



## Regional Pest Management Strategy 2012–17: Central Coast Hunter Region

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

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Cover photos, main: bush regeneration volunteers removing bitou bush (D Holloman/OEH); small: fox at brush-tailed rock-wallaby monitoring site in Yengo National Park (J Betteridge/OEH); bitou bush (OEH); wild dogs visiting a bait station in Brisbane Water National Park (R Ali/OEH); lantana (S Cottrel/OEH).

## Summary

The Central Coast Hunter Region of the NSW National Parks and Wildlife Service (NPWS) extends from the Hawkesbury River in the south to approximately north of the township of Wallabadah. The Region contains approximately 500,000 hectares of NPWS estate across a landscape diverse in topography and land use.

The main focus of pest management for NPWS is to minimise the impacts of pest species on reserve values and neighbouring land use, working cooperatively with other agencies and landholders to achieve these aims. However, given the complexity of species, environments and impacts, and the resources available, it is critical to view these actions in a strategic context to focus limited resources on the most effective pest management actions.

This regional pest management strategy identifies the key pest animal and plant species for reserve management in the Central Coast Hunter Region, the values they threaten and the actions that will be taken to minimise their impacts. The process for identifying these priority actions has been to identify key reserve assets and threats, consult with key stakeholders and identify what actions can be reasonably undertaken using agency resources and in partnership with other government authorities, neighbouring landholders and community groups.

The highest priorities are programs aimed at the protection of threatened species, neighbouring landholders and public health. Ranked by the level of risk that they present, high priority pest species include wild dogs, foxes, bitou bush, lantana and asparagus species.

Some of the most effective control methods used to address these species are undertaken through the bushcare volunteer program, aerial spraying and cooperative wild dog baiting programs.



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## Abbreviations

AA	Aboriginal area
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 <sup>1</sup> )
CCH	Central Coast Hunter
CMA	catchment management authority
EEC	endangered ecological community
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FIN	further information needed
KTP	key threatening process
LGA	local government area
LHPAs	Livestock Health and Pest Authorities
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NP	national park
NPWS	NSW National Parks and Wildlife Service
NR	nature reserve
NW Act	<i>Noxious Weeds Act 1993</i>
OEH	Office of Environment and Heritage
PAS	Priorities Action Statement
PWIS	Pest and Weeds Information Service
RHD	rabbit haemorrhagic disease
RLP Act	<i>Rural Lands Protection Act 1998</i>
SCA	state conservation area
TAP	threat abatement plan
TSC Act	<i>Threatened Species Conservation Act 1995</i>
WDMP	wild dog management plan
WoNS	weed of national significance

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<sup>1</sup> [http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/publications/cmas/cma\\_statewide-framework-web.pdf](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 Central Coast Hunter 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

Central Coast Hunter Region extends from the Hawkesbury River in the south to the Hunter River in the north, and past Wallabadah in the north-west. It covers the local government areas (LGAs) of Gosford, Wyong, Lake Macquarie, Newcastle, Cessnock, Maitland, Upper Hunter Shire; Liverpool Plains Shire Council and the Awabakal, Bahtabah, Darkinjung, Mindaribba, Wanaruah, Worimi and metropolitan local Aboriginal land councils.

### Regional context

The reserve system in CCH Region covers approximately 480,000 hectares and consists of:

- 21 national parks
- 22 nature reserves
- ten state conservation areas
- one regional park
- four Aboriginal areas
- one Aboriginal place.

Approximately half of the reserved area (215,130 ha) is declared wilderness in Wollemi, Yengo, Barrington and Mount Royal national parks.

The Region lies at the north-eastern extent of the Sydney Basin Bioregion and extends into the North Coast Bioregion. The vegetation is influenced by the Central Coast, North Coast and Central Western Slopes botanical divisions. The convergence of these influences in the Hunter Valley can be seen in the reserves in the north-west of the Region, particularly Wollemi National Park and Manobolai Nature Reserve. Reserves in the central coast hunter region protect a number of Endangered Ecological Communities (EECs) including Freshwater Wetlands on Coastal Floodplains, Box-Gum Woodland, Hunter Valley Vine Thickets, Littoral Rainforest, Lower Hunter Spotted gum Ironbark, Lowland Rainforest on Floodplain, Montane Peatlands and Swamps, Sub-tropical Coastal Floodplain Forest, Swamp Oak Floodplain Forest, Swamp Sclerophyll Forest and *Themeda* Grassland on Seacliffs and Coastal Headlands.

The landscape shows great diversity, from the Hawkesbury sandstone coastline and large coastal lakes of Lake Macquarie and Tuggerah Lakes, the Watagans Ranges, to the fertile plains of the Hunter Valley and the rugged dissected plateau country of Yengo and Wollemi national parks.

The Central Coast and Lower Hunter regions support large and rapidly expanding urban populations, with regional centres at Gosford, Wyong, Newcastle, Cessnock, Singleton, Muswellbrook and Scone. The regions also contain large areas of rural, agricultural, mined and forested lands. The economy of the regions is focused on mining, industrial manufacture, power generation, agriculture, wine production and tourism.

### Park management

CCH Region comprises four NPWS management areas: Hawkesbury North, Lakes, Lower Hunter, and Upper Hunter.

A number of pest species are present in CCH Region and their impacts can be observed at varying levels in the reserves (section 7). The species covered by this



strategy include terrestrial and aquatic weeds, vertebrate pests, plant diseases and soil pathogens. Urban and semi-rural development impacts heavily on the Region's reserves as it creates conditions favourable for weed invasion (including nutrient enriched run-off, sewage overflows, high flow stormwater, soil disturbance, vegetation clearing, dumping of fill and garden waste, and garden escape plants). This is evidenced by the high densities of weeds on urban boundaries and along creeks and rivers downstream of development. Environmental weeds and garden escapes, including declared noxious weeds, are among the greatest threats to the conservation of biodiversity and cultural heritage and recreational values.

Wild dogs are present in the Region, as are the emerging pest wild deer. Wild cattle also exist in isolated populations in more remote localities; feral cats and foxes are the most common vertebrate pests, while rabbits are generally confined to areas of grazing availability in open areas, mainly the coastal and urban interface.

CCH Region has been managing an isolated occurrence of the soil pathogen *Phytophthora cinnamomi* for a number of years in Dharug National Park. The plant disease myrtle rust is a recent challenge, coming to the attention of land management agencies on the Central Coast in 2010.

CCH Region reserves are regularly impacted by fire, both wildfire and hazard reduction burning. Fire is used as a tool for conservation, and a means of weed control or as a window of opportunity for implementing control. Fire can lead to increased pest invasion, most commonly weeds, but also increased vertebrate pest activity including increased browsing and damage to regenerating plants by goats, deer, cattle and rabbits. Conversely, prolonged absence of fire can lead to degradation of native plant communities and increased weed invasion, particularly by mesic species.

## **Community engagement**

More than 200 volunteers provide support through a diverse group of programs. Bushcare has over 20 groups active across the Region.

Hawkesbury Nepean and Hunter Central Rivers catchment management authorities (CMAs) also play a vital role in funding and facilitating community cross-tenure programs in the Region.

As pests are not defined or limited by fence lines and boundaries marked on maps, the key to successful long-term pest management is for all stakeholders to collaborate and follow strategies that encourage participation in landscape-wide cross-tenure efforts.

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**

Residential and rural interfaces are associated with plant and vertebrate pests. These areas provide challenges in controlling pests to protect the wellbeing of neighbouring landholders and communities. CCH Region is committed to establishing effective working partnerships with all neighbours to achieve satisfactory outcomes.

An emerging priority for CCH Region is the expanding populations and new incursions of deer species into reserves and bushland on other land tenures. Many deer are not only impacting on the rural interface but also encroaching on the urban interfaces and arterial roadways, providing complex problems for planning control. Future monitoring and innovative, coordinated control techniques will be essential to control these pests.

Currently, CCH Region undertakes many active weed control programs and uses techniques such as ground spraying, aerial spraying, biological control and bush regeneration. The Region has a strong volunteer Bushcare program with over 250 registered volunteers across a range of sites.

Management priorities for CCH Region in relation to pest control align with state and local priorities under the *Noxious Weeds Act 1993* (NW Act) and the *Rural Lands Protection Act 1998* (RLP Act). The Region is committed to using best practice control and monitoring techniques and to undertaking and assisting in research and programs that enable more effective and humane control of pest animals.

CCH Region has a strong pest control focus and, as a result, undertakes many programs that are worthy of being identified as regional achievements. The following programs are a sample of the regional achievements in relation to pests.

### **Wild dog management**

The management of wild dogs is a very high priority. CCH Region works under three wild dog plans: the Mid Coast Wild Dog Management Plan, Barnard River Wild Dog Management Plan and the Cumberland North Wild Dog Management Plan. Wild dogs pose a serious threat to livestock, domestic pets and the wellbeing of local communities. NPWS CCH Region, Livestock Health and Pest Authorities (LHPAs), local wild dog associations and affected landholders have identified hotspots of varying tenure where wild dogs continually impact that landscape. NPWS works with affected neighbours in routine coordinated and reactive programs (baiting programs and incident responses), where trained staff and professional contractors implement localised timely responses to remove the threat (emergency baiting and trapping).

