in Royal National Park
- fox control across the Kurnell Peninsula providing protection for successful breeding of little terns and other migratory shore birds
- wild dog and pig control across the Nattai reserves
- bitou bush and lantana control in Towra Point Nature Reserve and Kamay Botany Bay National Park
- mapping of African love grass and African olive in western Sydney reserves.

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Abbreviations

AMS	Asset Maintenance System
BMAD	Bell Miner Associated Dieback
BPWW	Biodiversity Priorities for Widespread Weeds (BPWW CC1-6 refers to control categories within BPWW Statewide Framework[1])
CAMBA	China-Australia Migratory Bird Agreement
CAP	catchment action plan
CMA	catchment management authority
DPI	Department of Primary Industries
EEC	endangered ecological community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
JAMBA	Japan-Australia Migratory Bird Agreement
KTP	key threatening process
LHPA	Livestock Health and Pest Authority
NP	national park
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Service
NR	nature reserve
NW Act	*Noxious Weeds Act 1993*
OEH	Office of Environment and Heritage
PAS	Priorities Action Statement
RP	regional park
SCA	state conservation area
TAP	threat abatement plan
TSC Act	*Threatened Species Conservation Act 1995*

[1] http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/publications/cmas/cma_statewide-framework-web.pdf

1 Introduction

Pest management within the Office of Environment and Heritage (OEH) is guided by two core planning instruments:

NSW 2021 – A Plan to Make NSW Number One sets out performance targets, including a specific priority action within *Goal 22 Protect Our Natural Environment* which is to *address core pest control in National Parks through the delivery of NPWS Regional Pest Management Strategies and improve educational programs and visitor access*.

NSW Invasive Species Plan provides specific goals, objectives and actions in relation to invasive species management.

This document is the Metro South West Region Pest Management Strategy and contains regionally specific components including prioritised pest programs.

The state strategy, Managing Pests in NSW National Parks, provides the broader planning framework for the management of pests by NPWS. It documents the policy and organisational context and describes the logic used for identifying, prioritising and monitoring pest management programs. It also establishes state-wide pest management goals, objectives and actions.

This regional strategy describes the local circumstances within the Region and applies the corporate framework from the state strategy to prioritise specific pest management programs. These priorities will be included in regional operations plans and implemented through the NPWS Asset Maintenance System (AMS). It also broadly identifies pest distribution and associated impacts across the Region.

2 Regional overview

Metro South West Region lies to the south and west of the Sydney central business district. The Region includes approximately 105,000 hectares of reserved land in four protected area categories: nature reserve (13), national park (eight), state conservation area (eight) and regional park (five). There are also three gazetted Aboriginal Places.

Regional context

The predominant geomorphologic features of the Metro South West Region reserves are sandstone plateaus with deeply incised valleys, the Cumberland Plain, coastal wetlands, bays, beaches, major rivers (Hacking, Georges, Wollondilly, Nepean, Hawkesbury) and coastal escarpments. The reserves are part of the circle of reserves around greater Sydney, continuous reserves from Hunter Region to the Victorian border, and vital corridors linking theses conservation zones to the Great Eastern Range.

The Cumberlain Plain has historically been a very fertile area and as a result has also been the preferred location for intensive agriculture for Sydney's outer metropolitan area since the earliest days of European settlement. However, with time this former land use has been replaced by increasing urban development. As a result, the distributions of much of its surviving biodiversity are small and fragmented, and many ecological communities are now listed as endangered.

In joint management with the Sydney Catchment Authority, Metro South West Region Nattai Area manages part of the Warragamba Special Areas (which contain water storages for Sydney and the Blue Mountains) through the Special Areas Strategic Plan of Management (SASPOM; Sydney Catchment Authority and DEC 2007). The SASPOM aims to provide high quality water in reservoirs by protecting the ecological integrity and natural and cultural values of the Special Areas. In order to protect and optimise the quality of water entering the storages, pest species management within the Special Areas aims to minimise the impacts of pests on water quality and to address the critical threats posed by pests to ecological integrity and conservation values in these areas. As joint manager of the Special Areas, Sydney Catchment Authority is both a major adjacent landholder and key partner with similar values in environment protection. Under the Joint Management Arrangements for the Special Areas, the Executive Steering Group and the Special Areas Operations Group provide opportunities for OEH and Sydney Catchment Authority to discuss, coordinate and cooperatively implement pest species management programs across land tenures in the Special Areas.

Together the reserves of the Region exhibit a rich cultural history beginning with long occupation by Aboriginal people. Some reserves, such as Cattai and Scheyville national parks, reflect the evolution of occupation, ownership and land management from Aboriginal occupation, through to contact with Europeans and European settlement during the earliest years of the nineteenth century. Now, in the twenty-first century, they reflect the modern recreational, environmental and educational values which have come to dominate the landscape.

The Region has two visitor centres (Kurnell and Audley) and three area offices (Kurnell, Audley, Bents Basin and Scheyville). Approximately 3,500,000 visitors enjoy the reserves each year with an average length of stay in excess of three hours.

By 2027, the current and proposed reserves of the Region's western periphery will provide recreational open space and intensively managed high visitation precincts, vital to the health and wellbeing of the many hundreds of thousands of residents who

will occupy future suburbs in the north-west and south-west growth centres of Sydney.

Visitors to the Region's reserves are more likely to be local residents than tourists, and many visitors choose a particular park due to its convenience and closeness to home. As a result, the mix of park visitors reflects the cultural diversity in the communities of the Region. The population of the Region is characterised by diverse socioeconomic communities with approximately 180 ethnic groups and over 140 languages spoken.

In general these reserves are:

- relatively small giving rise to a limited number of visitor precincts that experience extremely high seasonal visitation rates (Bents Basin State Conservation Area, Rouse Hill Regional Park, Cattai, Royal, Kamay Botany Bay and Georges River national parks)
- renown for their extensive historic values: Agnes Banks Sand Deposits (Mulgoa Nature Reserve), Audley historic recreational complex (Royal National Park), Cattai Estate (Cattai National Park) and Scheyville National Park are all included on the State Heritage Register as places of state significance
- subject to international conservation agreements (JAMBA and CAMBA) for the protection of wetlands and migratory birds (Towra Point Nature Reserve)
- of world and national heritage significance, including the Nattai and Thirlmere Lakes National Park components of the Greater Blue Mountains World Heritage Area and two national heritage listed national parks (Royal and Kamay Botany Bay national parks)
- part of vital drinking water catchments including the Nattai Wilderness, the East Warragamba and Prospect Reservoir: these represent one quarter of Sydney's water catchments
- historically significant, containing Cook's Landing Place (Kamay Botany Bay National Park, the place of first contact between Aboriginals and British explorers), Royal National Park (the first national park gazetted in Australia and the second in the world) and Scheyville National Park (an immigrant farm and military training college).

Park management

NPWS estate in Metro South West Region is managed across three Areas: Cumberland, Nattai and Royal.

Cumberland Area

Cumberland Area encompasses fourteen reserves in western Sydney between Maroota Ridge in the north and Casula in the south. The Area office and works depot is located in Scheyville National Park, a location steeped in military and later refugee history. The area's name of Cumberland comes from the fact that the area encompasses much of the Cumberland Plain which prior to European settlement was dominated by Cumberland Plain Woodland – this is now a critically endangered vegetation community. Cumberland Area manages most of the remaining significant vegetation remnants in western Sydney, the majority of which are dominated by Cumberland Plain Woodland and other threatened vegetation communities. Cumberland Area shares a western boundary with Blue Mountains Region and spectacular sandstone gorge country, a northern boundary with Metro North-east Region and a southern boundary with Nattai Area.

Nattai Area

Nattai Area manages the largest reserves in the Region with twelve reserves extending over 80,000 ha. The Area extends from Casula west to Warragamba and south to the northern boundary of Upper Lachlan Shire. The Area office is in Bents Basin State Conservation Area with works depots located at both Bents Basin and at Oakdale.

Royal Area

Royal Area extends in the north from the southern side of Botany Bay south to the northern part of the Illawarra Area. The western boundary of the area abuts both Nattai and Cumberland Areas. Royal Area manages seven reserves and includes the flagship of the NSW national parks reserves system, Royal National Park, which is Australia's oldest national park and the second national park gazetted in the world. The Area also manages the southern portion of Kamay Botany Bay National Park which is an iconic site as it was the location of Captain Cook's landing in 1770 and the meeting of Aboriginals and British explorers. The Area office, and regional office are located in Royal National Park at the historic village of Audley, with works depots located at both Audley and Kurnell.

Community engagement

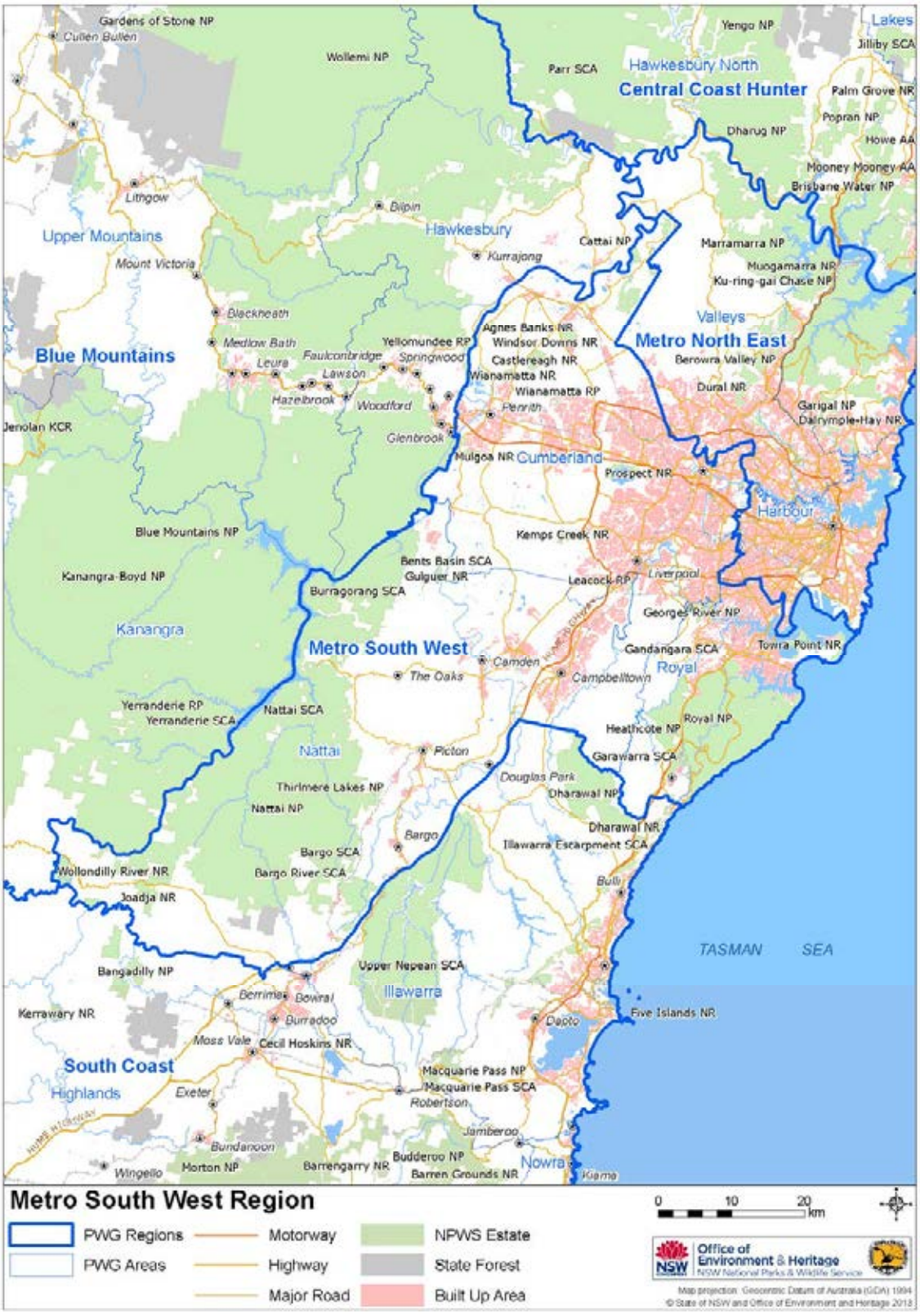
Metro South West Region works in close collaboration with neighbouring agencies, joint managers, landholders and a number of groups such as Oberon Wild Dog Association, Royal National Park Deer Working Group and Basket Creek Landcare Group.

In mid 2012, the NSW Government announced a new initiative to involve volunteer shooters in pest animal management on National Parks and Reserves. This initiative has been developed by NPWS into the Supplementary Pest Control (SPC) program, which is being trialled in 12 reserves across NSW. All volunteers involved in the program will be supervised by NPWS staff and will be trained to the equivalent levels as NPWS staff. All shooting will be conducted according to an approved NPWS shooting operations plan, which includes a Job Safety Analysis (JSA) and a Job Safety Brief (JSB). As part of this process, the program will only take place in sections of reserves that have been closed to the general public. The trial program will help to refine how this additional pest control option can further engage this sector of the community while complementing the programs detailed in the Regional Pest Management Strategies.

Pest management highlights

Since 2007 the Region has been successful in implementing or participating in a number of significant conservation-based pest management programs. These include:

- a collaborative eradication program targeting cane toads in the Taren Point industrial area
- ongoing deer control in Royal National Park
- fox control across the Kurnell Peninsula, providing protection for successful breeding of little terns and other migratory shorebirds
- wild dog and pig control across the Nattai reserves
- bitou bush and lantana control in Towra Point Nature Reserve and Kamay Botany Bay National Park
- mapping of African love grass and African olive in western Sydney reserves.