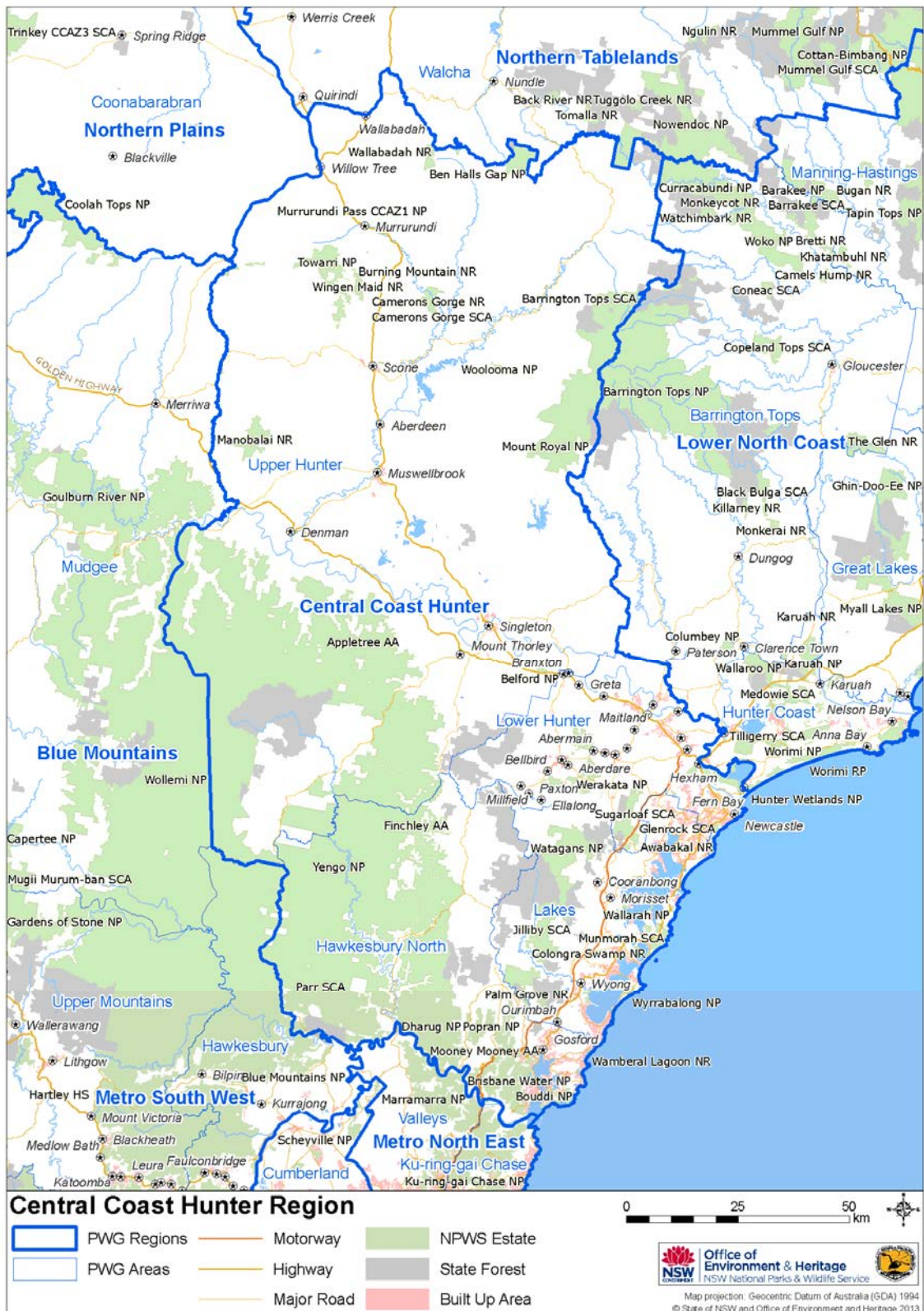
The future of improving the success of wild dog management in the coastal zone of CCH Region will be to follow the successful model set up by Mid Coast LHPA in the establishment of local community associations. NPWS will work with Cumberland LHPA and follow a proposed plan to establish local control groups consisting of land managers and major stakeholders in each of the identified hot spots.

### **Fox threat abatement program and protecting the brush-tailed rock-wallaby**

Many pest species are already widely established and their eradication is rarely practicable. It is therefore necessary to prioritise pest management efforts and allocate resources to those areas where they will be of greatest benefit. The NSW Fox Threat Abatement Plan (TAP) is a good example of how control effort has been prioritised. The Fox TAP identifies 81 priority sites for fox control across NSW and includes recovery actions for 34 threatened species (11 mammals, 15 birds and eight reptiles). Fox control and/or monitoring of threatened species populations are in

place at most of these sites, in collaboration with other agencies, community groups and private landholders.

In CCH Region two species were selected; firstly the brush-tailed rock-wallaby was selected as the species that would benefit most from fox control. The brush-tailed rock-wallaby is listed as an endangered species in NSW under the *Threatened Species Conservation Act 1995* (TSC Act). Brush-tailed rock-wallabies are monitored at five sites: Martindale, Broke/Milbrodale, Big Yango, St Albans and the Watagans Ranges. The Watagans Ranges and Broke/Milbrodale are treatment sites where baiting is conducted by NPWS staff and contractors on NPWS estate and private property on an ongoing basis. The foxes are monitored by sand pads twice a year and brush-tailed rock-wallabies are monitored quarterly. Secondly, the NSW Fox TAP is also implemented to protect populations of the endangered broad-toothed rat in Barrington Tops National Park.



### **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, undertaking fox control at the Watagans priority site for brush-tailed rock-wallabies 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 an urban interface area.

##### **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 wild pigs impacting on World Heritage values of Wollemi National Park, or 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, or control of rabbits undermining a 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, or 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 keep them free of weeds.

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 pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Wamberal Lagoon NR	541 – Wamberal Point south to Terrigal beach	Asparagus, polygala, lantana, bitou bush	Littoral Rainforest EEC (BPWW – CC1)	Asset protection	Spraying splatter gun, aerial spraying, follow up	C-TSC
Hawkesbury North	Bouddi NP	165 – Bouddi NP – Box Head	Bitou bush	<i>Westringia fruticosa</i> (Bitou Bush TAP – High), <i>Rulingia hermannifolia</i> (Bitou Bush TAP – Medium), Themeda Grassland on Seacliffs and Coastal Headlands EEC (TSC-e) (BPWW – CC1)	Asset protection	Aerial spraying, splatter gun	C-TSC
Hawkesbury North	Bouddi NP	2765 – Bullimah	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Aerial spray, splatter gun	C-TSC
Hawkesbury North	Bouddi NP	2766 – Tallow Beach	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Aerial spray, splatter gun, cut and paint	C-TSC
Hawkesbury North	Bouddi NP	2767 – Bombi Moors	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Aerial spray, splatter gun, cut and paint	C-TSC
Hawkesbury North	Bouddi NP	2768 – Caves Bay	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Aerial spray, splatter gun, cut and paint	C-TSC
Hawkesbury North	Bouddi NP	2769 – Mourawaring Moors	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Aerial spray, splatter gun, cut and paint	C-TSC
Hawkesbury North	Bouddi NP	2770 – Half Tide Rocks	Bitou bush, ground asparagus, lantana	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC*)	Asset protection	Splatter gun, cut and paint, foliar spray	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Wamberal Lagoon NR	542 – Wamberal Lagoon #2	Bitou bush, lantana	Littoral Rainforest EEC, magenta lilly pilli, <i>chamasyce psammogoten</i> (BPWW – CC1)	Asset protection	Spraying splatter gun, aerial spraying, follow up	C-TSC
Hawkesbury North	Wamberal Lagoon NR	540 – Wamberal Lagoon foredunes	Bitou bush, lantana, gazania, polygala	<i>Chamaesyce psammogeton</i> , <i>Senecio spathulatus</i> , <i>Syzygium paniculatum</i> , Littoral Rainforest, Swamp Oak Floodplain Forest EECs (BPWW – CC1)	Asset protection	Spraying splatter gun, aerial spraying, follow up	C-TSC
Hawkesbury North	Cockle Bay NR	204 – Palmers Lane	Blackberry, bridal creeper, lantana	Swamp sclerophyll forest, Coastal Saltmarsh EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Cockle Bay NR	205 – Empire Bay	Blackberry, honeysuckle, lantana	Coastal Saltmarsh, Swamp Sclerophyll Forest, Swamp Oak Forest EECs (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Dharug NP	872 – Mill Creek entrance wetland	Bridal creeper, moth vine, tradescantia	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest (BPWW – CC1)	Asset protection	Ground spraying, splatter gun	C-TSC
Hawkesbury North	Dharug NP	874 – Mill Creek visitor precinct	Bridal creeper, ochna, moth vine, <i>Sida rhombifolia</i> , blue periwinkle, Japanese honeysuckle	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest (BPWW – CC2)	Asset protection	Ground spraying, splatter gun, hand pulling removal	C-TSC
Hawkesbury North	Palmgrove NR	307 – Kilkenny Road	Crofton weed, lantana	Threatened frogs – stuttering barred frog, giant burrowing frog, red-crowned toadlet (BPWW – CC2)	Asset protection	Spraying, cut and paint, splatter gun	C-TSC
Hawkesbury North	Yengo NP	St Albans	Fox	Brush-tailed rock-wallabies	Asset protection	Monitoring – sand pads, scat counts	C-TSC
Hawkesbury North	Yengo NP	Big Yango	Fox	Brush-tailed rock-wallabies	Asset protection	Baiting – M44 ejectors; Monitoring – sand pads, scat counts	C-TSC
Hawkesbury North	Bouddi NP	166 – Wagstaffe Point	Ground asparagus	Pittwater Spotted Gum Forest EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC



Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Cockle Bay NR	2725 – Shelly Beach Road	Ground asparagus, bridal creeper	Coastal Saltmarsh, Swamp Sclerophyll Forest EECs (BPWW – CC*)	Asset protection	Spraying, hand removal	C-TSC
Hawkesbury North	Bouddi NP	167 – Rileys Bay	Japanese honeysuckle, bitou bush, lantana	Themeda Grassland on Seacliffs and Coastal Headlands EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Pelican Island NR	406 – Pelican Island	<i>Juncus acutus</i> , asparagus fern	Coastal Saltmarsh, Swamp Oak Floodplain Forest EECs (BPWW – CC1)	Asset protection	Spraying, hand removal	C-TSC
Hawkesbury North	Rileys Island NR	424 – Brisbane Water opposite St Huberts Island, Lintern Channel, Paddys Channel	<i>Juncus acutus</i> , asparagus fern	Coastal Saltmarsh, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest EECs (BPWW – CC1)	Asset protection	Spraying, hand removal	C-TSC
Hawkesbury North	Bouddi NP	331 – Little Beach catchment	Lantana	<i>Prostanthera askania</i> (BPWW – CC2)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Palmgrove NR	378 – Ourimbah Creek Road)	Lantana	Lowland Rainforest EEC, stuttering barred frog (BPWW – CC2)	Asset protection	Spraying, cut and paint	C-TSC
Hawkesbury North	Wambina NR	544 – Matcham, south-western area	Lantana	Lowland Rainforest EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Bouddi NP	268 – Grand Deep	Lantana, asparagus fern, bitou bush	Lowland Rainforest EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Cockle Bay NR	2764 – Palmers Lane	Lantana, blackberry	Coastal Saltmarsh and Swamp Sclerophyll Forest EECs (BPWW – CC*)	Asset protection	Splatter gun, cut and paint, foliar spray	C-TSC
Hawkesbury North	Dharug NP	635 – bottom of Western Commission Track	Lantana, blackberry, climbing nightshade	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest (BPWW – CC1)	Asset protection	Ground spraying, splatter gun	C-TSC
Hawkesbury North	Dharug NP	871 – Mill Creek, Wisemans Ferry Road	Lantana, bridal creeper, moth vine, tradescantia	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e) (BPWW – CC1)	Asset protection	Ground spraying, splatter gun	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Dharug NP	789 – Hazel Dell picnic area west	Moth vine, tradescantia, rambling dock, blue periwinkle, fishbone fern	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest (BPWW – CC1)	Asset protection	Ground spraying, splatter gun	C-TSC
Hawkesbury North	Bouddi NP	249 – Fletchers Glen	Privets	Lowland Rainforest EEC (BPWW – CC1)	Asset protection	Spraying, cut and paint, hand removal	C-TSC
Hawkesbury North	Dharug NP	788 – Hazel Dell picnic area east	Tradescantia, black-eyed Susan, spider lily	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest (BPWW – CC1)	Asset protection	Ground spraying, splatter gun	C-TSC
Hawkesbury North	Yengo NP	Big Yango	Feral cattle	River-Flat Eucalypt Forest on Coastal Floodplains (TSC-e), <i>Oleria cordata</i> (TSC-v; EPBC-v), Freshwater Wetlands on Coastal Floodplains EECs (TSC-e), swamp oak, world heritage area, Aboriginal cultural heritage at Mount Yengo	Asset protection	Trapping, strategic shooting	C-TSC
Lakes	Lake Macquarie SCA	320 – Bitou TAP site	Bitou bush	Littoral Rainforest EEC, <i>Eucalyptus camfieldii</i> (BPWW – CC1)	Asset protection	Bush regeneration, ground spraying, splatter gun	C-TSC
Lakes	Munmorah SCA	484 – Southern precinct	Bitou bush	Swamp Sclerophyll Forest on Coastal Floodplains (TSC-e), Littoral Rainforest (EPBC-ce; TSC-e), Swamp Oak Floodplain Forest EECs (TSC-e), coastal sand dune complex (Bitou Bush TAP – Medium) (BPWW – CC*)	Asset protection	Spraying, barrel mulching, splatter gun, cut and paint	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lakes	Wallarrah NP	532 – Pinny Beach	Bitou bush	<i>Pultenaea maritima</i> (TSC-v), <i>Diuris praecox</i> (EPBC-v, TSC-v), <i>Westringia fruticosa</i> (Bitou Bush TAP – High), <i>Tetratheca juncea</i> (EPBC-v, TSC-v), coastal sand dune complex – <i>Acacia longifolia</i> var. <i>sophorae</i> (Bitou Bush TAP – Medium), frontal dune vegetation complex (Bitou Bush TAP – High), Themeda Grassland on Seacliffs and Coastal Headlands EEC (TSC-e), coastal scrub – <i>Leptospermum laevigatum</i> , <i>Acacia longifolia</i> var. (BPWW – CC1)	Asset protection	Volunteers, Aboriginal land council, contractors, aerial spray, bush regeneration, fire and erosion work	C-TSC
Lakes	Wyrrabalong NP	497 – South Wyrrabalong	Bitou bush	Themeda Grassland EEC; many orchids – caladenia, <i>Diuris praecox</i> (EPBC-v; TSC-v) (BPWW – CC1)	Asset protection	Aerial spraying	C-TSC
Lakes	Wyrrabalong NP	419 – Rainforest North	Bitou bush, <i>Asparagus</i> spp., lantana, winter senna, turkey rhubarb, fleabane, morning glory, cobblers pegs	Littoral Rainforest EEC (EPBC-ce; TSC-e), <i>Syzygium paniculatum</i> (EPBC-v; TSC-e), grey-headed flying-fox (EPBC-v; TSC-v), squirrel glider (TSC-v), fruit dove (TSC-v), microbats and others FIN (BPWW – CC*)	Asset protection	Spraying, cut and paint, splatter gun (as appropriate)	C-TSC
Lakes	Tuggerah NR	254 – Forest including ox bow	Bitou bush, lantana, <i>Asparagus</i> spp., winter senna, camphor laurel, privet, blackberry coral tree, wild tobacco, pampas grass	Swamp Schlerophyll Forest (TSC), Swamp Oak Floodplain Forest (TSC-e), Coastal Saltmarsh (TSC-e), River-Flat Eucalypt Forest EECs (TSC-e), spotted gum forest (significant patch on clay lens) (FIN), powerful owl ( <i>Ninox strenua</i> ) (TSC-v), <i>Melaleuca biconvexa</i> (EPBC-v, TSC-v), <i>Elecarpis obavatis</i> , <i>Sesuvium portulacastrum</i> (BPWW – CC*)	Asset protection	Spraying, hand removal scrape and paint	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lakes	Pulbah NR	417 – Pulbah Island	Bitou bush, lantana, winter senna, prickly pear	<i>Syzygium paniculatum</i> (EPBC-v; TSC-e), <i>Macrozamia flexuosa</i> (Bitou Bush TAP – Low), Swamp Oak Floodplain Forest (TSC-e), Swamp Sclerophyll Forest on Coastal Floodplains EECs (TSC-e), Aboriginal Place (BPWW – CC3)	Asset protection	Bush regeneration	C-TSC
Lakes	Watagans NP	Watagans	Fox	Brush-tailed rock-wallaby	Asset protection	Ground baiting	C-TSC
Lakes	Jilliby SCA	299 – Jilliby SCA	Lantana	<i>Grevillea parviflora</i> ssp. <i>parviflora</i> , <i>Melaleuca biconvexa</i> , <i>Syzygium paniculatum</i> , Lowland Rainforest EEC (BPWW – CC1)	Asset protection	Splatter gun, ground spraying	C-TSC
Lakes	Lake Macquarie SCA	321 – Morisset	Lantana	Swift parrot, regent honeyeater, Swamp Sclerophyll Forest on Coastal Floodplains, Swamp Oak Floodplain Forest EECs, eastern bentwing-bat (BPWW – CC1)	Asset protection	Bush regeneration, ground spraying, splatter gun	C-TSC
Lakes	Pulbah Island NR	416 – Pulbah Island NR	Lantana	<i>Syzygium paniculatum</i> , Swamp Oak Floodplain Forest EEC, eastern bentwing-bat (BPWW – CC1)	Asset protection	Bush regeneration, splatter gun	C-TSC
Lakes	Wallarrah NP	534 – Palm Gullies	Lantana	Lowland Rainforest EEC (BPWW – CC1)	Asset protection	Bush regeneration, splatter spraying	C-TSC
Lakes	Watagans NP	552 – Slippery Rock Road	Lantana	<i>Grevillea parviflora</i> ssp. <i>parviflora</i> (EPBC-v; TSC-v), <i>Eucalyptus fergusonii</i> ssp. <i>Fergusonii</i> (rare or threatened Australian plant), Lowland Rainforest EEC (TSC-e) (BPWW – CC1)	Asset protection	Bush regeneration, vehicle spray (as appropriate), spraying	C-TSC
Lakes	Watagans NP	142 – Barraba Lane	Lantana	Lowland Rainforest (TSC-e), Lower Hunter Spotted Gum – Ironbark Forest EECs (TSC-e), brush-tail rock-wallaby (EPBC-v; TSV-e) (BPWW – CC2)	Asset protection	Bush regeneration, vehicle spray (as appropriate) spraying	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lakes	Lake Macquarie SCA	134 – Awaba Bay	Morning glory	Freshwater Wetlands on Coastal Floodplains EEC (BPWW – CC1)	Asset protection	Bush regeneration	C-TSC
Lakes	Wyrribalong NP	371 – Wetland North A	Morning glory, bitou bush, lantana, winter senna, Madeira vine, watsonia, turkey rhubarb, alligator weed	Freshwater Wetlands on Coastal Floodplains EEC (TSC-e), water quality in Tuggerah Lake impacts on sea grass beds, adjacent ecological communities impacted by weeds in main wetland (BPWW – CC1)	Asset protection	Spraying, cut and paint, splatter gun (as appropriate), bush regeneration	C-TSC
Lakes	Wyrribalong NP	372 – Wetland North B	Morning glory, bitou bush, lantana, winter senna, Madeira vine, watsonia, turkey rhubarb, alligator weed	Freshwater Wetlands on Coastal Floodplains EEC (TSC-e), water quality in Tuggerah Lake impacts on sea grass beds, adjacent ecological communities impacted by weeds in main wetland (BPWW – CC1)	Asset protection	Spraying, cut and paint, splatter gun (as appropriate), bush regeneration	C-TSC
Lakes	Wyrribalong NP	373 – Wetland North C	Morning glory, bitou bush, lantana, winter senna, Madeira vine, watsonia, turkey rhubarb, alligator weed	Freshwater Wetlands on Coastal Floodplains EEC (TSC-e), water quality in Tuggerah Lake impacts on sea grass beds, adjacent ecological communities impacted by weeds in main wetland (BPWW – CC1)	Asset protection	Spraying, cut and paint, splatter gun (as appropriate), bush regeneration	C-TSC
Lakes	Tuggerah NR	557 – Hyacinth site	Water hyacinth	Freshwater Wetlands on Coastal Floodplains (TSC-e), Swamp Oak Floodplain Forest (TSC-e), Swamp Sclerophyll Forest on Coastal Floodplains EECs (TSC-e), <i>Maundia triglochoides</i> (TSC-v), long-necked turtle, aquatic fauna, <i>Potamogeton crispata</i> – displaced FIN, ottelia, high diversity of waterbirds including TSC Act, JAMBA, CAMBA birds – FIN BPWW – CC1)	Asset protection	Mechanical harvesting, follow-up spraying	C-TSC
Lower Hunter	Awabakal NR	136 – Redhead Lagoon	Bitou bush	Freshwater Wetlands on Coastal Floodplains, Swamp Sclerophyll Forest on Coastal Floodplains EECs (BPWW – CC3)	Asset protection	Ground spraying	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lower Hunter	Awabakal NR	420 – Readhead bluff and rocky coastline	Bitou bush	Themeda Grassland on Seacliffs and Coastal Headlands EEC, <i>Tetratheca juncea</i> (BPWW – CC2)	Asset protection	Aerial spraying	C-TSC
Lower Hunter	Glenrock SCA	2728 – Leggy Point Car Park to Leggy Point, Leggy Point Loop Track	Bitou bush	<i>Macrozamia flexuosa</i> , <i>Tetratheca juncea</i> (BPWW – CC*)	Asset protection	Spraying, bush regeneration	C-TSC
Lower Hunter	Glenrock SCA	2729 – Bahai Landcare group	Bitou bush	<i>Diuris praecox</i> , <i>Tetratheca juncea</i> , <i>Macrozamia flexuosa</i> (BPWW – CC*)	Asset protection	Spraying	C-TSC
Lower Hunter	Glenrock SCA	265 – Bombala Track	Bitou bush, ground asparagus, senna	Ongoing Landcare site, Littoral Rainforest EEC, <i>Cynanchum elegans</i> , <i>Macrozamia pauli-guilielmi</i> (BPWW – CC2)	Asset protection	Hand removal	C-TSC
Lower Hunter	Glenrock SCA	483 – Themeda grassland, Burwood Beach	Bitou bush, invasive grasses	Themeda Grassland on Seacliffs and Coastal Headlands EEC, <i>Pultenaea maritima</i> (BPWW – CC2)	Asset protection	Ground spraying	C-TSC
Lower Hunter	Hunter Wetlands NP	2730 – Stockton sand spit	Bitou bush, <i>Juncus acutus</i>	Coastal Saltmarsh EEC, migratory shorebirds (BPWW – CC*)	Asset protection	Cut and paint, spraying, cut and removal	C-TSC
Lower Hunter	Hunter Wetlands NP	312 – Kooragang dykes	Bitou bush, <i>Juncus acutus</i>	Coastal Saltmarsh EEC, migratory shorebirds (BPWW – CC2)	Asset protection	Cut and paint, spraying, cut and removal	C-TSC
Lower Hunter	Glenrock SCA	2731 – Scout Camp Road	Bitou bush, lantana asparagus fern, senna	<i>Tetratheca juncea</i> , <i>Diuris praecox</i> (BPWW – CC*)	Asset protection	Landcare support, splatter gun, hand pull	C-TSC
Lower Hunter	Glenrock SCA	2733 – Dudley rainforest	Bitou bush, lantana asparagus fern, senna	Littoral Rainforest EEC, <i>Cynanchum elegans</i> (BPWW – CC*)	Asset protection	Splatter gun, hand removal	C-TSC
Lower Hunter	Glenrock SCA	454 – Scenic Drive	Bitou bush, lantana, asparagus fern, senna	<i>Tetratheca juncea</i> , <i>Macrozamia flexuosa</i> (BPWW – CC2)	Asset protection	Ground spraying	C-TSC
Lower Hunter	Glenrock SCA	247 – Lower Flaggy Creek, Yuelarbah	Bitou bush, lantana, morning glory, palm grass, asparagus fern	Littoral Rainforest EEC, <i>Syzygium paniculatum</i> , <i>Cynanchum elegans</i> (BPWW – CC2)	Asset protection	Spraying	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lower Hunter	Glenrock SCA	2732 – Dudley Beach	Bitou bush, lantana, senna	Themeda Grassland on Seacliffs and Coastal Headlands EEC, coastal dunes (BPWW – CC*)	Asset protection	Landcare support, splatter gun, hand pull	C-TSC
Lower Hunter	Werekata SCA	Quorrobolong	Feral goat	Lower Hunter Spotted Gum Ironbark Woodland EEC	Asset protection	Strategic ground shooting	C-TSC
Lower Hunter	Hunter Wetlands NP	2734 – Milhams Swamp	<i>Juncus acutus</i>	Coastal Saltmarsh EEC, Migratory waders (BPWW – CC*)	Asset protection	Spraying, manual removal	C-TSC
Lower Hunter	Hunter Wetlands NP	2735 – Burnt <i>Juncus</i> area	<i>Juncus acutus</i>	Coastal Saltmarsh EEC, Migratory waders, Ramsar (BPWW – CC*)	Asset protection	Spraying, manual removal	C-TSC
Lower Hunter	Sugaloaf SCA	2726 – Eastern domain	Lantana	<i>Tetradlea juncea</i> (BPWW – CC*)	Asset protection	Foliar spraying, splatter gun	C-TSC
Lower Hunter	Werekata SCA	148 – Bellbird	Lantana	Lower Hunter Spotted Gum – Ironbark Forest EEC (BPWW – CC1)	Asset protection	Spraying, splatter gun	C-TSC
Lower Hunter	Hunter Wetlands NP	2736 – Tomago Swamp	Lantana, bitou bush	Swamp Sclerophyll Forest on Coastal Floodplains EEC, Ramsar (BPWW – CC*)	Asset protection	Splatter gun, hand removal	C-TSC
Lower Hunter	Werekata NP	281 – Hebburn Colliery	Pampas grass, lantana	Lower Hunter Spotted Gum – Ironbark Forest, Kurri Sand Swamp Woodland EECs (BPWW – CC1)	Asset protection	Spraying, splatter gun	C-TSC
Lower Hunter	Werekata NP	Abermain no 2	Rabbit	Kurri Swamp Sand Woodland EEC	Asset protection	Pindone baiting, physical/mechanical control	C-TSC
Lower Hunter	Pambalong NR	400 – Pambalong NR and adjoining private property	Water hyacinth, alligator weed	Freshwater Wetlands on Coastal Floodplains EEC (BPWW – CC1)	Asset protection	Ground spraying	C-TSC
Upper Hunter	Belford NR	147 – Belford	African olive, mother-of-millions, lantana	Lower Hunter Spotted Gum Ironbark Woodland EEC (BPWW – CC1)	Asset protection	Basal bark, spraying, splatter gun	C-TSC
Upper Hunter	Barrington Tops SCA	412 – Polblue Swamp complex	<i>Cytisus scoparius</i> (Scotch broom)	Montane Peatlands and Swamps EEC, broad-toothed rat (BPWW – CC1)	Asset protection	Ground spray, cut and paint	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Barrington Tops SCA	523 – Tubrabucca Falls	<i>Cytisus scoparius</i> (Scotch broom)	Sub-alpine woodland, <i>Diuris venosa</i> (BPWW – CC1)	Asset protection	Ground spray	C-TSC
Upper Hunter	Barrington Tops SCA	524 – Tubrabucca Flat	<i>Cytisus scoparius</i> (Scotch broom)	Subalpine woodland, <i>Diuris venosa</i> (BPWW – CC1)	Asset protection	Ground spray	C-TSC
Upper Hunter	Barrington Tops NP, SCA	Barrington Plateau	Feral pig	Montane Peatlands and Swamps EEC, broad-toothed rat	Asset protection	Trapping, baiting	C-TSC
Upper Hunter	Wollemi NP	Martindale	Fox	Brush-tailed rock-wallaby	Asset protection	Monitoring brush-tailed rock-wallabies	C-TSC
Upper Hunter	Barrington Tops NP, SCA	Barrington Tops	Fox	Broad-toothed rat	Asset protection	Monitor, baiting	C-TSC
Upper Hunter	Barrington Tops NP, SCA	Barrington Plateau	<i>Holcus lanatus</i> (Yorkshire fog)	Montane Peatlands and Swamps EEC, broad-toothed rat	Asset protection	Monitor, ground spray	C-TSC
Upper Hunter	Barrington Tops NP, SCA	Barrington Plateau	Horse	Montane Peatlands and Swamps EEC, broad-toothed rat	Asset protection	Monitor, trapping, removal	C-TSC
Hawkesbury North	Bouddi NP	Bouddi	Deer	Motorists, neighbours	Asset protection	Shooting program	C-HD
Hawkesbury North	Brisbane Water NP	Central Mangrove, Somersby	Deer	Neighbouring landholders	Asset protection	Shooting program	C-EC
Hawkesbury North	Yengo NP, Parr SCA, Dharug NP, Popran NP, Finchley AA	Cumberland WDMP	Wild dog	Neighbouring private landholders' livestock	Asset protection	Baiting, trapping	C-EC
Hawkesbury North	Brisbane Water NP	Cumberland WDMP	Wild dog	Neighbouring landholders' stock	Asset protection	Baiting, trapping	C-EC
Lakes	Jilliby SCA	Dooralong Valley	Deer	Neighbouring private landholders' crops	Asset protection	Strategic shooting program	C-EC
Lakes	Jilliby SCA and Watagans NP	Cumberland WDMP	Wild dog	Neighbouring private landholders' stock	Asset protection	Baiting, trapping	C-EC



Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lower Hunter	Werekata NP	Werekata	Deer	Crops on adjacent private landholdings, for example horticulture, vineyards, olives	Asset protection	Strategic shooting, monitoring	C-EC
Lower Hunter	Werekata NP and SCA, Sugaloaf SCA	Cumberland WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Cumberland WDMP	C-EC
Upper Hunter	Ben Halls Gap NP	Ben Halls Gap	Feral pig	Neighbours' properties	Asset protection	Trapping, aerial and ground baiting	C-EC
Upper Hunter	Mount Royal NP	Royal	Feral pig	Neighbouring private landholdings	Asset protection	Trapping, ground shooting	C-EC
Upper Hunter	Belford NP	Mid Coast WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Mid Coast WDMP	C-EC
Upper Hunter	Manobolai NR	Mid Coast WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Mid Coast WDMP	C-EC
Upper Hunter	Mount Royal NP	Mid Coast WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Mid Coast WDMP	C-EC
Upper Hunter	Wollemi NP	Mid Coast WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Mid Coast WDMP	C-EC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Yengo NP	Mid Coast WDMP	Wild dog	Neighbouring livestock	Asset protection	Cooperative control programs and response to incidents – baiting, trapping, shooting as per Mid Coast WDMP	C-EC
Upper Hunter	Barrington Tops NP, SCA	Hunter Valley WDMP	Wild dog	Neighbours' stock	Asset protection	Aerial and ground baiting	C-EC
Upper Hunter	Ben Halls Gap NP	Barnard River WDMP	Wild dog	Neighbours' stock	Asset protection	Aerial and ground baiting	C-EC
Upper Hunter	Camerons Gorge NR/SCA	Mid Coast WDMP	Wild dog	Neighbours' stock	Asset protection	Aerial and ground baiting	C-EC
Upper Hunter	Murrurundi Pass NP	Mid Coast WDMP	Wild dog	Neighbours' stock	Asset protection	Aerial baiting	C-EC
Upper Hunter	Towarri NP, Cedar Brush NR, Wingen Maid NR	Mid Coast WDMP	Wild dog	Neighbours' stock	Asset protection	Ground baiting	C-EC
Upper Hunter	Wallabadah NR		Wild dog	Neighbours' stock	Asset protection	Aerial baiting	C-EC
Upper Hunter	Woolooma NP	Mid Coast WDMP	Wild dog	Neighbours' stock	Asset protection	Aerial baiting	C-EC
Lakes	Munmorah SCA	Elizabeth Bay Drive	Mud plantain ( <i>Heteranthera reniformis</i> )		Eradication	Off-park monitoring, spraying	C-NE
Upper Hunter	Barrington Tops SCA	Barrington Plateau roadsides and trails	<i>Leucanthemum vulgare</i> (ox-eye daisy)		Containment	Monitor, ground spray, bush regeneration	C-NE
Upper Hunter	Towarri NP	Tinagroo, Glen Range	<i>Olea</i> spp. (olives)		Containment	Monitor	C-NE