Gardens of Stone NP
Cullen Bullen
Wollemi NP
Parr SCA
Yengo NP
Lakes
Jilliby SCA
Hawkesbury North
Central Coast Hunter
Palm Grove NR
Popran NP
Dharug NP
Howe AA
Mooney Mooney AA
Brisbane Water NP
Lithgow
Bilpin
Upper Mountains
Hawkesbury
Cattai NP
Marramarra NP
Kurrajong
Mount Victoria
Muogamarra NR
Ku-ring-gai Chase NP
Blackheath
Valleys
Agnes Banks NR
Windsor Downs NR
Metro North East
Medlow Bath
Yellomundee RP
Blue Mountains
Faulconbridge
Springwood
Leura
Lawson
Castlereagh NR
Berowra Valley NP
Wianamatta NR
Wianamatta RP
Dural NR
Hazelbrook
Woodford
Penrith
Garigal NP
Dalrymple-Hay NR
Jenolan KCR
Glenbrook
Mulgoa NR
Cumberland
Prospect NR
Harbour
Blue Mountains NP
Kemps Creek NR
Bents Basin SCA
Gulguer NR
Kanangra-Boyd NP
Leacock RP
Liverpool
Burragorang SCA
Georges River NP
Kanangra
Metro South West
Towra Point NR
Gandangara SCA
Camden
Royal
The Oaks
Campbelltown
Yerranderie RP
Yerranderie SCA
Nattai SCA
Heathcote NP
Royal NP
Nattai
Picton
Garawarra SCA
Douglas Park
Thirlmere Lakes NP
Dharawal NP
Nattai NP
Dharawal NR
Bargo
Illawarra Escarpment SCA
Bargo SCA
Wollondilly River NR
Bargo River SCA
Bulli
Joadja NR
TASMAN SEA
Bangadilly NP
Upper Nepean SCA
Illawarra
Berrima
Bowral
Five Islands NR
Kerrawary NR
Burradoo
Dapto
Moss Vale
Cecil Hoskins NR
South Coast
Macquarie Pass NP
Highlands
Macquarie Pass SCA
Exeter
Robertson
Jamberoo
Bundanoon
Budderoo NP
Nowra
Wingello
Morton NP
Barrengarry NR
Barren Grounds NR
Kiama
Metro South West Region
PWG Regions
PWG Areas
Motorway
Highway
Major Road
NPWS Estate
State Forest
Built Up Area
0
10
20
km
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NSW National Parks & Wildlife Service
Map projection: Geocentric Datum of Australia (GDA) 1994
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3 Regional prioritisation

The following key factors are considered when determining priorities for pest management within the Region. However, a precautionary approach using risk management will be applied where there is uncertainty about the impacts of the pest on the asset. The feasibility of effective control will also be a consideration.

Critical priority

C-TSC (Threatened Species Conservation)

Programs targeting pests which are, or are likely to be, significantly impacting on threatened species, populations or communities. These include the highest priorities identified in the threat abatement plans (TAPs), Priorities Action Statements (PAS) and Biodiversity Priorities for Widespread Weeds (BPWW). For example, undertake fox control at the Towra Point priority site for Little Terns as identified in the Fox TAP.

C-HD (Health and Disease)

Programs that target pests which impact significantly on human health or are part of a declared national emergency, for example outbreak of foot and mouth disease or control of feral pigs in the catchment area of a domestic water supply reservoir.

C-EC (Economic)

Programs targeting pests that impact significantly on economic enterprises, for example wild dog control where there is potential for significant stock losses as identified in wild dog management plans.

C-NE (New and Emerging)

Programs addressing new occurrences or suppressed populations of highly invasive pest species with potential for significant impacts on park values (subject to risk/feasibility assessment), and programs to control Class 1 and 2 noxious weeds.

High priority

H-IH (International Heritage)

Programs that target pests that impact significantly on world heritage or international heritage values, for example control of pigs and goats impacting on world heritage values of Greater Blue Mountains World Heritage Area, pest control in Ramsar wetlands.

H-CH (Cultural Heritage)

Programs targeting pests that impact significantly on important cultural heritage values, for example control of feral goats where they are inhabiting an area containing Aboriginal rock art, control of rabbits undermining an historic building.

Medium priority

M-WNH (Wilderness and National Heritage)

Programs that target pests that impact significantly on wilderness, wild rivers, national heritage values or other important listed values, for example control of willows along a declared wild river or within a wilderness area.

M-RA (Recreation and Aesthetic values)

Programs that target pests that impact significantly on recreation, landscape or aesthetic values, for example control of blackberry on the margins of camping areas, control of weeds in an area of natural beauty that is visited frequently.

M-CP (Cooperative Programs)

Cooperative programs (not covered in higher priorities above) targeting pests that impact significantly on park values or agricultural production (including the control of Class 3 noxious weeds or implementation of other endorsed state or regional plan), for example control of bitou bush across boundaries as part of a regional control plan prepared by a regional weeds advisory committee and supported by NPWS.

M-II (Isolated Infestations)

Programs addressing isolated infestations of highly invasive pest species, widely distributed in other parts of the Region, with high potential for future impacts on park values.

Lower priority

L-LP (Localised Programs)

Programs targeting pests that have localised impacts on natural ecosystems or agricultural lands that promote community skills, awareness and involvement with parks, for example participation in a new bush regeneration project with a local community group for control of Class 4 noxious weeds.

L-PP (Previous Programs)

Previous programs targeting pests that have localised impacts on native species and ecosystems, and that can be efficiently implemented to maintain program benefits, for example the maintenance of areas treated previously for serrated tussock to continue keeping them weed free.

In some circumstances, new programs may be introduced, or priority programs extended to target pests where a control window of opportunity is identified. These may arise where burnt areas become more accessible for ground control of weeds, where drought makes control of feral pigs and feral goats more efficient because they congregate in areas where water is available, or when a new biocontrol agent becomes available.

Future priorities for pest control will need to reflect changes in the distribution, abundance or impacts of pests that may occur in response to environmental changes, including climate change. NPWS is supporting research to understand the interaction between climate change, pests and biodiversity.

4 Prioritised regional pest programs

Live versions of this table will be kept on the OEH intranet and updated annually over the five year period of the strategy. Sites are listed in order of priority category, management area, target species and then reserve.

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Cumberland	Agnes Bankes NR	589 – Agnes Banks reserve edge and track	African lovegrass	Cooks River/ Castlereagh Ironbark Forest EEC (TSC-e), Agnes Banks Woodland EEC (TSC-e), Castlereagh Swamp Woodland EEC (TSC-e), Shale/Gravel Transition Forest EEC (TSC-e), Cumberland land snail (*Meridolum corneovirens*) (TSC-e), masked owl (*Tyto novaehollandiae*) (TSC-v), *Persoonia nutans* (EPBC-e; TSC-e), *Dillwynia tenuifolia* (EPBC-v; TSC-v) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Kemps Creek NR	709 – Cumberland Plain Woodland. Eastern boundary Gurner Ave	African lovegrass, bridal creeper	Shale hills woodland (Cumberland Plain Woodland), shale plains woodland (Cumberland Plain Woodland) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Kemps Creek NR	986 – Shale gravel transition forest, core area of reserve	African lovegrass, bridal creeper	Shale/Gravel Transition Forest EEC (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Prospect NR	2272 – North-eastern and eastern parts	African olive, asparagus fern, blackberry, lantana, mother-of-millions, prickly pear, *Privet* spp, St John's wort, grasses, pampas grass	Cumberland Plain woodland – shale hills woodland, shale plains woodland, *Acacia pubescens, Pimelea spicata, Marsdenia viridiflora* (BPWW – CC2)	Asset protection	Ground spraying, bush regeneration techniques, foliar spraying, biological control, grub out	C-TSC
Cumberland	Cattai NP	602 – Arndell's scrub	African olive, honey locust, lantana, African lovegrass, mothvine, balloon vine, prickly pear	Western Sydney Dry Rainforest, Shale/Sandstone Transition Forest EECs (BPWW – CC1)	Asset protection	Foliar spraying, cut and paint, hand removal	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Cumberland	Scheyville NP	995 – SNP – Old Pitt Town Rd	African olive, lantana, bridal creeper	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce), Cumberland land snail (*Meridolum corneovirens*) (TSC-e), eastern freetail bat (TSC-v) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Mulgoa NR	680 – Central drainage line	Blackberry, African olive	Alluvial woodland – River-Flat Eucalypt Forest on Coastal Floodplains EEC (BPWW – CC1)	Asset protection	Foliar spraying, biological control, bush regeneration techniques	C-TSC
Cumberland	Scheyville NP	845 – West bank, Long Neck Lagoon	Blackberry, green cestrum, moth vine, small-leaved privet	Alluvial woodland, Freshwater Wetlands EEC (TSC-e) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Scheyville NP	844 – South East banks, Long Neck Lagoon	Blackberry, green cestrum, small-leaved privet, moth vine	Freshwater Wetland (TSC-e), Cumberland Plain Woodland (EPBC-e; TSC-ce), Swamp Oak Floodplain Forest EECs (TSC-e) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Cattai NP	866 – Melaleuca Track, Mitchell Park	Bridal creeper, privet species	Shale Sandstone Transition Forest EEC (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Mulgoa NR	908 – Northern Creek line	Cat's claw creeper, tree of heaven	Alluvial woodland – River-Flat Eucalypt Forest on Coastal Floodplains EEC (BPWW – CC1)	Asset protection	Foliar spraying, biological control, bush regeneration techniques	C-TSC
Cumberland	Maroota Ridge SCA	860 – Maroota Ridge	Lantana	*Olearia cordata* (EPBC-v TSC-v), *Zieria involucrata* (EPBC-v, TSC-e), *Pimelea curviflora* var *curviflora* (TSC-v), moist sclerophyll forest, Powerful owl *Ninox strenua* (TSC-v), Glossy Black-cockatoo *Calyptorhynchus lathami* (TSC-v), Yellow-bellied glider *Petaurus australis* (TSC-v). (BPWW-CC1)	Asset protection	Foliar spray, Cut and paint, splatter gun, physical/mechanical removal, naturally occurring biological controls, annual quadrat monitoring	C-TSC
Cumberland	Scheyville NP	907 – North-eastern section of park near intersection with Pebbly Hill Rd	Lantana	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Scheyville NP	931 – Pitt Town–Dural, Pebbly Hill Rd	Lantana, moth vine	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Cumberland	Scheyville NP	915 – Old Pitt Town, Schofield Rd	Mother-of-millions	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce), Cumberland land snail (*Meridolum corneovirens*) (TSC-e), speckled warbler (*Pyrrholaemus saggitatus*) (TSC-v), *Acacia pubescens* (EPBC-v; TSC-v), *Dillwynia tenuifolia* (EPBC-v; TSC-v) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Cattai NP	742 – Field Study Centre slope, Mitchell Park	Mother-of-millions, bridal creeper	Shale Sandstone Transition Forest EEC (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Scheyville NP	847 – North Arm and adjacent woodland, Long Neck Lagoon	*Privet* spp., green cestrum, blackberry, moth vine, kikuyu, tradescantia	Freshwater Wetlands EEC fringing lagoon (TSC-e) and adjacent Swamp Oak Floodplain Forest EEC (TSC-e) and Cumberland Plain Woodland EEC (EPBC-e; TSC-ce) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Scheyville NP	843 – North Long Neck Creek	*Privet* spp., lantana, blackberry, moth vine	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Bents Basin SCA	727 – *Eucalyptus benthamii* sites in riparian zone	Privet, African olive, honey locust, prickly pear	*E. benthamii* (EPBC-v; TSC-v); River-Flat Euclaypt Forest on Coastal Floodplains EEC (TSC-e) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Cumberland	Agnes Bankes NR	588 – Northern Addition	Robinia, African lovegrass	Agnes Banks Woodland EEC (TSC-e), Cumberland plain snail (*Meridolum corneovirens*) (TSC-e), masked owl (*Tyto novaehollandiae*) (TSC-v), *Persoonia nutans* (EPBC-e; TSC-e), *Dilwynia tenuifolia* (EPBC-v; TSC-v), *Pultenaea parviflora* (EPBC-v; TSC-e), *Micromyrtus minutiflora* (EPBC-v; TSC-e) (BPWW – CC1)	Asset protection	Ground spraying	C-TSC
Cumberland	Cattai NP	675 – Cattai Creek Rainforest, Mitchell Park	Tradescantia, lantana, privet species, bridal creeper	Western Sydney Dry Rainforest EEC, *Pimelea curviflora* (EPBC-v; TSC-v) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Nattai	Nattai NP	832 – Lakesland	African lovegrass	Shale Sandstone Transition Forest EEC (EPBC-e; TSC-e) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Gulguer NR	730- Eastern boundary	Box elder, African olive, prickley pear, small-leaved privet, mothvine, bridal creeper	Shale Sandstone Transition Forest EEC – low sandstone influence (EPBC-e; TSC-e) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Nattai	Nattai NP	Wollondilly	Fox	Rock-wallabies	Asset protection	Monitoring – nil treatment	C-TSC
Nattai	Gulguer NR	660 – Cambpell's Ford and the gorge	Honey locust, box elder, mothvine, bridal creeper, small-leaved privet	Riparian forest and riparian scrub – River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e); large-footed fishing bat (TSC-v) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Nattai	Thirlmere Lakes NP	898 – New acquisition	Lantana, fireweed, radiata pine, thistles, inkweed, *Conyza* spp., purpletop	Shale Sandstone Transition Forest EEC (EPBC-e; TSC-e) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Nattai	Nattai NP	2786 – Wollondilly foreshore, Bullio Valley	Serrated tussock	White Box Yellow Box Blakely's Red Gum Woodland EEC (BPWW – CC4), world heritage values	Asset protection	Foliar spraying	C-TSC
Nattai	Wollondilly NR	2787- Bomans Hill Precint	Serrated tussock	White Box Yellow Box Blakely's Red Gum Woodland EEC (BPWW – CC4)	Asset protection	Foliar spraying, ecological burning	C-TSC
Royal	Towra Point NR	2303 – the Knoll	Asparagus fern, bitou bush, lantana	Kurnell Dune Forest EEC (BPWW – CC1)	Asset protection	Foliar spraying, cut and paint	C-TSC
Royal	Royal NP	2206 – Jibbon	Asparagus fern, green cestrum, lantana, moth vine, prickly pear, mother-of-millions	Kurnell Dune Forest, Littoral Rainforest EECs (BPWW – CC2)	Asset protection	Bush regeneration techniques, basal bark, foliar spraying, biological control, cut and paint	C-TSC
Royal	Royal NP	2115 – Bonnie vale	Asparagus fern, green cestrum, mother-of-millions, Japanese honeysuckle, lantana, moth vine, turkey rhubarb	Bangalay Sand Forest, Kurnell Dune Forest (TSC-e), Sydney Freshwater Wetlands (TSC-e), Swamp Schlerophyll Forest (TSC-e), Littoral Rainforest EECs (EPBC-e; TSC-ce) (BPWW – CC3)	Asset protection	Bush regeneration techniques, basal bark, foliar spraying, biological control, cut and paint	C-TSC
Royal	Royal NP	2163 – East Heathcote	Bitou bush, Japanese honeysuckle, moth vine, pampas grass, privet, turkey rhubarb	Duffys Forest Ecological Community, Sydney Turpentine – Ironbark Forest EECs (BPWW – CC2)	Asset protection	Foliar spraying and/or basal bark, cut and paint, grub out, bush regeneration techniques	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Royal	Kamay Botany Bay NP	2215 – Kurnell – Swamp Forest complex	Bitou bush, lantana	Sydney Coastal Estuary Swamp Forest Complex (Bitou Bush TAP species) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Royal	Kamay Botany Bay NP	2213 – Kurnell – foredune complex	Bitou bush, lantana	Coastal Sand Dune Complex (Bitou Bush TAP species) (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Royal	Kamay Botany Bay NP	2113 – Boat Harbour Reserve	Bitou bush, lantana	Kurnell Dune Forest, Sydney Freshwater Wetlands EECs (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Royal	Kamay Botany Bay NP	2298 – Tabbagai	Bitou bush, lantana	Botany Bay bearded greenhood orchid (*Pterostylis* sp. 15) (EPBC-e; TSC-e) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Royal	Kamay Botany Bay NP	2269 – Pott Pt, Cooks Knoll, Kurnell	Bitou bush, lantana	Coastal Banksia Woodlands (*Banksia integrifolia*) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Royal	Towra Point NR	2310 – Towra Point NR – Zone A	Bitou bush, lantana, polygala	Swamp Oak Flooplain Forest EEC, Coastal Saltmarsh EEC, Sydney Freshwater Wetland EEC, *Syzygium paniculatum* (EPBC-v; TSC-e) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Royal	Towra Point NR	2311 – Towra Point NR – Zone B	Bitou bush, lantana, turkey rhubarb, blackberry, African olive, pampas grass, kikuyu, bridal creeper, panic veldgrass	Kurnell Dune Forest, Littoral Rainforest, Swamp Oak Floodplain Forest EECs (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC
Royal	Garrawarra SCA	2173 – Flat Rock Creek	Blackberry	Angophora forest, a rare vegetation community in this section of the park (BPWW – CC1)	Asset protection	Foliar spraying	C-TSC
Royal	Royal NP	2230 – Lost World	Crofton weed, mistflower	Littoral Rainforest EEC (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Royal	Royal NP	Royal	Deer	Bangalay Sand Forest, Coastal Saltmarsh, Duffys Forest Ecological Community, Kurnell Dune Forest, Littoral Rainforest, Southern Sydney Sheltered Forest on Transitional Sandstone Soils, Swamp Oak Floodplain Forest, Swamp Sclerophyll Forest on Coastal Floodplains, Sydney Freshwater Wetlands, Sydney Turpentine – Ironbark Forest, Themeda Grassland on Seacliffs and Coastal Headlands, River-Flat Eucalypt Forest on Coastal Floodplain, Freshwater Wetlands, Cumberland Plain Woodland, Shale/Sandstone Transition Forest, Western Sydney Dry Rainforest EECs	Asset protection	Shooting programs	C-TSC
Royal	Towra Point NR	Towra Spit Island	Fox	Shorebirds (little terns and pied oystercatchers)	Asset protection	Shooting, baiting, trapping	C-TSC
Royal	Royal NP	2332 – Werrong	Lantana, Crofton weed, mistflower, pampas grass, mother-of-millions, prickly pear	Littoral Rainforest EEC (EPBC-ce; TSC-e), red-crowned toadlet (TSC-v), eastern pygmy-possum (TSC-v), *Pterostylis longifolia*, *P. nutans*, *P. grandiflora* (BPWW – CC2)	Asset protection	Foliar spraying, biological control, grub out	C-TSC
Royal	Royal NP	2330 – Wattle Forest	Moth vine, Crofton weed, mistflower, arum lily, tradescantia , green cestrum	Littoral Rainforest, River-Flat Eucalypt Forest on Coastal Floodplain EECs (BPWW – CC2)	Asset protection	Cut and paste, foliar spraying	C-TSC
Royal	Royal NP	2110 – Big Marley lagoon	Pampas grass, mother-of-millions	Freshwater Wetlands (TSC-e), Littoral Rainforest EECs (EPBC-e; TSC-ce) (BPWW – CC1)	Asset protection	Grub out, foliar spraying	C-TSC
Royal	Garrawarra SCA	2188 – Hacking River fire trail	Privet, Crofton weed	Southern Sydney Sheltered Forest on Transitional Sandstone Soils EEC (TSC-e) (BPWW – CC2)	Asset protection	Foliar spraying	C-TSC

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Nattai NP	Nattai	Cattle	Domestic water supply, Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Shooting, mustering	C-HD
Nattai	Wollondilly River NR	Wollondilly	Cattle	Domestic water supply, White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	Shooting	C-HD
Nattai	Joadja NR	Joadja	Goat	Domestic water supply, Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Blakely's Red Gum Woodland EECs	Asset protection	Shooting	C-HD
Nattai	Nattai NP	Nattai	Goat	Domestic water supply, Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Shooting	C-HD
Nattai	Burragorang SCA	Burragorang	Pig	Domestic water supply, River-Flat Eucalypt Forest on Coastal Floodplains, Cumberland Plain Woodland, Shale/Sandstone Transition Forest, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Trapping, baiting and shooting	C-HD
Nattai	Joadja NR	Joadja	Pig	Domestic water supply, Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Trapping, baiting and shooting	C-HD
Nattai	Nattai NP	Nattai NP	Pig	Domestic water supply, Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Trapping, baiting and shooting	C-HD
Nattai	Nattai SCA	Nattai SCA	Pig	Domestic water supply, White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	Trapping, baiting and shooting	C-HD
Nattai	Wollondilly River NR	Wollondilly River	Pig	Domestic water supply, Western Sydney Dry Rainforest, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Trapping, baiting and shooting	C-HD

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Joadja NR	Southern Highlands Wild Dog Management Plan	Wild dog	Neighbours' stock	Asset protection	Baiting, M-44, trapping	C-EC
Nattai	Nattai NP	Southern Highlands Wild Dog Management Plan	Wild dog	Neighbours' stock	Asset protection	Baiting, M-44, trapping	C-EC
Nattai	Wollondilly River NR	Southern Highlands Wild Dog Management Plan	Wild dog	Neighbours' stock	Asset protection	Baiting, M-44, trapping	C-EC
Cumberland	Bents Basin SCA	Bents Basin	Alligator weed		Containment	Foliar spraying, biological control	C-NE
Cumberland	Cattai NP	Cattai	Alligator weed		Containment	Foliar spraying, biological control	C-NE
Cumberland	Kemps Creek NR	Kemps Creek	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Cumberland	Mulgoa NR	Mulgoa	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Cumberland	Prospect NR	Prospect	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Cumberland	Bents Basin SCA	Bents Basin	Deer		Containment	Shooting, baiting, trapping	C-NE
Cumberland	Cattai NP	Cattai	Deer		Containment	Shooting, baiting, trapping	C-NE
Cumberland	Kemps Creek NR	Kemps Creek	Deer		Containment	Shooting	C-NE
Cumberland	Mulgoa NR	Mulgoa	Deer		Containment	Shooting	C-NE
Cumberland	Scheyville NP	Scheyville	Deer		Containment	Shooting, baiting, trapping	C-NE
Cumberland	Kemps Creek NR	Kemps Creek	*Phytophthora* spp.		Containment	Trails of tree injection and on ground spraying with phosphite. Future aerial spraying where appropriate. Quarantine of park. Regular soil sampling to ascertain rate of spread.	C-NE
Cumberland	Cattai NP	Cattai	Senegal tea		Eradication	Folia spraying	C-NE
Cumberland	Scheyville NP	Longneck Lagoon	Water hyacinth		Eradication	Foliar spraying, hand pulling, harvesting	C-NE

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Gulguer NR	Gulguer	Alligator weed		Containment	Foliar spraying	C-NE
Nattai	Leacock RP	Leacock	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Nattai	Nattai NP	Nattai NP	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Nattai	Thirlmere Lakes NP	Thirlmere Lakes	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Nattai	William Howe RP	William Howe	Boneseed		Eradication	Foliar spraying and/or basal bark	C-NE
Nattai	William Howe RP	William Howe	Coolatai grass		Containment	Foliar spraying	C-NE
Nattai	Gulguer NR	Gulguer	Deer		Containment	Shooting, baiting, trapping	C-NE
Royal	Kamay Botany Bay NP	Kamay Botany Bay – Commemoration Flat foreshore	Alligator weed		Containment	Foliar spraying	C-NE
Royal	Towra Point NR	Towra Point	Alligator weed		Containment	Foliar spraying	C-NE
Royal	Royal NP	East Heathcote	Boneseed		Containment	Foliar spraying and/or basal bark	C-NE
Royal	Royal NP	Bold Hill	Boneseed		Containment	Foliar spraying and/or basal bark	C-NE
Royal		Off-park adjacent to western edge of Towra Point NR	Cane toad		Eradication	Surveys and hand collection	C-NE
Royal	Royal NP	Royal	Coolatai grass		Containment	Foliar spraying	C-NE
Royal	Kamay Botany Bay NP	Kamay Botany Bay	Deer		Containment	Shooting, baiting, trapping	C-NE
Royal	Towra Point NR	Towra Point	Deer		Containment	Shooting, baiting, trapping	C-NE
Royal	Georges River NP	Yeramba Lagoon	Salvinia		Eradication	Harvesting, biological control, foliar spraying	C-NE
Royal	Royal NP	Marley	Sea spurge		Eradication	Foliar spraying	C-NE
Royal	Royal NP	Hacking River (Jersey Springs to Audley Pond)	Senegal tea		Eradication	Foliar spraying	C-NE

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Nattai NP	Nattai River, Wollondilly River	Blackberry	World heritage values, natural ecosystem values	Asset protection	Foliar spraying	H-IH
Nattai	Thirlmere Lakes NP	Blue Gum	Blackberry	World heritage values, natural ecosystem values	Asset protection	Foliar spraying	H-IH
Royal	Royal NP	Wattamolla	Asparagus fern	Landscape aesthetics	Asset protection	Bush regeneration techniques	M-RA
Royal	Garrawarra SCA	Garrawarra SCA	Mother-of-millions	Aesthetics of coastal headlands, native vegetation	Asset protection	Foliar spraying	M-RA
Royal	Kamay Botany Bay NP	The Leap Lookout	Mother-of-millions	Aesthetics value of headlands, native vegetation	Asset protection	Foliar spraying	M-RA
Royal	Royal NP	2111 – Big Marley sandune system	Pampas grass	Aesthetics and vegetation on sand dunes surrounding Big Marley Lagoon – sandstone woodland and heath (BPWW – CC4)	Asset protection	Grub out or foliar spraying	M-RA
Cumberland	Bents Basin SCA	Bents Basin	Asparagus fern, bridal creeper, Chilian needle grass, gleditisa, grasses, green cestrum, lantana, moth vine, mother-of-millions, prickly pear, *Privet* spp., St John's wort, vines and scramblers, tradescantia , willows, African olive, blackberry	Cumberland Plains Woodland, Shale/ sandstone transition forest ,alluvial woodland (River-Flat Forest on Coastal Floodplains) EECs, *Eucalyptus benthamii*	Asset protection	Bush regeneration techniques, low volume spraying in areas where less than 1 metre in height. Hand removal of rhizomes (bridal creeper), foliar spraying, cut and paint, stem inject/cut and paint/basal spraying, ground spraying.	M-CP
Cumberland	Pitt Town NR	Pebbly Hill Road	Moth vine, lantana	Cumberland Plain Woodland EEC (EPBC-e; TSC-ce)	Asset protection	Cut and paste, foliar spraying	M-CP
Nattai	Burragorang SCA	Werriberri Catchment	Blackberry	Natural ecosystem	Asset protection	Foliar spraying	M-CP
Nattai	Wollondilly River NR	Wollondilly River	Blackberry	Natural ecosystem	Asset protection	Foliar spraying	M-CP
Nattai	Thirlmere Lakes NP	Thirlmere Lakes NP	Grasses	Shale/Sandstone Transition Forest, Freshwater Wetlands on Coastal Floodplains EECs	Asset protection	Foliar spraying	M-CP