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Lower Hunter	Hunter Wetlands NP	514 – Tomago wetlands	Pampas grass, <i>Juncus acutus</i>	Coastal Saltmarsh EEC (TSC-e), migratory waders and shorebirds habitat (BPWW – CC4)	Asset protection	Spraying, manual removal	H-IH
Upper Hunter	Wollemi NP	570 – Wirriba Clear	Blackberry	World Heritage Area (BPWW – CC3)	Asset protection	Aerial spraying followed up with ground spraying, splatter gun	H-IH
Upper Hunter	Wollemi NP	418 – Putty Creek	Blackberry	World Heritage Area (BPWW – CC3)	Asset protection	Ground spraying, splatter gun	H-IH
Upper Hunter	Wollemi NP	573 – Wollemi Creek	Blackberry	World Heritage Area (BPWW – CC3)	Asset protection	Ground spraying, splatter gun	H-IH
Upper Hunter	Wollemi NP	Putty	Feral pig	World Heritage Area	Asset protection	Trapping, shooting, monitoring	H-IH
Upper Hunter	Wollemi NP	295 – Jerrys Plains	Mother-of-millions	World Heritage Area (BPWW – CC4)	Asset protection	Prescribed burn, follow-up ground spraying	H-IH
Hawkesbury North	Yengo NP	889 – Mount Yengo Aboriginal Place	Lantana	Cultural heritage site, dry rainforest, <i>Acacia fulva</i> , ironbark–bloodwood ridge top vegetation (BPWW – CC5)	Asset protection	Ground spraying, splatter gun	H-CH
Upper Hunter	Brushy Hill NR	Low land areas near the limestone kiln	<i>Opuntia</i> spp. (pear), <i>Lycium ferocissimum</i> (boxthorn), <i>Ricinus communis</i> (castor oil plant), <i>Datura stramonium</i> (thorn apple), <i>Conium maculatum</i> (hemlock), thistles	Cultural heritage sites, woodland areas	Asset protection	Ground spray, cut and paint	H-CH
Upper Hunter	Towarri NP	Glen Murray Homestead Ruins	<i>Vinca major</i> (blue periwinkle), <i>Ulex europaeus</i> (gorse)	Homestead ruins	Asset protection	Ground spray	H-CH
Hawkesbury North	Yengo NP	852 – Macdonald River	Black willow	Riparian vegetation, <i>Eucalyptus deanei</i> and <i>E. michaeleana</i> , wet eucalypt (part of riparian vegetation), world heritage area (BPWW – CC5)	Asset protection	Annual spraying with Willow Warrior Volunteers Program	M-WNH

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Yengo NP	Macdonald River	Feral cattle	Blue Mountains World Heritage Area riparian vegetation, <i>Eucalyptus deanei</i> and <i>E. michaeleana</i> , wet eucalypt (part of riparian vegetation)	Asset protection	Lick block stations, strategic ground shooting, aerial shooting	M-WNH
Hawkesbury North	Bouddi NP	Putty Beach	Bitou bush, asparagus fern	Recreation, aesthetic and natural areas	Asset protection	Hand spray, hand removal	M-RA
Hawkesbury North	Bouddi NP	Lobster Beach	Bitou bush, asparagus fern, lantana	Recreation, aesthetic and natural areas	Asset protection	Splatter gun, cut and paint, foliar spray	M-RA
Hawkesbury North	Bouddi NP	Daleys Point	Camphor laurel, blackberry	Recreation, aesthetic and natural areas	Asset protection	Cut and paint, foliar spray	M-RA
Upper Hunter	Burning Mountain NR	Burning Head	<i>Hypericum perforatum</i> (St John's wort)	Protect values of Burning Head Liaise with neighbours with off-park infestations	Asset protection	Ground spray	M-RA
Upper Hunter	Burning Mountain NR	Walking track and surrounds	<i>Opuntia</i> spp. (pear), <i>Heliotropium amplexicaule</i> (blue heliotrope)	Walking track and surrounds	Asset protection	Bush regeneration	M-RA
Hawkesbury North	Bouddi NP	340- McMasters Ridge site – little valley	Bitou bush, lantana	Lowland Rainforest EEC (TSC-e), <i>Melaleuca biconvexa</i> (BPWW – CC5)	Asset protection	Splatter gun, cut and paint	M-CP
Hawkesbury North	Dharug NP	Dharug NP	Feral cat	Native fauna	Asset protection	Volunteer cat trapping	M-CP
Hawkesbury North	Bouddi NP	Bouddi	Fox	Neighbouring landholders' stock	Asset protection	Baiting	M-CP
Lakes	Tuggerah NR and SCA	Pioneer Dairy	Fox	Native fauna	Asset protection	Baiting, trapping, shooting	M-CP
Lower Hunter	Hunter Wetlands NP	283 – Hexham Swamp	<i>Juncus acutus</i> , pampas grass	Coastal Saltmarsh (TSC-e), Freshwater Wetlands on Coastal Floodplains EECs (TSC-e), <i>Zannichellia palustris</i> (TSC-e) (BPWW – CC5)	Asset protection	Spraying, manual removal	M-CP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Brushy Hill NR	Brushy Hill	Deer	Environmental degradation	Asset protection	Monitor, ground control	M-CP
Upper Hunter	Cedar Brush NR	Cedar Brush	Deer	Environmental degradation	Asset protection	Monitor, ground control	M-CP
Upper Hunter	Burning Mountain NR	Burning Mountain	Deer, feral goat, feral pig	Environmental degradation, public safety	Asset protection	Monitor, aerial shoot	M-CP
Upper Hunter	Murrurundi Pass NP	Murrurundi Pass	Deer, feral goat, feral pig	Environmental degradation	Asset protection	Monitor, aerial shoot, ground control	M-CP
Upper Hunter	Towarri NP	Towarri	Deer, feral goat, feral pig	Environmental degradation, public safety, neighbouring properties	Asset protection	Monitor, aerial shoot, ground control	M-CP
Upper Hunter	Wallabadah NR	Wallabadah	Deer, feral goat, feral pig	Environmental degradation	Asset protection	Monitor, aerial shoot	M-CP
Upper Hunter	Ben Halls Gap NP	Ben Halls Gap	Feral goat	Environmental degradation	Asset protection	Monitor, ground control	M-CP
Upper Hunter	Camerons Gorge SCA	Camerons Gorge	Feral goat	Environmental degradation	Asset protection	Monitor, ground control	M-CP
Upper Hunter	Crawney Pass NP	Crawney Pass	Feral goat	Environmental degradation	Asset protection	Monitor, ground control	M-CP
Upper Hunter	Ben Halls Gap NP	Ben Halls Gap	Rabbit	Environmental degradation	Asset protection	Monitor, baiting	M-CP
Upper Hunter	Murrurundi Pass NP	Murrurundi Pass	Rabbit	Environmental degradation	Asset protection	Monitor, baiting	M-CP
Upper Hunter	Scone Mountain NP	Scone Mountain	Rabbit	Environmental degradation	Asset protection	Monitor, baiting	M-CP
Upper Hunter	Crawney Pass NP	Barnard River WDMP	Wild dog	Neighbours' stock	Asset protection	Ground baiting	M-CP
Hawkesbury North	Palm Grove NR	Challenge Ranch	Lantana		Containment	Ground spraying, cut and paint	M-II

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Murrurundi Pass NP	Two Creeklines	<i>Ailanthus altissima</i> (tree of heaven)		Containment	Basal bark	M-II
Upper Hunter	Scone Mountain NP	Scone Mountain Trail, walking track	<i>Asparagus asparagoides</i> (bridal creeper), <i>Opuntia</i> spp. (pear species)		Containment	Ground spray	M-II
Upper Hunter	Burning Mountain NR	New England Highway reserve entrance	<i>Hyparrhenia hirta</i> (Coolatai grass)		Containment	Monitor, ground spray	M-II
Upper Hunter	Murrurundi Pass NP	Park entrance, Stringybark Ridge	<i>Hyparrhenia hirta</i> (Coolatai grass)		Containment	Monitor, ground spray	M-II
Upper Hunter	Crawney Pass NP	Along road, north-west boundary	<i>Hypericum perforatum</i> (St John's wort)		Containment	Ground spray	M-II
Upper Hunter	Towarri NP	Dry Creek	<i>Lantana camara</i> , <i>Rubus anglocandicans</i> (blackberry)		Containment	Ground, aerial spray	M-II
Upper Hunter	Barrington Tops SCA	Green Gap	<i>Pinus</i> spp.		Containment	Physical removal	M-II
Upper Hunter	Ben Halls Gap NP	North-western area	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	M-II
Upper Hunter	Ben Halls Gap NP	Shirley Berry Block	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	M-II
Upper Hunter	Towarri NP	Singles Creek	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	M-II
Hawkesbury North	Bouddi NP	Maitland Bay information centre	Annual weeds, thunbergia, black-eyed Susan, mother-of-millions		Containment	Ground spraying and hand removal	L-LP
Hawkesbury North	Brisbane Water NP	Pearl Beach	Bamboo, ochra	Natural areas	Asset protection	Cut and paint and hand removal	L-LP
Hawkesbury North	Bouddi NP	Kilcare Surf Club	Bitou bush, asparagus fern	Natural areas	Asset protection	Ground spraying	L-LP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Hawkesbury North	Bouddi NP	Maitland Bay Drive	Bitou bush, lantana	Natural areas	Asset protection	cut and paint and foliar spray	L-LP
Hawkesbury North	Brisbane Water NP	Woy Woy Bay	Lantana	Natural areas	Asset protection	Ground spraying and hand removal	L-LP
Hawkesbury North	Brisbane Water NP	Mullet Creek	Mother-of-millions, privet	Natural areas	Asset protection	Ground spraying and hand removal	L-LP
Lower Hunter	Blue Gum Hills RP	554 – Riparian zones	Lantana, wild tobacco, Crofton weed	Rainforest (BPWW – CC4)	Asset protection	Splatter gun, hand removal	L-LP
Hawkesbury North	Wamberal lagoon NR	Wamberal Lagoon West	Lantana, annuals	Natural areas	Asset protection	Ground spraying	L-PP
Hawkesbury North	Wamberal Lagoon NR	Remembrance Drive	Morning glory, asparagus fern		Containment	Ground spraying	L-PP
Hawkesbury North	Yengo NP	1037 – Big Yango	St John's wort, blackberry, tiger pear, firethorn, cotoneaster, fruit trees, mimosa bush, willow, white poplar, fireweed, Noogoora burr, blue heliotrope, tree of heaven	River-Flat Eucalypt Forest on Coastal Floodplains (TSC-e), <i>Oleria cordata</i> (TSC-v; EPBC-v), Freshwater Wetlands on Coastal Floodplains EEC (TSC-e), swamp oak (BPWW – CC4)	Asset protection	Ground spraying, splatter gun	L-PP
Upper Hunter	Barrington Tops NP	Moonan Brook, Stewarts Brook	<i>Ailanthus altissima</i> (tree of heaven)		Containment	Monitor, basal bark	L-PP
Upper Hunter	Towarri NP	Heaven Ridge Trail	<i>Ailanthus altissima</i> (tree of heaven)		Containment	Monitor	L-PP
Upper Hunter	Wingen Maid NR	Dry Creek	<i>Ailanthus altissima</i> (tree of heaven)		Containment	Monitor	L-PP
Upper Hunter	Towarri NP	Middlebrook, particularly northern end	<i>Asparagus asparagoides</i> (bridal creeper), <i>Ligustrum</i> spp. (privet species), <i>Rubus anglocandicans</i> (blackberry)		Containment	Monitor, ground, aerial spray	L-PP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Barrington Tops NP	Wrights Trail area near bridge	<i>Carduus nutans</i> ssp. <i>nutans</i> (nodding thistle)		Containment	Monitor, ground spray	L-PP
Upper Hunter	Camerons Gorge NR	Camerons Gorge	<i>Cylindropuntia imbricata</i> (rope pear), <i>Rubus anglocandicans</i> (blackberry), <i>Opuntia</i> spp. (pear species), <i>Vinca major</i> (blue periwinkle), <i>Lycium ferocissimum</i> (boxthorn), <i>Asparagus asparagoides</i> (bridal creeper), <i>Arundo donax</i> (giant reed)		Containment	Ground spray, cut and paint	L-PP
Upper Hunter	Camerons Gorge NR, SCA	Pages River Flats	<i>Echium plantagineum</i> (Paterson's curse)		Containment	Ground spray	L-PP
Upper Hunter	Murrurundi Pass NP	Cleared Area	<i>Echium plantagineum</i> (Paterson's curse), <i>Heliotropium amplexicaule</i> (blue heliotrope)		Containment	Ground spray	L-PP
Upper Hunter	Wallabadah NP	Wallabadah National Park	<i>Hypericum perforatum</i> (St John's wort)		Containment	Ground spray	L-PP
Upper Hunter	Towarri NP	Trails, Sheep Camp	<i>Opuntia stricta</i> (prickly pear), <i>Xanthium</i> spp. (burrs), <i>Tagetes minuta</i> (stinking Roger)		Containment	Monitor, ground spray	L-PP
Upper Hunter	Barrington Tops NP, SCA	Polblue Trail	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	L-PP
Upper Hunter	Crawney Pass NP	Northern Creekline, Southern Creekline, South of Ridge Track	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	L-PP
Upper Hunter	Wallabadah NR	Creekline, northern fenceline	<i>Rubus anglocandicans</i> (blackberry)		Containment	Ground spray	L-PP



Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of control	Action	Priority
Upper Hunter	Murrurundi Pass NP	Cleared Area	<i>Rubus anglocandicans</i> (blackberry), <i>Hypericum perforatum</i> (St John's wort)		Containment	Ground spray	L-PP
Upper Hunter	Towarri NP	Tarrayarra	<i>Rubus anglocandicans</i> (blackberry), <i>Hypericum perforatum</i> (St John's wort)		Containment	Monitor, ground spray	L-PP
Upper Hunter	Towarri NP	Kellys Creek, Braeside, Heavens Ridge, Washpools	<i>Rubus anglocandicans</i> (blackberry), <i>Rosa rubiginosa</i> (sweet briar)		Containment	Ground, aerial spray	L-PP

\* Not yet ranked as of June 2012

## 5 Consultation

The Central Coast Hunter Regional Pest Management Strategy was developed through consultation with the community and NPWS staff. Two pest management strategy stakeholder consultation forums were conducted at Cessnock and Gosford on 19 and 20 September 2011. A range of community representatives were represented, including members of local councils, LHPAs, neighbouring landholders, local wild dog associations, NSW Farmers Association and CMAs. A summary of key issues and strategies from both meetings have been summarised in the *NSW Regional Pest Management Strategy Consultation Forum Report*.

Some of the key issues addressed in this strategy, with reference to goals and objectives in the state strategy, are:

- new and emerging pests – the importance of identifying new threats, incursions and delivering a timely response (Goal 1 Objective 1.1)
- resources – the need for appropriate and long term resources to be available for pest management programs (Goal 3 Objective 3.1)
- coordination between stakeholders – the requirement for cooperation, and landscape scale pest management programs (Goal 2 Objective 2.2)
- risk assessment – the need for a risk assessment approach to pest management (Goal 2 Objective 2.1)
- learning/training – the development of staff, communities and volunteers skills in order to build the capacity of NPWS to identify and treat pests (Goal 3 Objective 3.3)
- communication between stakeholders – the need for communication and education of stakeholders (Goal 3 Objective 3.2)
- wild dogs – the identification of key pest issues of wild dogs (this document: section 4 priority programs, and section 6 wild dog species profile).