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Nattai NP	Nattai NP	Grasses, lantana, prickly pear, St John's wort, tree of heaven	Mount Gibraltar Forest in the Sydney Basin Bioregion, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Foliar spraying, biological control	M-CP
Nattai	Nattai SCA	734 – Edges of Lake Burragorang	Prickly pear, other weeds	White Box Yellow Box Blakely's Red Gum Woodland EEC (BPWW – CC4)	Asset protection	Foliar spraying	M-CP
Nattai	Wollondilly River NR	Wollondilly River NR	Prickly pear, tree of heaven, willows, lantana	Western Sydney Dry Rainforest, White Box Yellow Box Blakely's Red Gum Woodland EECs	Asset protection	Foliar spraying, stem inject/cut and paint/basal spraying, biological control	M-CP
Nattai	Nattai NP	895 – Nattai Valley, along Nattai river	Willows	Cumberland Plain woodland – shale hills woodland, shale plains woodland, *Acacia pubescens*, *Pimelea spicata*, *Marsdenia viridiflora* (BPWW – CC5)	Asset protection	Stem inject/cut and paint/basal spraying	M-CP
Royal	Royal NP	Cabin communities	Asparagus fern (*Asparagus aethiopicus*)	Littoral Rainforest, Southern Sydney Sheltered Forest on Transitional Sandstone Soils EECs	Asset protection	Bush regeneration techniques	M-CP
Royal	Royal NP	Audley (Reids Flat, Pool Flat)	Asparagus fern, bridal creeper, coral trees, green cestrum, Japanese honeysuckle, lantana, morning glory, prickly pear, *Privet* spp., turkey rhubarb	Swamp Sclerophyll Forest on Coastal Floodplains, Littoral Rainforest, Kurnell Dune Forest, Duffys Forest Ecological Community, Cumberland Plains Woodland, Shale gravel transition forest, Castlereagh swamp woodland EECs	Asset protection	Bush regeneration techniques, foliar spraying, basal bark and foliar spraying, biological control	M-CP
Royal	Royal NP	Costens Pt	Asparagus fern, coral trees	Sydney Turpentine – Ironbark Forest, Duffys Forest Ecological Community	Asset protection	Bush regeneration techniques, foliar spraying	M-CP
Royal	Royal NP	Warumbul	Asparagus fern, coral trees, other weeds	Sydney Turpentine Ironbark Forest, Duffys Forest Ecological Community EECs	Asset protection	Bush regeneration techniques, foliar spraying	M-CP
Royal	Royal NP	Gundamaian Pt	Asparagus fern, coral trees, other weeds	Sydney Turpentine Ironbark forest, Duffys Forest Ecological Community EECs	Asset protection	Bush regeneration techniques, foliar spraying	M-CP
Royal	Royal NP	Maianbar	Asparagus fern, other weeds	Bangalay Sand Forest EEC	Asset protection	Bush regeneration techniques	M-CP
Royal	Royal NP	Red Jacks Pt	Asparagus fern, other weeds	Bangalay Sand Forest EEC	Asset protection	Bush regeneration techniques	M-CP

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Royal	Royal NP	Yenabilli Pt	Asparagus fern, other weeds	Sydney Turpentine – Ironbark Forest EEC	Asset protection	Bush regeneration techniques	M-CP
Royal	Royal NP	Karingal	Blackberry, coral trees, lantana	Littoral Rainforest EEC	Asset protection	Ground spraying, manual, foliar spraying and bush regeneration techniques, biological control	M-CP
Royal	Royal NP	Stony Batter Otford	Coral trees, other weeds	Littoral Rainforest EEC	Asset protection	Foliar spraying and bush regeneration techniques	M-CP
Royal	Royal NP	Helensburgh	Coral trees, *Privet* spp.	Southern Sydney Sheltered Forest on Transitional Sandstone Soils EEC	Asset protection	Foliar spraying and bush regeneration techniques	M-CP
Royal	Royal NP	Savilles Ck	Coral trees, *Privet* spp., willows, other weeds	Duffys Forest Ecological Community EEC	Asset protection	Foliar spraying, bush regeneration techniques, stem injection, cut and paint, basal spraying	M-CP
Royal	Gandangara SCA	2183 – Glow in the dark	English ivy, Japanese honeysuckle, moth vine	Castlereagh Swamp Woodland Community, River-Flat Eucalypt Forest, Shale Sandstone Transition Forest, Swamp Oak Floodplain Forest, Swamp Sclerophyll Forest on Coastal Floodplains EECs (BPWW – CC4)	Asset protection	Bush regeneration techniques	M-CP
Royal	Royal NP	Palm Jungle	Lantana	Littoral Rainforest	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	Lady Carrington Dve	Lantana	Duffys Forest Ecological Community EEC	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	Forest Path	Lantana	Duffys Forest Ecological Community EEC	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	2252 – North and South Era	Lantana, crofton weed, blackberry, senna, mother-of-millions, pampas grass	Littoral Rainforest EEC (BPWW – CC4)	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	2128 – Burning Palms	Lantana, crofton weed, mother-of-millions, tree of heaven	Littoral Rainforest EEC (BPWW – CC4)	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	Otford	Lantana, other weeds	Littoral Rainforest EEC	Asset protection	Foliar spraying, biological control	M-CP

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Royal	Royal NP	Red Cedar Flat	Lantana, other weeds	Littoral Rainforest EEC	Asset protection	Foliar spraying, biological control	M-CP
Royal	Royal NP	2123 – Bulgo	Lantana, pampas grass, crofton, mistflower blackberry, winter senna	Littoral Rainforest EEC (BPWW – CC4)	Asset protection	Foliar spraying, biological control, grub out	M-CP
Royal	Royal NP	Loftus Hts	Pampas grass	Duffys Forest Ecological Community EEC	Asset protection	Grub out or foliar spraying	M-CP
Royal	Royal NP	Garie	Prickly pear	Littoral Rainforest EEC	Asset protection	Foliar spraying	M-CP
Royal	Royal NP	Hacking River (Forest Island to Audley Pond)	Tree of heaven	Littoral Rainforest EEC	Asset protection	Foliar spraying	M-CP
Royal	Georges River NP	2347 – Yeramba lagoon	African lovegrass, *Privet* spp., whiskey grass	Freshwater wetlands and mangrove/saltmash complex (BPWW – CC4)	Asset protection	Foliar spraying	M-CP
Royal	Georges River NP	Georges River	Alligator weed		Containment	Foliar spraying, biological control	M-CP
Cumberland	Kemps Creek NR	Kemps Creek	Alligator weed		Containment	Foliar spraying	M-II
Cumberland	Prospect NR	Prospect NR	Bridal creeper		Containment	Low volume spraying in areas where less than 1 metre in height. Hand removal of rhizomes.	M-II
Cumberland	Kemps Creek NR	Kemps Creek	Kei apple		Containment	Basal bark and foliar spraying	M-II
Cumberland	Bents Basin SCA	Bents Basin	Ludwigia		Containment	Foliar spraying, biological control	M-II
Cumberland	Kemps Creek NR	Kemps Creek	Ludwigia		Containment	Foliar spraying, biological control	M-II
Nattai	Leacock RP	Leacock	Chilean needle grass		Containment	Foliar spraying	M-II
Nattai	Leacock RP	Leacock	Ludwigia		Containment	Foliar spraying, biological control	M-II

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	William Howe RP	William Howe RP	Ludwigia		Containment	Foliar spraying, biological control	M-II
Royal	Heathcote NP	Kallala Gully	Ludwigia		Containment	Foliar spraying, biological control	M-II
Royal	Royal NP	Hacking River Calala to Audley, Kangaroo Ck (to 250m upstream from Audley Pond)	Ludwigia		Containment	Foliar spraying, biological control	M-II
Royal	Towra Point NR	The Causeway	African olive		Containment	Ground spraying	M-II
Royal	Towra Point NR	Captain Cook Drive, opposite Sir Joseph Banks Drive	Ludwigia		Containment	Foliar spraying, biological control	M-II
Royal	Towra Point NR	Causeway	Rabbit		Eradication	Shooting, baiting, trapping	M-II
Cumberland	Cattai NP	Cattai NP	Lantana, tree of heaven, willows	River-Flat Eucalypt Forest on Coastal, Floodplain, Freshwater Wetlands, Cumberland Plain Woodland, Shale/Sandstone Transition Forest, Western Sydney Dry Rainforest EECs	Asset protection	Foliar spraying, biological control, stem injection, cut and paint, basal bark spraying	L-LP
Cumberland	Prospect NR	Prospect NR	Vines and scramblers, willows	Cumberland Plains Woodland, Shale/Sandstone Transition Forest, Alluvial Woodland (River-Flat Forest on Coastal Floodplains) EECs, *Eucalyptus benthamii*	Asset protection	Bush regeneration techniques, stem inject/cut and paint/basal spraying	L-LP
Nattai	William Howe RP	William Howe RP	African olive, asparagus fern, blackberry, grasses, lantana, vines and scramblers	Cumberland Plains Woodland EEC	Asset protection	Ground spraying, bush regeneration techniques, foliar spraying, biological control	L-LP
Nattai	Leacock RP	2223 – Leacock RP	African olive, asparagus fern, blackberry, lantana, mother-of-millions, *Privet* spp., robinia, St John's wort, tree of heaven, vines and scramblers, willows	Shale plains woodland (Cumberland Plains Woodland), alluvial woodland, (River-Flat Forest on Coastal Floodplains), Cumberland Swamp Oak Riparian Forest (BPWW – CC4) EECs	Asset protection	Ground spraying, bush regeneration techniques, foliar spraying, biological control, stem inject/cut and paint/basal spraying	L-LP

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Nattai	Nattai NP	Wollondilly foreshores	Rabbit	Natural ecosystem	Asset protection	Biological control, trapping, shooting	L-LP
Royal	Royal NP	New site – Spring Gully	Japanese honeysuckle, other weeds	Littoral Rainforest EEC	Asset protection	Bush regeneration techniques	L-LP
Royal	Georges River NP	Georges River NP	Mother-of-millions		Containment	Foliar spraying	L-LP
Royal	Royal NP	Rail corridor	Pampas grass		Containment	Grub out or foliar spraying	L-LP
Royal	Royal NP	Roadsides throughout	Whiskey grass		Containment	Foliar spraying	L-LP

Prioritised pest programs in Newington Nature Reserve

Newington Nature Reserve is managed under a MOU with the Sydney Olympic Park Authority, the pest programs below will not be entered in AMS but are provided here to demonstrate prioritised pest management at the reserve in keeping with NPWS pest management principles and processes.

Area	Reserve(s)	Site name	Target pest	Assets at risk	Aim of control	Actions	Priority
Sydney Olympic Park Authority	Newington NR	Newington NR	Cat, fox	Ground nesting birds (common) white-fronted chat (endangered population – TSC-v), green and golden bell frog (EPBC-v, TSC-e)	Asset protection	Ground shooting, soft jaw trapping, cage trapping, den fumigation	C-TSC
Sydney Olympic Park Authority	Newington NR	Newington NR	African olive, lantana, boneseed, camphor laurel, privet, ochna, senna, blackberry, moth vine, corky passionflower, exotic grasses including: kikuyu, carpet grass (*Axonopus* sp.), buffalo grass, *Briza subaristata*, *Paspalum* sp	Sydney Turpentine Ironbark Forest (EPBC-c, TSC-e), Swamp Oak Floodplain Forest (TSC-e) and Coastal Saltmarsh (TSC-e), Wilsonia backhousei (TSC-v), white-fronted chat (endangered population – TSC-v), green and golden bell frog (EPBC-v, TSC-e), *Miniopterus schreibersii oceanensis* eastern bent-wing bat (TSC-v) foraging	Asset protection	Cut and paint, physical removal, targeted exotic grass control, maintenance of buffer zone, regular inspections and 5 yearly vegetation condition survey.	C-TSC
Sydney Olympic Park Authority	Newington NR	Newington NR	Mosquitoes	Park visitors and surrounding suburbs (nuisance biting) and public health	Asset protection	Regular monitoring of mosquito adult and larval populations, tides and rainfall leads to approximately five aerial sprays of BTI per year	C-HD
Sydney Olympic Park Authority	Newington NR	Newington NR	Feral honey bees	Tree hollows (microbat roosts and bird breeding sites)	Asset protection	Fumigation of hollows where identified	L-LP

5 Consultation

This regional pest management strategy was developed through consultation with the community and staff. A Pest Management Strategy Stakeholder Forum was conducted at Bents Basin on 16 September 2011. A diverse range of community representatives attended, including members of local councils, LHPAs, The Game Council, universities, catchment management authorities, rural landholders and several other stakeholder groups. Key issues, referring to the goals and objectives in the state strategy, raised from this forum were:

- the need for a 'nil tenure' approach across the landscape on pest management programs (Goal 2 Objective 2.2)
- communication from NPWS to the community on both the impacts of pest species and notification of the programs being conducted (Goal 3 Objective 3.2)
- continual review of methodologies and evaluation of programs to ensure best practice (Goal 3 Objective 3.4)
- the suggestion that critical priority pest management programs be those that prevent the establishment of new pest populations (Goal 1 Objective 1.1)
- the need for appropriate and long-term resources to be available for pest management programs (Goal 3 Objective 3.1)
- focus on a reduction in the mortality rate of non-target species.

Workshops were conducted with each operational area with rangers and field staff in order to accurately identify and prioritise pest management programs within that area. Following the preparation of the draft pest management strategy, the document was placed on public exhibition and comments were invited from the community, other government agencies and stakeholder groups.

Following the finalisation of the document, the table in section 4 will be updated annually and posted on the OEH website. Representatives from the Region will continue to work collaboratively with a number of groups, such as Oberon Wild Dog Association, Royal National Park Deer Working Group and Basket Creek Landcare Group.

6 Pest species overviews

Information about high profile pests for this Region is summarised below. More details regarding the distribution, impacts and management options for these and other pest species can be found in other reference documents and on the internet.[2]

Cane toad (*Bufo marinus*)

Distribution and abundance

Cane toads are large, robust amphibians native to Central and South America. They are extremely hardy animals and voracious predators of insects and other small prey. These qualities led to their introduction to Australia in 1935 as a means of controlling pest beetles in the sugar cane industry, before the use of agricultural chemicals became widespread.

Since their release, cane toads have dispersed across northern and eastern Queensland, the top end of the Northern Territory and have recently arrived in northern Western Australia. They are also in northern NSW and their dispersal along flooded creek lines in the arid south-west of Queensland has raised concern that they will eventually spread to South Australia via river systems such as the Cooper.