Many other issues were identified with a broad range of strategies suggested. Where possible this feedback is incorporated as identified above or into the approaches for managing specific pests (sections 4 and 6). A stand-out issue that was raised in both the forums was the need for improved communication and collaboration between stakeholders on landscape pest issues. NPWS is committed to working with all key stakeholders as a landscape partner and to improving ways to communicate the results, achievements and failures of pest management programs. One strategy suggested as a method of achieving this goal was to use the stakeholders that attended the forums to found a basic communication network. NPWS will also look to harness the knowledge and skills of local landholders in the community and, with the support of LHPAs, will endeavour to establish community control groups in key areas to improve the overall management response to wild dogs in the Region.

The importance of prioritising pest programs has also been addressed in this strategy and is defined in section 3 and demonstrated in section 4, where the priority programs are tabled. NPWS will identify important assets like threatened species, cultural heritage and neighbouring landholders and will adopt an asset protection approach to pest management. Some suggestions were outside the scope of this strategy, such as those requiring a legislative or policy response, while other issues at a broader level such as environmental pest management across the landscape were discussed at the state-level forum.

Workshops were conducted with each of the operational areas in CCH Region with key rangers and field staff in order to accurately identify and prioritise pest management programs. The draft pest management strategy was placed on public exhibition and comments were invited from the community, other government agencies and stakeholder groups.

## 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.<sup>2</sup>

### Alligator weed (*Alternanthera philoxeroides*)

#### Distribution and abundance

Hunter Wetlands National Park and Pambalong Nature Reserve are the only reserves in CCH Region with infestations of alligator weed.

#### 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. New plants regenerate readily from plant fragments, which facilitate rapid spread and increase the difficulty of control. Alligator weed is a Weed of National Significance (WoNS) and in CCH Region is declared Class 2 or Class 3 under the NW Act. Alligator weed has a long history in the Sydney Basin where it is seen as a major threat in the Hawkesbury–Nepean catchment.

#### Priorities for control

The scope and presence of alligator weed in Hexam Swamp and Tomago wetlands in Hunter Wetlands National Park presents a complex range of management issues that need to be addressed before tackling a program.

At this stage, targeting the control of alligator weed in the Freshwater Wetlands EEC of Pambalong Nature Reserve and private landholdings in the upstream catchment through a cooperative approach appears to be the most productive approach.

#### Control

The flea beetle (*Agasicles hygrophila*) is used as a biological control in the core infestations in Hunter Wetlands National Park. NPWS will work with local control authorities, CMAs and neighbouring landholders upstream in a collaborative control program. Contractors will treat alligator weed in conjunction with water hyacinth.

#### Monitoring

The spread and control of alligator weed in freshwater wetlands is a very complex issue often involving different tenures, land-use and access issues. Furthermore, the aquatic form is very difficult to control. Control must happen in collaboration with other stakeholders to achieve any benefit.

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

NPWS will record and map all occurrences of the terrestrial form of alligator weed on its lands and monitor its distribution in response to control.

## **Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*)**

### **Distribution and abundance**

CCH Region manages a large section of coastal reserve where bitou bush is a common weed. The distribution of bitou bush includes all coastal LGAs: Gosford, Wyong, Lake Macquarie and Newcastle.

A large proportion of the coastal parks were formerly sand mined. These areas in particular have extensive areas of bitou bush that have both large distributions and high densities.

Areas affected by bitou bush include Bouddi National Park, Wamberal Lagoon Nature Reserve, Wyrabalong National Park, Munmorah State Conservation Area and Glenrock State Conservation Area.

### **Impacts**

Invasion of native plant communities by bitou bush and boneseed is listed as a key threatening process (KTP) under the TSC Act. Bitou bush is also listed as a WoNS.

Bitou bush has a high visual impact because of its presence over such vast areas of the coastline. It is a highly competitive weed that displaces native vegetation in coastal environments and is an aggressive invader and coloniser of dunal systems and nearby coastal environments. It is a prolific seeder with seed viability of up to three years.

Additionally it provides shelter and food for introduced pests such as rabbits and foxes. Foxes and numerous native bird species feed on the black fruit, the seeds of which are then effectively and widely dispersed.

### **Priorities for control**

Priorities for control will focus on asset protection, including threatened species and EECs such as Themeda Grasslands and Littoral Rainforest, as identified in BPWW, which includes site priorities from the Bitou Bush TAP.

### **Control**

Aerial spraying is a large component of bitou bush control in CCH Region. Switching from glyphosate to metsulfuron methyl is a new strategy to be implemented and trialled over the 2013 season application. Metsulfuron methyl is applied by cut and paint and splatter gun using 5% glyphosate.

The bitou seed fly (*Mesoclanis polana*) is a biological control which has been successful in reducing flowering and seed production. The bitou tip moth (*Comostolopsis germana*) has also been established in some areas of the Central Coast.

### **Monitoring**

CCH Region will implement identified monitoring techniques outlined in the Bitou Bush TAP and the Monitoring Manual for Bitou Bush Control and Native Plant Recovery. Nested quadrats have been established at Munmorah State Conservation Area and Wamberal Lagoon Nature Reserve. Daily records sheets are kept in accordance with the *Pesticides Act 1999*. Extensive mapping using both aerial and ground photography has been undertaken at key photo points to show changes over time and to monitor effectiveness of control programs and re-establishment of native vegetation communities.

## **Blackberry (*Rubus fruticosus* agg.)**

### **Distribution and abundance**

The term blackberry covers at least 14 different but closely related species, including hybrids that have become naturalised in Australia.

Blackberry rarely invades undisturbed vegetation communities but does readily establish in disturbed areas on agricultural land, roadsides, banks of watercourses, forests and bushland. It is common throughout temperate Australia in areas where rainfall is greater than 750 mm per annum. Blackberry is known to exist in large infestations in certain locations in Yengo National Park Big Yango precinct and Wollemi National Park, and is present in various smaller densities throughout many other reserves in CCH Region.

### **Impacts**

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 NW Act throughout most of NSW.

Blackberry is a sprawling perennial shrub that has long thorn-covered stems (canes) that can form large thickets which exclude light from the soil surface. Thickets can grow to several metres high and seriously impede regeneration of native flora species through competition for moisture, soil nutrients and light. Large, dense infestations can restrict access to watercourses by native fauna and park users.

It also provides significant harbour for rabbits, foxes, feral pigs and other pest animal species.

### **Priorities for control**

The priority for blackberry control is determined by the assets being impacted, the location and the size of infestation.

Priority is also allocated to protect assets, EECs and threatened species as identified in BPWW and where blackberry is impacting on neighbouring properties.

### **Control**

Control of blackberry will be undertaken in identified areas of Wollemi and Yengo national parks with approved herbicides as per the label directions.

Control will be undertaken in early spring at Cockle Bay Nature Reserve.

Control will be undertaken in Tuggerah Nature Reserve by ground spraying when opportune.

Survey of previously treated areas will be undertaken and follow-up treatment implemented as required.

### **Monitoring**

NPWS staff and contractors document treatment details on chemical users' forms in accordance with the Pesticides Act, including GPS locations and length of roadsides treated.

NPWS staff assess known infestations and identify follow-up treatment requirements for identified areas.

Liaise with local councils regarding coordinated management where relevant.

## **Lantana (*Lantana camara*)**

### **Distribution and abundance**

Lantana is a widespread weed commonly occurring throughout all parks from the coast to the western areas of CCH Region. It is both an edge and understorey species in a range of vegetation communities, and occurs in varying densities. Lantana has vigorous growth habits, particularly in high rainfall coastal parks such as Jilliby State Conservation Area, Wambina Nature Reserve, Wallarah National Park, Sugarloaf State Conservation Area, Watagans National Park, Bouddi National Park and Glenrock State Conservation Area. It readily invades disturbed plant communities, particularly after fire.

### **Impacts**

Lantana invades both disturbed and undisturbed bushland. In moist environments, lantana is a particularly aggressive coloniser and forms dense infestations that smother the native vegetation and inhibit natural regeneration.

In some instances, lantana infestations on the edge of some parks can restrict the entry of cattle from adjoining properties. In the case of isolated rainforest remnants, it can protect the vegetation from drying winds and excessive sunlight penetration. Lantana can also provide shelter for many native animals, including threatened species. It is essential that these issues are taken into account when developing and implementing weed control and/or restoration programs.

The invasion, establishment and spread of *Lantana camara* is listed as a KTP under the TSC Act, and lantana is a WoNS. In 2010 the WoNS program prepared the Plan to Protect Environmental Assts from Lantana (*Lantana camara*). The sites of high priority significance identified in this plan have been incorporated in BPWW.

### **Priorities for control**

There are various priorities for lantana control in the Region. Lantana is controlled as part of overall restoration and weed control programs, threatened species and world heritage management, roadside maintenance and visitor facility maintenance. These programs vary from critical to medium priority. Examples of priority sites include Barraba Lane and Slippery Rock Road Watagans National Park, Wallarah National Park, Lemon Tree area adjoining Jilliby State Conservation Area, Sugarloaf State Conservation Area, Watagans National Park, Bouddi National Park and Glenrock State Conservation Area and include priority sites identified in BPWW.

Biological control agents have been released as part of the previous NSW lantana biocontrol taskforce program. NPWS staff will continue to assist with this program where practicable.

### **Control**

Control actions for implementation are identified in local area weed management and Bushcare priority plans, and threatened species recovery plans or PAS. A combination of manual and spraying herbicide techniques, including splatter gun, are used (where appropriate) to maximise native regeneration potential. Due to the nature of weed growth in CCH Region, repeat treatments are required as part of the primary, secondary and maintenance modes of control. Cut and paint and hand removal is also used.