In February 2010 a population of cane toads was discovered in the Taren Point industrial area. NPWS officers along with staff from Sutherland Shire Council developed a plan of action and commenced an intensive eradication program. These efforts appear to have contained the localised spread of the toads and will now focus on eradicating the remaining individuals.

Impacts

Cane toads have an impressive array of highly toxic chemical defences available to them at almost all stages of their lives. The toxins occur in their skin and organs and are secreted by large glands at the back of the head when a cane toad is threatened. As a result, toads will poison many predators that attempt to eat them.

There is much anecdotal and some documented evidence regarding cane toad impacts on native predators, including quolls, snakes, goannas and freshwater crocodiles, all of which may be lethally poisoned when attempting to eat toads. Although some may recover, many predators die when they are first exposed to cane toads, and predator populations soon start to decline (SEWPaC 2010).

Priorities for control

Priorities for control are guided by the 2011 NPWS Cane Toad Plan, which proposes the creation of a containment line such that populations outside the line will be eradicated. The Taren Point population is the most southerly population outside this containment line.

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[2] www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/general-information/pest-animal-survey
www.environment.gov.au/biodiversity/invasive/publications/humane-control.html
www.invasiveanimals.com/
www.environment.gov.au/biodiversity/invasive/ferals/index.html
www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm
www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles
www.weeds.org.au/WoNS/
www.rirdc.gov.au/programs/national-rural-issues/weeds/weeds_home.cfm
www.weeds.gov.au/

Prevention of cane toads entering Towra Point Nature Reserve is a critical priority. The current infestation is within two kilometres of the reserve. NPWS is working closely with Sutherland Shire Council to eradicate this infestation.

Monitoring

NPWS staff undertake routine night-time surveys of Towra Point Nature Reserve and Kamay Botany Bay National Park. NPWS staff also participate in a variety of joint control programs with Sutherland Shire Council and report to a joint working group on all cane toad related issues. The working group includes Sutherland Shire council, Department of Primary Industries, The University of Sydney, Sydney Metropolitan Catchment Management Authority, Frog and Tadpole Study Group and specialists from OEH and NPWS. NPWS is providing financial support for a research project on the ecology, impact and control of cane toads on the southern invasion front which aims to maximise the prospects of eradicating this infestation.

Deer (Cervidae)

Distribution and abundance

Deer were introduced into Australia in the late 19th and early 20th centuries to enhance the aesthetics of the local environment and provide game for sport. Some individuals survived and formed the basis of large, well-established wild deer populations. Deer were also released by farmers in the late 20th century during difficult climatic and economic conditions and some escaped from poorly maintained farms. Hunters and hunting agencies also released deer in the late 20th century and, as a consequence, fallow, red, sambar, chital, rusa and hog deer have formed wild populations in many habitats, ranging from arid woodland to rainforest.

Impacts

The six species of feral deer currently established in NSW are primarily grazers, browsing on the buds, shoots and leaves of trees and shrubs (Bentley 1978). Deer may also strip bark from woody plants and browse on reproductive structures (Akasi and Nakashisuka 1999; Keith and Pellow 2004; Flora and Fauna Guarantee Scientific Advisory Committee 2004). All deer species are classed as intermediate mixed grazers (Whitehead 1972), meaning that they can feed on a combination of shrub, understorey and grass species, depending on availability. Consumption of a wide variety of native plant species by rusa and sambar deer has been recorded in south-eastern Australia (Hamilton 1981; Stockwell 2003; Keith and Pellow 2004; Flora and Fauna Guarantee Scientific Advisory Committee 2004) and, based on studies from overseas (Veblen et al. 1992; Fuller and Gill 2001; Rooney 2001; Coomes et al. 2003), it is likely that the other species of feral deer in NSW also consume a wide range of plant species.

Rusa deer alter the structure, species abundance and composition of grassland communities (Hamilton 1981). Patches of sandstone heath, woodland and littoral rainforest in Royal National Park with high deer density have 30–70% fewer plant species than patches with low deer densities (NPWS 2002).

Grazing and trampling by deer could alter the composition and structure of ecological endangered communities (EECs), including Littoral Rainforest, Sydney Freshwater Wetlands, Montane Peatlands and Swamps, River-Flat Eucalypt Forest on Coastal Floodplains, and Swamp Sclerophyll Forest on Coastal Floodplains EECs.

Grazing and trampling by deer could also alter the composition and structure of the habitats of threatened fauna, including:

- *Isoodon obesulus* (southern brown bandicoot)
- *Potorous longipes* (long-footed potoroo).

The NSW Scientific Committee has made a final determination to list herbivory and environmental degradation caused by feral deer as a key threatening process (KTP) under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Priorities for control

Critical priority programs are those affecting EECs such as Littoral Rainforest, endangered populations or threatened species in Royal National Park, Towra Point Nature Reserve, Kamay Botany Bay National Park, Gulguer Nature Reserve, and Cattai and Scheyville national parks.

Control

In Royal National Park ground shooting programs are currently operating. These allow for the implementation of complementary methods, including fertility control and baiting, should the technology or social acceptance become available.

Monitoring

Monitoring includes maintaining records of all operations and a tally of all animals removed from the reserve, plus establishment of exclusion plots and recording car accidents caused by deer.

Red fox (*Vulpes vulpes*)

Distribution and abundance

The European red fox is an adaptable and elusive predator common in rural and urban areas throughout southern Australia. It occurs across a range of habitats and the main determinants of its population size and distribution appear to be food supply, disturbance of natural habitats and refuge availability.

Foxes are found in all reserves in the Region.

Impacts

The introduction of the red fox has been linked to regional declines and extinctions of a broad suite of medium-sized non-flying mammals, ground-nesting birds and freshwater turtles. In the Region, foxes are threatening numerous endangered and vulnerable species including, but not limited to, little terns, brush-tailed rock-wallabies and southern brown bandicoots.

The NSW Scientific Committee has made a final determination to list predation by the European red fox as a KTP under the TSC Act.

Predation by the European red fox is also listed as a KTP under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Priorities for control

Towra Point Nature Reserve is listed as a critical priority site for fox control in the NSW Fox TAP (NPWS 2010). The site has been identified as an important breeding site for little terns and other threatened shorebirds. The Wollondilly River Fox TAP site is listed as a priority monitoring-only site in the NSW Fox TAP. The site targets brush-tailed rock-wallabies.

Control

Intensive 1080 baiting is being undertaken across Towra Point Nature Reserve and other government and private lands at Kurnell. This cooperative program involves NPWS, Sutherland Shire Council, other government landowners and private lands across the Kurnell Peninsula.

Monitoring

Monitoring of foxes, threatened shorebirds, and brush-tailed rock-wallabies is conducted in line with the NSW Fox TAP.

Feral goat (*Capra hircus*)

Distribution and abundance

Feral goats are descended from domestic stock introduced into Australia at various times since 1788 (Henzell 2000). They are distinguished from domestic goats by not being permanently restrained by fences or subject to husbandry (Environment Australia 1999). Competition and land degradation by feral goats is listed as a KTP under the EPBC Act.

Feral goats are found in most regions of Australia, with the majority of their distribution in the arid and semi-arid pastoral regions of Queensland, Western Australia, South Australia and NSW. Dingoes and feral dogs are their chief predators and, where wild dogs are not actively controlled, they have been observed to limit the distribution of feral goats (Parkes et al. 1996).

Feral goats have substantial populations in the Nattai reserve system and smaller populations in the Gulguer and Kemps Creek nature reserves and Leacock Regional Park.

Impacts

Feral goats present a potential threat to plant communities given the large number of plant species that are palatable to them and their ability to browse and graze in inaccessible areas such as in trees or in dense thickets (Squires 1980; Henzell 1993; Parkes et al. 1996). Moreover, the floristic composition of plant communities may be altered as a result of intense browsing by feral goats (Harrington 1986).

Feral goats can cause significant habitat degradation. Removal or destruction of vegetation together with trampling by ungulate herbivores decreases soil stability and contributes to erosion (Henzell 1993; Eldridge 1998).

Feral goat activity can significantly alter the habitat of native fauna and flora, for example accumulated feral goat droppings may degrade the habitat of the endangered broad-headed snake (*Hoplocephalus bungaroides*) (Murphy 1996). Competition between brush-tailed rock-wallabies and feral goats for refuge areas has been noted by Bayne (unpub.) and postulated by Short and Milkovits (1990).

Concerns about the impacts of feral goats has led to the NSW Scientific Committee listing competition and habitat degradation by feral goats as a KTP under the TSC Act.

Competition and land degradation by feral goats is listed as a KTP under the EPBC Act.

Priorities for control

Critical priority programs include those where feral goats are impacting on brush-tailed rock-wallabies and broad-headed snake populations. Further critical priority areas include where feral goats are impacting on water quality in special areas (for example, Warragamba Special Area).

Control

Current control methods for feral goats include aerial shooting, ground shooting, mustering and trapping. Cooperative programs with neighbours are essential to the success of programs, especially where populations are transient and numbers are sustained by populations on neighbouring lands.

Monitoring

All sightings of feral goats are to be recorded in an area log, including all animals controlled, the date, the location and the number of animals sighted. Where threatened species and ecological community programs are occurring area staff will liaise with NPWS Threatened Species Unit to implement appropriate monitoring programs for those threatened species and ecological communities.

Feral pig (*Sus scrofa*)

Distribution and abundance

Feral pigs are descended from domestic stock introduced into Australia by European settlers, and possibly from introductions to northern Australia from Timor and New Guinea (Choquenot et al. 1996; Pavlov 2000). Feral pigs are found across continental Australia with the highest densities in NSW, Queensland and through northern Australia to the Kimberley region. In 2002, feral pigs were estimated to inhabit 61% of the area of NSW and the ACT (West and Saunders 2003). Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a KTP under the EPBC Act.

Feral pigs are distributed throughout the Nattai reserves. Individual pig sightings occur from time to time in Royal National Park and Towra Point Nature Reserve.

Feral pigs have a high reproductive potential (Choquenot et al. 1996). Piglets attain sexual maturity at approximately seven months (Pavlov 2000) and females may produce two litters of six piglets every 12 to 15 months (Menkhorst 1995).

Impacts

Feral pigs present a significant threat to native species and ecological communities as a result of their behaviour and feeding habits. Feral pig wallowing and rooting cause direct disturbance to habitats (Hone 2002) and water quality in the Warragamba Special Areas. Disturbance of habitats by feral pigs may also facilitate the invasion and spread of weeds and thus affect the composition of plant communities (DEH 2003).

Feral pigs are active predators of native birds, reptiles (including their eggs), frogs and soil invertebrates such as earthworms, as well as the underground storage organs of plants and the fruiting bodies of fungi. Direct predation by feral pigs may have contributed to declines in populations of some frog species (Richards et al. 1993).

Feral pigs have been implicated as potential vectors of disease. In particular, feral pigs may be responsible for spreading *Phytophthora cinnamoni* (DEH 2003). There is

evidence that feral pigs can carry the fungus on their hooves (Kliejunas and Ko 1976), and that the spread of the fungus is associated with soil disturbance and reduction of litter cover by pigs (Brown 1976). Chewing and other damage to tree trunks may facilitate infection of vegetation by the fungus and other diseases.

Priorities for control

Critical priority programs include those where feral pigs are likely to significantly impact on threatened species and EECs, including:

- Nattai National Park, and Nattai, Burragorang, Bargo River and Bargo state conservation areas
- where there are new invasions of pigs into any reserve.

Control

Control programs will use a variety of options including baiting, shooting (including aerial shooting) and trapping.

Cooperative programs, working with neighbours and the local LHPA, are essential to ensure effectiveness, particularly where infestations may be supported by populations on neighbouring lands.

Monitoring

Monitoring will be primarily through the assessment of pig damage to vegetation, frog habitat and other sensitive areas. This assessment will be undertaken through ground and aerial surveys, with observed damage mapped to guide future control operations.

Anecdotal sightings of pigs and pig damage, and the outcomes of all control efforts, will be recorded and mapped.

Rabbit (*Oryctolagus cuniculus*)

Distribution and abundance

The European rabbit was introduced into Australia in 1858. It has spread across the southern two-thirds of the continent, and its area of occupancy is now approximately 4.5 million square kilometres (Myers et al. 1989).

Rabbits are present in most reserves across the Region but their densities fluctuate seasonally and across the landscape.

Impacts

There is evidence that feral rabbits impact negatively on indigenous species via competition for resources, alteration of the structure and composition of vegetation, and land degradation. Competition and land degradation by feral rabbits is listed as a KTP under the EPBC Act.

Feral rabbits are grazers that prefer green grass and herbage. They may also feed on seeds and browse and, during drought, the bark and roots of shrubs. Several indigenous species overlap in diet with the feral rabbit, and are impacted negatively by competition for food with the feral rabbit. Threatened species that suffer in dietary competition with the feral rabbit include the brush-tailed rock-wallaby (Short and Milkovits 1990).

Grazing by feral rabbits reduces survival and recruitment of several species of threatened plants, including *Acacia carneorum*, *Grevillea kennedyana*, *Cynanchum elegans*, *Thesium australe* and *Lepidium hyssopifolium* (Cropper 1987; Auld 1990, 1993; Griffith 1992; Matthes and Nash 1993). Grazing by feral rabbits appears also to have marked effects on the structure and composition of vegetation communities in many areas (Williams et al. 1995), and a number of EECs including the *Acacia loderi* EEC.

By removing above-ground and below-ground vegetation, feral rabbits contribute to erosion and loss of topsoil by wind and rain. This form of land degradation reduces the chance of successful establishment of indigenous plants, and increases the susceptibility of many indigenous vertebrates to predation from feral predators (Dickman 1993).

Priorities for control

Critical priority programs include those where rabbits impact on threatened species or EECs including:

- little tern and pied oyster catcher breeding grounds in Towra Point Nature Reserve
- brush-tailed rock-wallaby habitat in the Nattai reserves.

Control

Integrated control will be effected through:

- poisoning using 1080, pindone and, where resistance is low, rabbit haemorrhagic disease
- ground shooting
- biocontrol
- harbour destruction where possible, and fumigation in other locations
- rehabilitation of degraded areas.

Monitoring

Monitoring will be conducted using spotlight counts, or through the maintenance of exclusion plots to determine the impact of rabbits on the vegetation. Operational monitoring will be achieved through recording staff time used during the program, and the cost-effectiveness of materials and the program.

Wild dog (*Canis lupus* sspp.)

Distribution and abundance

Wild dogs are any wild-living dog, including feral dogs (*Canis lupus familiaris*), dingoes (*Canis lupus dingo*) and their hybrids. Populations of wild dogs occur mainly along the Great Dividing Range, coastal hinterlands and in north-western NSW.

Wild dogs are present in the Nattai reserves from Burragorang to Bargo River. Many of these reserves are included under Schedule 2 of the Wild Dog Pest Control Order and subsequently control measures form part of the Southern Highlands Wild Dog Management Plan 2010–2014.

Impacts

Wild dogs, including dingoes, can cause substantial losses to livestock enterprises, especially those involving sheep and goats. As a result, wild dogs have been declared a pest under the *Rural Lands Protection Act 1998* under which managers of controlled land have an obligation to eradicate wild dogs by any lawful method. All land in NSW is identified as controlled land under the current Pest Control Order for Wild Dogs.[3]

Wild dogs can have both positive and negative impacts on biodiversity. Predation by wild dogs can suppress the abundance of herbivores (native and exotic) which may be important for reducing overgrazing across much of arid and semi-arid Australia. Wild dogs may also suppress smaller exotic predators (cats and foxes) with potential benefits for a broad suite of small- to medium-sized ground-dwelling mammals and ground-nesting birds. Conversely, predation by wild dogs may have significant direct impacts on threatened species such as koalas.

Dingoes were introduced into Australia from Asia prior to European settlement and hence are eligible to be listed as a threatened species under the TSC Act. Although dingoes have not been listed as a threatened species, predation and hybridisation by feral dogs has been listed as a KTP under the TSC Act.

In order to balance the need for wild dog control with the conservation of dingoes, the Pest Control Order for Wild Dogs allows the general destruction obligation for lands listed under Schedule 2 of the Order to be satisfied through the preparation of a wild dog management plan with both control and conservation objectives.

Priorities for control

Critical priorities for wild dog control on reserves are based primarily on the level of livestock predation reported by adjoining landholders, in accord with the relevant wild dog management plans. Control will be focused on areas of reserves such as the southern end of the Nattai reserves where there are current and/or historic records demonstrating significant impact on livestock from wild dogs emanating from the reserves. There will be close liaison with Cumberland LHPA and landholders when developing control programs.

Control

A fully integrated suite of control techniques will be used to manage wild dogs in the Region. These measures are identified in detail in the Southern Highlands Wild Dog Management Plan 2010–2014. Control programs will be undertaken in partnership with Cumberland LHPA and individual landholders and consist of a two-tiered management approach. The first tier is a strategic control program aimed at preventing future livestock predation, which includes ground baiting and trapping.

The second tier will be initiated should dog attacks on livestock be reported, when a reactive program will be initiated within 24 hours of the report in accordance with the wild dog management plan. NPWS response will include:

- ground baiting
- trapping using either NPWS staff (trained trappers) or contract trappers
- ‘howling up’ and shooting the dogs.

[3] www.gazette.nsw.gov.au/pdfs/2009/11th_September.pdf

Monitoring

Stock losses caused by wild dogs in Metro South West Region are recorded and communicated to Cumberland LHPA. Such measures are essential in planning and evaluating the effectiveness of control programs included in wild dog management plans.

Alligator weed (*Alternanthera philoxeroides*)

Distribution and abundance

Originally confined to Georges River National Park, new infestations of alligator weed have recently been discovered in Towra Point Nature Reserve and on the foreshore of Kamay Botany Bay National Park. In Georges River National Park it occurs primarily in Yeramba Lagoon but scattered infestations also occur along the length of Georges River.

Impacts

Alligator weed produces masses of creeping and layering stems over land and water. It is an aggressive invader that responds to high nutrient levels and is a major threat to wetlands, rivers and irrigation systems, especially the turf industry on the Hawkesbury–Nepean floodplain.

New plants regenerate readily from plant fragments and their rapid spread increases the difficulty of control. Alligator weed is a Weed of National Significance (WoNS) and in the Region is declared Class 2 or Class 3 under the *Noxious Weeds Act 1993* (NW Act). Alligator weed has a long history in the Sydney Basin where it is seen as a major threat in the Hawkesbury–Nepean and Georges River catchments.

Priorities for control

All infestations are a critical priority for control. Any new incursions detected in any park are a critical priority for control. The WoNS Alligator weed control manual provides details on management (DPI NSW 2007).

Control

NPWS is working with local control authorities, the Department of Primary Industries (DPI) and the Sydney Weeds Committee to coordinate a regional control program using herbicides, mechanical removal and biological control as part of a collaborative integrated control program.

Monitoring

NPWS will record and map all occurrences of alligator weed and monitor its distribution in response to control.

NPWS will liaise regularly with the local control authority and DPI.

Blackberry (*Rubus fruticosus* agg.)

Distribution and abundance

Blackberry is know in all Australian states and territories except the Northern Territory. In NSW it is a major problem for pastures and native forests (Parsons and Cuthbertson 1992). It is found throughout the Region and historically has been the

focus of intensive control programs. In order to maximise the investment in previous control works, programs in Nattai Area's reserves are a priority.

Impacts

Blackberry readily invades grassy woodlands, bushland, roadsides, pastures and riparian areas, growing well in sun and shade and tolerating frosts, drought and fire, although dense shade can curtail its growth. Blackberry displaces native plants and destroys animal habitats by forming thickets that provide excellent harbour for feral animals such as rabbits, pigs and goats. In turn many of these feral animals have a negative impact on water quality in the Special Areas. Blackberry thicket can exclude other vegetation along riparian areas eventually resulting in the destabilisation of banks.

Blackberry can be spread large distances by birds and feral animals such as foxes, and along creek lines by water flow.

Blackberry is a WoNS because of its invasiveness, potential for spread, and economic and environmental impacts. It is listed as a Class 4 weed under the Noxious Weeds Act throughout NSW.

Priorities for control

Infestations in the Nattai reserves in the Sydney water catchment scheduled 1 or 2 lands are of critical priority. Control of these infestations is a requirement under the joint plan of management with Sydney Catchment Authority.

Control

Seedlings and small plants should be dug out when soils are moist, otherwise roots are likely to fragment. Herbicide treatments include scrape and paint methods for small infestations and aerial spot spraying, vehicle spraying, knapsack spraying and splatter gun application for larger infestations. The WoNS Blackberry control manual: *Management and control options for blackberry (Rubus spp.) in Australia* provides details on management (DPI VIC 2009).

Monitoring

Monitoring of large infestations of blackberry are to include annual photographs of sites including pre- and post-control photographs and sizes of regeneration areas treated. Liaison with the Department of Agriculture in relation to monitoring of biological control agents is ongoing. Where there are threatened species or ecological community programs liaise with NPWS Threatened Species Unit to implement appropriate monitoring programs for those threatened species or ecological communities. The Monitoring Manual for Bitou Bush Control and Native Plant Recovery (Hughes et al. 2009) provides guidance on monitoring methodology for threatened species or ecological communities and can easily be adapted for this weed.

Bitou bush and boneseed (*Chrysanthemoides monilifera*)

Distribution and abundance

Bitou bush (*Chrysanthemoides monilifera* spp*. rotundata*) was first recorded in NSW near Newcastle in 1908 and was extensively planted for dune stabilisation between 1946 and 1968. It spread rapidly and is now found on 90% of the sandy coast of NSW, covering an area in excess of 70,000 ha.

Most bitou bush invasion is confined to the first 500 m of the coastline across the Region, with Kamay Botany Bay National Park and Towra Point Nature Reserve having the most significant infestations. Boneseed (*Chrysanthemoides monilifera* spp. *monilifera*) is also present in isolated patches across the Cumberland Plain.

Impacts

Bitou bush is a highly competitive weed that smothers native plant communities and destroys habitat and food sources for native animals. It threatens over 180 native plant species, populations and ecological communities in NSW. Bitou bush invades dunes, coastal heathlands, grasslands, woodlands and forests (DEC 2006) and can disturb cultural heritage sites by destroying the fabric of the site.

The dense monoculture of *Chrysanthemoides monilifera* which develops after invasion threatens local vegetation at all sites which are affected. This may result in local and regional declines of many plant communities, possibly to the extent that they become endangered. The changed structure of the habitat may adversely impact on both native vertebrate and invertebrate fauna and may favour the proliferation of non-indigenous species.

Bitou bush and boneseed are WoNSs. Bitou bush is declared Class 3 under the NW Act across the Region. Boneseed is Class 2 in most of the Region. The invasion of native plant communities by bitou bush and boneseed is listed as a KTP under the TSC Act, and a threat abatement plan for bitou bush has been prepared.

Priorities for control

The Bitou Bush TAP and BPWW identifiy a number of priority sites for control. Bitou bush control programs are of critical priority and have commenced in many of these sites. They include:

- bitou bush sites:
  - Kamay Botany Bay National Park – regular aerial spraying
  - Towra Point Nature Reserve – a detailed weed management plan has been prepared for this reserve
  - Royal National Park, which has a few isolated infestations.
- boneseed sites:
  - reserves across the Cumberland Plain
  - southern coastal extents of Royal National Park.

Control

Bitou bush is controlled using an integrated approach. A number of different techniques are used, including physical removal, cut and paint technique, and herbicide treatment from backpack, vehicle and helicopter. Two biocontrol agents, the tip moth (*Comostolopsis germana*) and seed fly (*Mesoclanis opolana*) have effectively established. The WoNs bitou bush and boneseed control manuals provide details on management (DEC 2006).

Monitoring

Bitou bush density and distribution mapping will be undertaken as part of the Towra Point Nature Reserve weed management plan over the course of the next five years. All other control works will be captured using AMS. In addition, the Region will implement identified monitoring techniques outlined in the Bitou Bush TAP and the

Monitoring Manual for Bitou Bush Control and Native Plant Recovery (Hughes et al. 2009).

Exotic vines and scramblers

Distribution and abundance

Exotic vines and scramblers are widespread, and locally abundant, in the eastern part of NSW. This group of plants includes many species and includes but is not limited to potato vine, Madeira vine, ground asparagus, bridal creeper, climbing asparagus, balloon vine, cape ivy, English ivy, coastal morning glory, morning glory, Japanese honeysuckle and cat's claw creeper.

Impacts

Exotic vines and scramblers may act as transformer species (Richardson et al. 2000), altering the nature of the environment where they become dominant. Rainforests are susceptible to invasion by exotic vines particularly after canopy disturbance (Floyd 1989). Exotic vines and scramblers may smother existing vegetation, both in the ground layer and canopy (Groves and Willis 1999; Greenberg et al. 2001; Kriticos et al. 2003; Timmins and Reid 2000). This alters the light in the invaded community and may suppress regeneration of native species. The sheer weight of exotic vines may cause breakage of branches in the canopy, and in some cases total canopy collapse (Harden and Fox 1988; Harden et al. 2004). Some species form dense ground cover carpets that suppress native species (for example, *Tradescantia fluminensis* and *Vinca major*).

In sclerophyll communities, exotic vines and scramblers are more mesic than the native species, and may change the nature of the fuel and thus alter fire behaviour and regime. Invasion by exotic vines and scramblers can also alter other biotic aspects of communities, such as the abundance and diversity of plant-dwelling invertebrates (Ernst and Cappuccino 2005). Dense smothering blankets or thickets of exotic vines and scramblers may also restrict movement of some native fauna and adversely affect their ability to access water or other resources while sometimes favouring other fauna by providing protective shelter and/or food.

Exotic vines and scramblers such as *Asparagus* spp. form masses of tuberous roots that may alter the biota of the soil and litter, changing rates of litter decomposition and nutrient cycling and compete for water and mineral nutrients with other plant species (Raymond 1996; Groves and Willis 1999; Timmins and Reid 2000; Willis et al. 2003). They may also create a humid microclimate at ground or lower trunk level, favouring pathogenic attack and altering soil moisture and nutrient fluxes. Riparian vegetation is particularly prone to infestation by vines such cat's claw creeper (*Macfadyena unguis-cati*) due to high water and nutrient availability.

Invasions and establishment of exotic vines and scramblers has been listed as a KTP by the NSW Scientific Committee as it adversely affects threatened species, populations and ecological communities, or could cause species, populations and ecological communities that are not threatened to become threatened. Bridal creeper, *Asparagus* spp., Madeira vine and cat’s claw creeper are all WoNSs.

Priorities for control

Critical priorities for control where EECs are directly affected include:

- Cumberland Plain Woodland
- Littoral Rainforest

- Moist Shale Woodland in the Sydney Basin Bioregion
- Mount Gibraltar Forest in the Sydney Basin Bioregion
- Shale–Sandstone Transition Forest
- Swamp-Oak Floodplain.

These sites have been identified through the BPWW.

Control

Due to the wide variety of the species included, control is varied. However, a common method with many vines is to scrape or cut and paint the stems.

Monitoring

Photo points for large infestations combined with regular inspections are recommended. Guidance on the use of photo points can be found in the standard tier of the Monitoring Manual for Bitou Bush Control and Native Plant Recovery.

Lantana (*Lantana camara*)

Distribution and abundance

Lantana has spread along the east coast of Australia, from southern NSW to Cape York and from sea level up to 600 m elevation. It has invaded at least four million hectares, mainly in NSW and Queensland (CRC Weed Management 2003).

Lantana readily invades disturbed sites and communities. Various types of sclerophyll woodlands, sclerophyll forest, rainforests and dry rainforests are all susceptible to lantana establishment (Driscoll and Quinlan 1985; Lamb 1988; Gentle and Duggin 1997), although in communities with a naturally dense canopy lantana colonisation may be heavily dependent on, and limited to, disturbance zones, edges and canopy breaks. There is a strong correlation between lantana establishment and disturbance (Stock and Wild 2002; Stock 2004) with critical factors being disturbance-mediated increases in light and available soil nutrients and, in rainforest, the competitive advantage of seedlings relative to many native species (Stock 2004).

Impacts

Most variations of lantana in Australia are toxic to domestic livestock (sheep and cattle) to some degree. Toxicity seems to be related to genetic factors, not environmental ones (Everist 1974, citing Seawrite 1965 and unpublished work by LS Smith). Toxins may occur in leaves, flowers, fruit and sap and include triterpene acids (lantadenes A and B) and their reduced forms. Some toxic reactions have been recorded in humans, especially children. Palatability and toxicity to native herbivores have not yet been documented.

Lantana is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread and economic and environmental impacts (CRC Weed Management 2003). It is recognised in most states and territories of actual or potential occurrence as a serious weed of agriculture or environment or both, and in NSW has been listed as a KTP as it adversely affects threatened species, populations and ecological communities.

In 2010 the WoNS program prepared the Plan to Protect Environmental Assets from Lantana (*Lantana camara*) (Biosecurity Queensland 2010). The sites of high priority significance identified in that plan have been incorporated in the BPWW.

Priorities for control

The Plan to Protect Environmental Assets from Lantana has determined the biodiversity at risk from lantana which is considered to be of critical priority for control in the following EECs:

- Kurnell Dune Forest
- Cumberland Plain Woodland
- Littoral Rainforest
- Shale/Sandstone Transition Forest
- River-Flat Eucalyptus Forest on Coastal Floodplains
- Swamp Oak Floodplain Forest
- Western Sydney Dry Rainforest
- Sydney Turpentine–Ironbark Forest.

Control

Seedlings and small plants can be easily pulled out. Cut and paint methods can be used for individual plants and spraying for larger infestations. Due to the widespread nature of most lantana infestations, control programs will develop specific control strategies to suit each specific site. Where suitable, rust will also be released as a biological control method.

Monitoring

Monitoring of large infestations of lantana is to include annual photographs of sites including pre- and post-control photographs and sizes of regeneration areas to be treated. The National Plan to Protect Environmental Assets from Lantana recommends the use of the Monitoring Manual for Bitou Bush Control and Native Plant Recovery (Hughes et al. 2009), as it can easily be adapted for this weed.

Perennial grasses

Distribution and abundance

Perennial grasses are found throughout the Region; however, they have the greatest impacts in Royal, Heathcote, Kamay Botany Bay national parks, and the Nattai reserves.

Impacts

A number of exotic perennial grasses including buffel grass (*Cenchrus ciliaris*), Coolatai grass (*Hyparrhenia hirta*), African lovegrass (*Eragrostis curvula*), Chilean needlegrass (*Nassella neesiana*) and serrated tussock (*Nassella trichotoma*) invade and may dominate native plant communities by competing with, and displacing native species. Some other perennial grasses that invade smaller areas of native plant communities include browntop bent (*Agrostis capillaris*), whisky grass (*Andropogon virginicus*), Rhodes grass (*Chloris gayana*), pampas grasses (*Cortaderia* spp.), panic veldgrass (*Ehrharta erecta*), molasses grass (*Melinis minutiflora*), torpedo grass (*Panicum repens*), vasey grass (*Paspalum urvillei*), kikuyu (*Pennisetum clandestinum*), phalaris (*Phalaris aquatica*), South African pigeon grass (*Setaria sphacelata*), giant Parramatta grass (*Sporobolus fertilis*), giant rat's tail grass (*Sporobolus natalensis*) and para grass (*Urochloa mutica*).

Other exotic perennial grasses not specified may have the potential to adversely affect native plant communities and native species. Perennial grasses readily invade disturbed areas and healthy bushland. Further concerns about the impacts of exotic perennial grasses have led the NSW Scientific Committee to list invasion of native plant communities by exotic perennial grasses as a KTP under the TSC Act.

Priorities for control

Critical priority programs include those where grasses are impacting threatened species and EECs as identified in the BPWW as well as new and emerging species. Examples include:

- new infestations of Coolatai grass in Georges River, Heathcote and Royal national parks
- Cumberland Plain Woodland.

Control

Foliar application of an appropriate herbicide is recommended, but hand pulling and careful bagging of the entire plant (seed head and rhizome) is an option with small infestations.

Ongoing research in partnership with the University of Western Sydney and Greening Australia is developing restoration techniques involving the planting of native seedlings to manage exotic grasses across ecosystems for the Cumberland Plain.

Monitoring

Photo points for larger infestations combined with regular inspections are recommended.

Senegal tea (*Gymnocoronis spilanthoides*)

Distribution and abundance

Also known as temple plant, Senegal tea originates from Europe and is a sprawling aquatic shrub with rough-edged shiny dark green leaves and hollow stems which assist it to float. The plant produces running stems in water or mud and often forms mats along edges of water courses. A perennial plant, it is dormant in winter and dies in exposed areas, reshooting from protected crowns in spring.

It produces conspicuous white ball-shaped flowers approximately 1.5 cm in diameter, flowering in late spring and early summer.

The species is not widespread in the area around Sydney with only a few known infestations. There are two known infestations in Metro South West Region. The largest is in the upper Hacking River at Audley in Royal National Park and a smaller patch is in Cattai National Park. All infestations will be managed as a new occurrence as this species is highly invasive and there is very good potential for long-term eradication. Senegal tea is a Class 1 noxious weed across NSW and is on the National Environmental Alert List.

Impacts

Senegal tea is an aggressive, invasive plant. Its stems can grow up to 15 cm per week. It can form floating mats, blocking irrigation ditches, shallow dams and other waterways. If permitted to spread, it will invade and degrade natural wetlands,

competing with slower growing native plants and affecting wetland birds and other animals dependent on wetlands.

Priorities for control

As this weed species has significant potential to spread throughout greater Sydney, and given the limited nature of current infestations, all known infestations are considered new and are of critical priority.

Control

NPWS is working with local control authorities, DPI and the South Western Regional Weeds Committee to coordinate a regional program that uses herbicides as part of a collaborative control program.

Monitoring

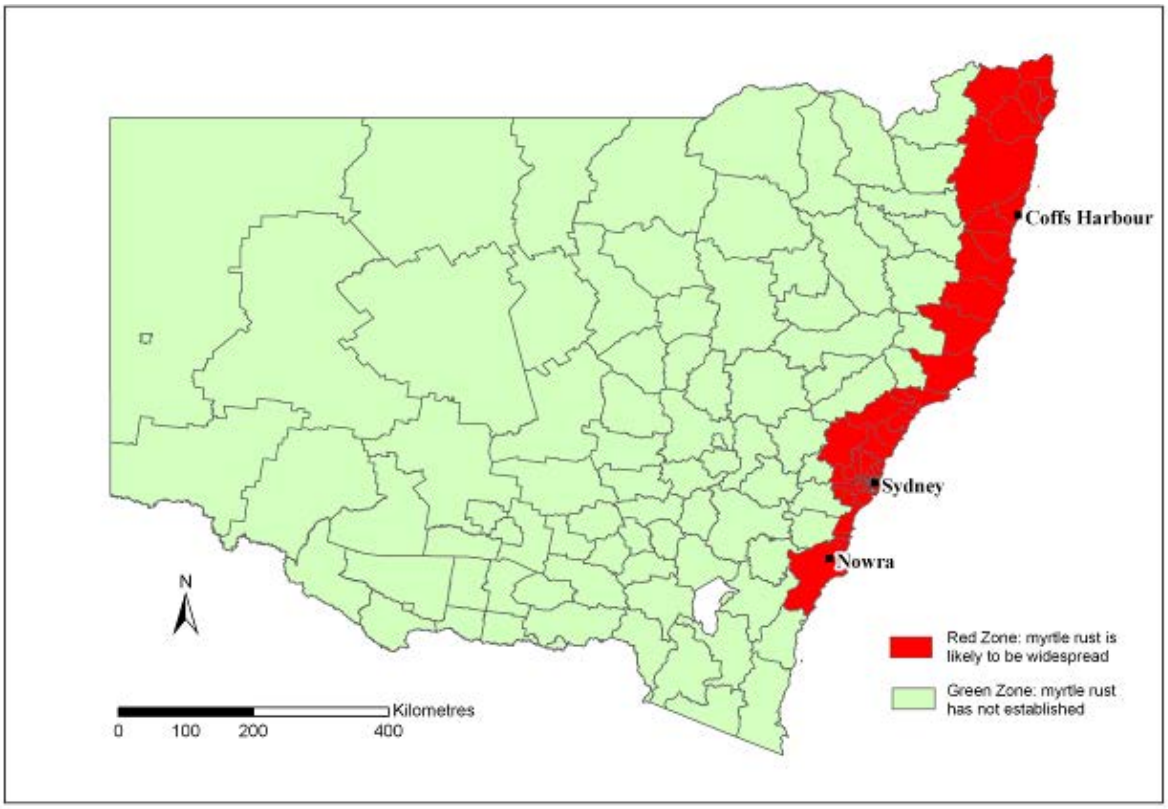
Each spring the previous year's treatments are inspected to determine if there is any regrowth. If there is, a subsequent treatment program is initiated for the remainder of the growing season.

Myrtle rust (*Uredo rangelii*)

Distribution and abundance

Myrtle rust is a plant disease caused by the exotic fungus *Uredo rangelii*. It was first detected in Australia on 23 April 2010 on the NSW Central Coast. It has established in coastal NSW from the Clyde River north into Queensland. Myrtle rust is likely to spread rapidly to the extent of its biological range as the spores are dispersed readily by wind. Eradication is unfeasible.

Myrtle rust belongs to a group of closely related fungi known as the guava or eucalyptus rust complex. The complex includes the fungus *Puccinia psidii* which has had severe impacts on eucalypt plantations in Brazil and has been found in other parts of the Americas, Hawaii and Japan. *P. psidii* was considered as a potential biocontrol agent in the Florida everglades for the invasive plant *Melaleuca quinquenervia*, but it has since been found to attack some native American species, including a threatened species.



Approximate distribution of myrtle rust *Uredo rangelii* as of 24 January 2011.

Data from NSW Department of Primary Industries (www.dpi.nsw.gov.au/biosecurity/plant/myrtle-rust); local government boundaries from the Land and Property Management Authority.

Impacts

Myrtle rust affects plants in the family Myrtaceae, including the genera *Eucalyptus*, *Angophora*, *Callistemon* and *Melaleuca*. Infection occurs on young growing shoots, leaves, flower buds and fruits. It produces masses of powdery bright yellow or orange-yellow spores on the infected areas. Leaves may become buckled and twisted and die as a result of infection.

The likely impacts of myrtle rust on biodiversity in Australia are unknown. Infection with myrtle rust may cause significant mortality among younger plants and hence reduce recruitment into adult populations. This may contribute to the decline and extinction of species, which is of immediate concern for those species already at high risk – threatened species. Reduced recruitment may also have severe impacts on the structure and function of the many natural ecosystems that depend on Myrtaceae. As at 28 March 2011, myrtle rust had been detected in 68 species of Myrtaceae, spanning 27 genera. Severe infection had been observed in relatively few species (most notably scrub turpentine, *Rhodamnia rubescens*, and native guava, *Rhodomyrtus psidoides*), but the number of species so affected may increase as new strains of rust evolve. All five threatened species of Myrtaceae exposed to myrtle rust under laboratory test conditions became infected.

The introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae is listed as a KTP under the TSC Act.

Priorities for control

Priorities for control are outlined in the Management Plan for Myrtle Rust on National Parks, including the potential impacts of myrtle rust on threatened species. The plan also provides guidance to managers of other bushland and threatened species sites.

The objectives of the plan are to:

- slow the establishment of myrtle rust on national parks
- minimise the impacts of myrtle rust on threatened species and ecological communities on national parks.

Control

The Management Plan for Myrtle Rust on National Parks includes eight approaches to manage myrtle rust:

- identify high value assets at risk
- limit its spread
- monitor its spread
- manage infections
- research its impacts
- training, extension and external communication
- record its incidence
- liaise and report on its spread and impacts.

Specific actions for Metro South West Region are to map the extent of the current infestation in Royal National Park, implement quarantine procedures to prevent further spread and develop a detailed control program.

Monitoring

Presence/absence data will be entered into the biological survey subsystem of the Wildlife Atlas from monitoring threatened species and sentinel sites.

If any fungicide control works are required, daily record sheets will be kept for all control programs in accordance with the *Pesticides Act 1999*. Before and after photos are also taken during the course of implementation of works. Where treatment is proposed, GPS locations are taken of work site locations including the extent of myrtle rust distribution and control implemented. Sites are revisited periodically for follow-up treatment and maintenance.

Phytophthora (*Phytophthora* spp.)

Distribution and abundance

Phytophthora cinnamomi is a plant pathogen believed to have evolved in south-east Asia and was first described in 1922. Dieback was not discovered in Australia until 1922, and it is believed that it was probably introduced in to Western Australia prior to the 1900s before quarantine procedures were initiated.

Phytophthora is only known to exist in one location in the Region at Kemps Creek Nature Reserve; however, other infestations are suspected and require further investigation.

Impacts

Phytophthora is listed as a KTP under state and federal legislation. A national threat abatement plan for Phytophthora was prepared in 2001. Phytophthora is a soil-borne pathogen belonging to the water mould group. It grows best in tropical conditions and is parasitic, requiring a living host on which to feed. This fungus is known to attack

nearly 1000 plant species throughout the world and is one of the most widespread plant pathogens known. The spores of the fungus (zoospores and chlamydospores) spread rapidly through water, moist soil or in particles of infected soil, lodging on plant roots and eventually killing the host plant (Shearer and Bailey 1989).

Management objectives

One of the national TAP (Environment Australia 2001) objectives is to prevent further species and ecological communities being threatened. Identification of affected areas and appropriate management will aim to:

- prevent the spread of Phytophthora from current known locations to non–infected areas (including using hygiene controls)
- identify the presence or absence of Phytophthora by conducting surveys and sampling areas of poor tree health or dieback
- identify and implement appropriate containment and hygiene protocols for affected areas
- ascertain whether Phytophthora occurs in any other parks in the Region.

Control priorities

Priorities will be determined when reports of the presence of Phytophthera are confirmed, followed by the development and implementation of a containment strategy for affected areas.

Control techniques

Appropriate controls will need to be determined on a site-to-site basis and may include signage, wash-down bays and techniques, aerial spraying of phosponate, or the controlled trial use of commercial phosphite to treat individual eucalypts through stem injection (for example), if appropriate.

A strategy to reduce public access to infected areas and catchments may also be required.

Monitoring

Monitoring involves developing best practice guidelines for managing affected areas, including standardised monitoring forms for sampling potential Phytophthora sites. Soil sampling in areas adjoining containment boundaries will monitor any movement of the pathogen, as will strategic and opportunistic checking of dieback in known areas.

Appendix 1 New and emerging pest species

Any suspected new pest species in the Region should first be reported to the Regional Pest Management Officer, who will then decide if it is necessary to alert the following groups.

Species	Contact	Website
All species	Report sightings to Wildlife Atlas.	www.environment.nsw.gov.au/wildlifeatlas/about.htm#contribute
All species	Regional Invasive Species Officer (DPI) (see website for contacts).	www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/345280/RWACs-ISO-contacts-map.pdf
Animal diseases	Emergency Animal Disease Hotline (DPI) – report unusual disease signs, abnormal behaviour or unexplained deaths in livestock. Phone: 1800 675 888	www.dpi.nsw.gov.au/biosecurity/animal
Aquatic pests	Aquatic Pest Hotline (DPI) – report suspected aquatic pests or weeds. Phone: (02) 4916 3877	www.dpi.nsw.gov.au/biosecurity/aquatic
Insects and plant pests/ diseases*	Exotic Plant Pest Hotline (DPI) – report suspect exotic and emergency insects and plant pests/diseases. Phone: 1800 084 881	www.dpi.nsw.gov.au/biosecurity/plant
Pest animals	Website – form available for the reporting of new incursions of pest animals.	www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/other-vertebrate-pests2/pest-reporting/pest-reporting-form
Weeds **	Notify relevant Local Control Authority and Weeds Hotline (DPI). Phone: 1800 680 244 Email: weeds@dpi.nsw.gov.au.	www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/contacts

* Certain diseases and pests are notifiable for the purposes of the Plant Diseases Act 1924. For example, red imported fire ant has been made notifiable under this Act. This means that you have a legal obligation to report suspected red fire ant infestations as soon as possible.

** Noxious Weeds in Control Classes 1, 2 and 5 are notifiable weeds under the NW Act. This means that you must notify the local control authority within three days of becoming aware that the notifiable weed is on the land.

In Metro South West Region there are a number of weeds and pest animals that pose a risk of invasion and/or further spread and establishment. Those listed below are not currently known to exist in reserves, exist in small isolated infestations or are only in a small number of reserves. These species, the locations of current infestations and/or possible reserves where infestations may establish are discussed below. Any new occurrences of these pests, outside of the areas on-park mentioned below, should be reported to the Regional Pest Management Officer, who will decide upon the appropriate course of action.

Red-eared slider turtle (*Trachemys scripta elegans*)

The current extent of the distribution and abundance of red-eared slider turtles in NSW is unknown. Individuals have been recorded in the Georges River National Park but a breeding population has not been confirmed anywhere in the Region. Vagrants are occasionally found in suburban areas and these are assumed to be escaped or unlawfully released pets.

The red-eared slider turtle is an aggressive animal, which can kill native turtles, birds and aquatic wildlife. They are included in the top 100 of the 'world's worst' invasive species by the International Union for the Conservation of Nature (IUCN), due to their invasive nature and their potential impacts on biodiversity. In NSW, the true extent of their impact on aquatic ecosystems is unclear and they have not been declared under the TSC Act however in recognition of their invasiveness and potential for impact it is illegal to keep red-eared slider turtles as pets in NSW under the Non-Indigenous Animals Act, 1987.

There are no identified control program priorities for red-eared slider turtles in the Region. However, it is a critical priority that they are prevented from establishing populations where possible; thus all reports of suspected red-eared slider or other exotic turtles in or immediately adjacent NPWS estate and including waterways that flow to NPWS estate, will be promptly recorded and investigated and control initiated as feasible.

Control will be by manual collection or cage trapping as feasible and humane euthanasia. All exotic turtles captured from the wild should be examined for breeding status. If breeding turtles or populations are identified proactive surveying and additional control techniques will be investigated for feasibility of success at known and at risk locations.

NPWS staff may be called upon to take possession of seized or surrendered pet red-eared slider turtles, in this instance staff will take the pet to a veterinarian for humane euthanasia, a death certificate must be issued by the veterinarian and the matter should also be reported to OEH Wildlife Licensing Manager. Metro South West Region staff also have a role to play in raising community awareness of the impacts of red-eared slider turtles and encouraging members of the public to report all sightings.

Off park reports will be referred to the DPI and other land management agency as relevant. Collaborative surveys, control or community education will be supported where impacts to park values or wildlife are likely. Red-eared slider turtles sightings and control will be recorded in the Pest and Weed Information Service including the location, numbers collected, sex, breeding status and size and effort will be recorded in AMS.

Tropical soda apple (*Solanum viarum*)

Tropical soda apple is a prickly perennial shrub up to two metres high. It has cream coloured spines, large leaves, white flowers and fruit that looks similar to small water melons when immature, reaching golf ball size and turning yellow as it matures. It was first recorded in Australia in August 2010 in the Kempsey area and several other small infestations have since been identified around Wingham, Coffs Harbour and Grafton (NSW Primary Industries 2011). An isolated infestation of two plants were identified on the Peats Bight Trail in Muogamarra Nature Reserve. and subsequently controlled and the site is subject to ongoing monitoring. If any further infestations are identified, control programs will be conducted by NPWS and the relevant LCA and the Sydney Regional Weeds Committee will be informed. Similar *Solanum* species uncommon in the Region are also subject to control. Tropical soda apple is listed as a Class 2 weed across the Region.

Samphire (*Crithmum maritimum*)

Samphire is the sole species of the genus *Crithmum*. It is an edible wild plant found on southern and western coasts of Britain and Ireland, on Mediterranean and western coasts of Europe including the Canary Islands, North Africa and the Black Sea. The term samphire is used for several unrelated species of coastal plant.

A recent infestation is believed to have been identified at Jibbon in Royal National Park. NPWS will work with the Sydney Regional Weeds Committee to develop an appropriate response.

Appendix 2 Pest-related key threatening processes

These are the pest-related KTPs in NSW relevant to the Metro South West Region as determined by the NSW Scientific Committee.[4] All the determinations listed are final.

Name	Gazettal date
Anthropogenic climate change	17/11/2000
Clearing of native vegetation	
Competition and grazing by the feral European rabbit	10/05/2002
Competition and habitat degradation by feral goats	12/11/2004
Competition from feral honeybees (*Apis mellifera*)	29/11/2002
Forest eucalypt dieback associated with over-abundant psyllids and bell miners	28/10/2008
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	24/03/2000
Herbivory and environmental degradation caused by feral deer	17/12/2004
Importation of red imported fire ants into NSW	23/08/2002
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered *Psittacine* species and populations	06/12/2002
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	22/08/2003
Infection of native plants by *Phytophthora cinnamomi*	13/12/2002
Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	15/04/2011
Introduction of large earth bumblebee (*Bobbus terrestris* L.)	13/02/2004
Invasion and establishment of exotic vines and scramblers	21/04/2006
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	09/11/2007
Invasion and establishment of the cane toad (*Bufo marinus*)	21/04/2006
Invasion of native plant communities by African olive (*Olea europaea* L. subsp. *cuspidata*)	01/10/2010
Invasion, establishment and spread of lantana (*Lantana camara*)	08/09/2006
Invasion of native plant communities by *Chrysanthemoides monilifera*	12/03/1999
Invasion of native plant communities by exotic perennial grasses	12/09/2003
Invasion of the yellow crazy ant (*Anoplolepis gracilipes*) into NSW	19/08/2005
Loss of hollow-bearing trees	
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	26/08/11
Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	31/07/2009
Predation by the European red fox	20/03/1998
Predation by the feral cat	24/03/2000
Predation by plague minnow (*Gambusia holbrooki*)	29/01/1999
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	27/08/2004
Removal of dead wood and dead trees	12/12/2003

[4] For further details and a full list of determinations see www.environment.nsw.gov.au/committee/ListOfScientificCommitteeDeterminations.htm.

Appendix 3 Weeds of National Significance

The 20 WoNSs were listed based on four criteria: invasiveness, impacts, potential for spread and social and environmental values.[5] They were developed as a means of prioritising weed control at a national level and over a range of land uses.

Individual landowners and managers are responsible for managing WoNSs. State and territory governments are responsible for overall legislation and administration.

Each WoNS has a strategic plan that outlines strategies and actions required to control the weed, and identifies responsibilities for each action.

Each WoNS has a management coordinator[6] and a national management group or steering committee to oversee implementation of the goals and actions of the WoNSs strategic plans and to develop and coordinate priority actions.

The strategic control of WoNSs where they significantly impact park values is a priority for NPWS.

Inaugural list of Weeds of National Significance in Metro South West Region

Scientific name	Common name	Known on NPWS estate in the region
Acacia nilotica	Prickly acacia	Outside potential range
Alternanthera philoxeroides	Alligator weed	Known
Annona glabra	Pond apple	Outside potential range
Asparagus asparagoides	Bridal creeper	Known
Cabomba caroliniana	Cabomba	Potential to occur
Chrysanthemoides monilefera subsp. *monilifera* and subsp.*rotundata*	Boneseed, bitou bush	Known
Cryptostegia grandiflora	Rubber vine	Outside potential range
Hymanachne amplexicaullis	Hymenachne	Outside potential range
Lantana camara	Lantana	Known
Mimosa pigra	Mimosa	Outside potential range
Nassella neesiana	Chilean needle grass	Potential to occur
Nassella trichotoma	Serrated tussock	Known
Parkinsonia aculeata	Parkinsonia	Outside potential range
Parthenium hysterophorus	Parthenium weed	Outside potential range
Prosopis spp.	Mesquite	Outside potential range
Rubus fruiticosus agg.	Blackberry	Known
Salex spp. except *S. babylonica*, *S.* x *reichardtiji*, *S.* x *calodendron*	Willows except weeping willow, pussy willow and sterile pussy willow.	Known
Salvinia molesta	Salvinia	Known
Tamarix aphylla	Athel pine	Outside potential range
Ulex europaeus	Gorse	Known

[5] www.weeds.gov.au/weeds/lists/index.html
[6] www.environment.gov.au/biodiversity/invasive/weeds/contacts/wons.html

Additional Weeds of National Significance in Metro South West Region, April 2012

Scientific name	Common name	Known on NPWS estate in the Region
Andropogon gayunus	Gamba grass	Outside potential range
Anredera cordifolia	Madera vine	Known
Asparagus aethiopicus, *A. africanus, A. declinatus*, *A. plumosus, A. scandens* and includes original WoNS *Asparagus asparagoides*	Asparagus weeds	Known
Cytisus scoparius, *Genista monspessulana*, *Genista linifolia*	Brooms: Scotch, Montpellier, flax leaf	Known
Jatropha gossypiifolia	Bellyache bush	Outside potential range
Eichhornia crassipes	Water hyacinth	Potential to occur
Lycium ferocissimum	African boxthorn	Known
Macfadyena unguis-cati	Cat's claw creeper	Known
Opuntia spp. (excludes *O. ficus-indica), Cylindropuntia* spp., *Austrocylindropuntia* spp.	Optuntioid cactus	Known
Sagittaria platyphylla	Sagittaria	Known
Senecio madagascariensis	Fireweed	Known
Solanum elaeagnifolium	Silver-leaf nightshade	Outside potential range

Appendix 4 National Environmental Alert List

The National Environmental Alert List[7] was developed to identify plant species in the early stages of establishment that have the potential to become a significant threat to biodiversity if they are not managed. Species were identified based on three criteria: posing a high or serious potential threat to the environment, having limited distribution within Australia at present, and being amenable to successful eradication or containment programs.

New incursions of these weeds in the Metro South West Region should be recorded and reported to the Pest Management Officer, and a control program developed.

Scientific name	Common name
Barleria prionitis	Porcupine flower
Cynoglossum creticum	Blue hound's tongue
Nassella hyalina	Cane needle grass
Koelreuteria elegans ssp. *formosana*	Chinese rain tree
Asystasia gangetica ssp. *micrantha*	Chinese violet
Acacia catechu	Cutch tree
Cyperus teneristolon	Cyperus
Dittrichia viscosa	False yellowhead
Pelargonium alchemilloides	Garden geranium
Calluna vulgaris	Heather
Senecio glastifolius *	Holly leaved senecio
Equisetum spp.	Horsetail species
Acacia karroo	Karoo thorn
Kochia scoparia	Kochia
Lagarosiphon major	Lagarosiphon
Thunbergia laurifolia	Laurel clock vine
Pereskia aculeata	Leaf cactus
Nassella charruana	Lobed needle grass
Hieracium spp.	Orange hawkweed
Praxelis clematidea	Praxelis
Tipuana tipu	Rosewood
Gymnocoronis spilanthoides **	Senegal tea plant
Chromolaena odorata	Siam weed
Trianoptiles solitaria	Subterranean cape sedge
Piptochaetium montevidense	Uruguayan rice grass
Cytisus multiflorus	White Spanish broom
Retama raetam	White weeping broom
Lachenalia reflexa	Yellow soldier

* Reported in Royal National Park but unconfirmed.
** Known in Royal National Park.

[7] www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/alert.html

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