### **Monitoring**

Daily record sheets are kept for all weed control programs in accordance with the Pesticides Act, and before and after photos are taken. Where possible, GPS locations (including the

extent of weed distribution and control implemented) are recorded. Sites are revisited periodically for follow-up treatment and maintenance.

Techniques in the Monitoring Manual for Bitou Bush Control and Native Plant Recovery (Hughes et al. 2009) have been trialled on lantana and may be used to monitor the biodiversity response following lantana management at key sites.

## **Spiny rush (*Juncus acutus*)**

### **Distribution and abundance**

*Juncus acutus* is abundant in the southern zone of south-western Australia and the east coast of Australia, including coastal areas of Victoria and NSW. In CCH Region it has established isolated pockets in Bouddi National Park, Cockle Bay Nature Reserve, Pelican Island Nature Reserve, Riley's Island Nature Reserve and Hunter Wetlands National Park. It has a similar appearance to native sedges.

### **Impacts**

*Juncus acutus* is a prolific seeder that can flower throughout the year, but mainly spring to summer, producing up to 4000 seeds. It also demonstrates a 75% germination rate and seed stays viable in the soil for many years. Seeds can be spread via transport of mud on people, animals and vehicles.

### **Priorities for control**

Priorities for control in CCH Region should address the threat *Juncus acutus* poses to salt marsh EECs.

### **Control**

Control is by cutting back with hedge trimmers and spraying using 1–2% glyphosate during flowering before seed set.

### **Monitoring**

Daily record sheets are kept for all weed control programs in accordance with the Pesticides Act. Before and after photos are also taken during the course of implementation of works. Where possible GPS locations are taken of the work site, including the extent of weed distribution and control implemented. Sites are revisited periodically for follow-up treatment and maintenance.

## **Asparagus species**

These include:

- *Asparagus asparagoides* (bridal creeper)
- *Asparagus aethiopicus* (ground asparagus)
- *Asparagus plumosus* (climbing asparagus).

### **Distribution and abundance**

Asparagus is present in many bushland reserves across the Region. There are infestations in Cockle Bay Nature Reserve and Wyrabalong National Park and bridal creeper is found at Yengo National Park (Mill Creek Area).

## Impacts

Bridal creeper is listed as a WoNS largely due to its invasiveness, potential for spread and economic and environmental impacts. It is listed as a Class 4 noxious weed in all LGAs in CCH Region. It invades undisturbed environments where its climbing stems and foliage smother native plants and form thick dense mats.

Ground asparagus is mostly found in coastal reserves. The plant quickly establishes in disturbed and undisturbed sites and competes with native ground cover species.

Climbing asparagus occurs in coastal reserves adjacent to urban areas. The stems climb trees and trail along the ground creating dense mats and reducing regeneration of native species.

All these asparagus species produce fleshy fruit, readily distributed by birds.

## Priorities for control

Management should target threatened swamp sclerophyll and swamp forest and most of the lowland area flood plain EECs as identified in BPWW.

## Control

Isolated infestations can be controlled by physical removal, cut and paint or cut and scrape technique. Heavier infestations are initially controlled using herbicide applied by backpack sprayers or vehicle-based spray in some instances. Spraying asparagus fern has been successful using glyphosate and metsulfuron methyl, and also using the crowning technique.

The bridal creeper rust (*Puccinia mysiphylli*) has been an effective biological control at some sites in the Region as it limits flowering and spread.

## Monitoring

Daily record sheets are kept for all weed control programs in accordance with the Pesticides Act. Before and after photos are also taken during the course of implementation of works. Where possible GPS locations are taken of work sites, including the extent of weed distribution and control implemented. Sites are revisited periodically for follow-up treatment and maintenance.

## Water hyacinth (*Eichhornia crassipes*)

### Distribution and abundance

Water hyacinth occurs along the east coast from Kiama in NSW to southern Cape York Peninsula in Queensland. It also occurs in western areas in water bodies. In CCH Region water hyacinth is located in isolated but heavy infestations at Tuggerah Nature Reserve and Pambula NR.

### Impacts

Water hyacinth is native to the Amazon basin in South America, and was brought to Australia in the 1890s as an ornamental plant. It is a WoNS and a Class 4 noxious weed for Wyong LGA under the NW Act and is recognised as one of the world's worst aquatic weeds. It rapidly infests nutrient-rich rivers, dams, lakes and irrigation channels on every continent except Antarctica. It devastates aquatic environments by altering hydrology and smothering aquatic life by deoxygenating the water, and it reduces nutrients for young fish and other aquatic plants.



Water hyacinth will rapidly take over an entire waterway. Under favourable conditions it can double its mass every five days, forming new plants on the ends of stolons. It also grows from seed which can remain viable for 20 years or longer. This enormous reproductive capacity causes annual reinfestation from seed and rapid coverage of previously treated areas, making ongoing control necessary.

### **Priorities for control**

Priorities for control are:

- removal of water hyacinth from isolated satellite infestations, for example those in Tuggerah NR
- containment of larger infestations through an integrated approach
- early detection and removal of new incursions in water bodies
- protection of Freshwater Wetlands EECs and sensitive water bodies
- cooperation with other agencies and neighbours in identified catchments.

### **Control**

Water hyacinth is difficult to control in all freshwater aquatic environments. When access is limited by the presence of the weed itself, control becomes more difficult. Early detection and rapid response offer the greatest likelihood of successful control and the opportunity for eradication. It is essential that any new infestations are controlled as soon as possible. If allowed to become established, the seed bank rapidly expands, increasing costs and massively increasing the duration of the control program. In large established infestations the aim of a long-term control program should be to carry out annual control treatments in order to reduce the quantities of reproducing plants and restrict seed bank build-up over the long term.

Mechanical harvesting of large infestations has been effective, although costly. As a guide, it takes 600–900 hours to harvest one hectare of dense water hyacinth. This action should be undertaken prior to flowering and seed set.

In NSW, a number of herbicides are registered for the control of water hyacinth. The most commonly used technique for applying herbicides to water hyacinth is high volume spraying with hose and handgun power sprays either from a boat, hovercraft, ARGO all-terrain vehicle or from the banks. Treatment with herbicides should be carried out early in the growing season, generally in spring. Spraying an entire heavy infestation can cause the weed mat to sink and rot resulting in deoxygenation of the water, potentially killing fish and other aquatic life. This can be avoided by spraying one-third of the infestation at a time, or by physically removing as much of the weed as possible prior to spraying. The use of floating booms can assist in temporarily containing the spread while control is being undertaken.

Water hyacinth is mechanically harvested and sprayed in Pambula and Tuggerah nature reserves.

### **Monitoring**

Daily record sheets are kept for all weed control programs in accordance with the Pesticides Act. Before and after photos are taken during the course of implementation of works. Where possible GPS locations are taken of work sites, including the extent of weed distribution and control implemented. Sites are revisited periodically for follow-up treatment and maintenance.

## **Red fox (*Vulpes vulpes*)**

### **Distribution and abundance**

Foxes are found in most environments in Australia; however, they are probably most abundant in urban fringes, open space and agricultural areas, because these areas provide abundant food, cover and denning sites. In contrast, foxes appear to be rare in closed forest distant from cleared land.

Foxes occur throughout CCH Region in bushland, agricultural areas and urban areas.

### **Impacts**

The introduction of foxes into Australia has had a devastating impact on native fauna, particularly among medium-sized (450–5000 g) ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Recent studies have shown that predation by foxes continues to suppress remnant populations of many such species. Foxes have also caused the failure of several attempts to reintroduce native fauna into areas of their former range. Predation by foxes was the first KTP to be listed under the TSC Act. Foxes are also significant predators of domestic stock including lambs and poultry; predation by foxes has the potential to reduce lambing rates significantly.

The species of greatest concern is the brush-tailed rock-wallaby. Listed as endangered under the TSC Act, brush-tailed rock-wallabies are distributed patchily through Wollemi, Yengo and Watagans national parks and Sugarloaf State Conservation Area. Despite their low numbers, Watagans National Park site has one of the strongest fox populations in NSW. The impact of foxes to the community is prevalent throughout urban centres with bushland fragments in residential areas. Foxes commonly take chickens, rabbits, guinea pigs and other small domestic pets, creating a complex issue for urban land managers and councils.

### **Priorities for control**

Under the Fox TAP, five sites have been identified as a critical priority targeting the protection of the brush-tailed rock-wallaby. Three sites are listed as treatment sites: Watagans, Barrington Tops and Big Yango.

Foxes are also targeted in general programs in other NPWS estate including Bouddi National Park and Tuggerah Nature Reserve, and also in targeted wild dog programs across the Region.

### **Control**

Intensive, continuous and ongoing broad-area 1080 baiting is being undertaken in all Fox TAP treatment sites.

NPWS will roll out the use of M44 ejectors across Fox TAP sites to trial this new technique and boost program performance, particularly in remote areas, for example in brush-tailed rock-wallaby colonies.

### **Monitoring**

The impact of fox predation on brush-tailed rock-wallabies and, conversely, the effectiveness of the control program are being assessed through long-term monitoring of brush-tailed rock-wallabies and fox populations. Wallaby populations are being measured three times a year through established scat counting sites. These sites are difficult to monitor as they are located high up in brush-tailed rock-wallaby habitat in high sandstone escarpments. Foxes and other medium-sized mammals are being measured biannually via track counts on sand

pads and motion-triggered cameras. Data are analysed by the Pest Management Unit and published periodically as part of the review of the Fox TAP.

## **Wild dog (*Canis lupus* spp.)**

### **Distribution and abundance**

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

Wild dogs are known to occur sporadically throughout CCH Region. Their abundance is greatest surrounding rural residential areas where food sources are plentiful.

In the Cumberland LHPA, areas where wild dogs are present include all lands around Mellong and Putty roads, Peats Ridge, Mangrove Mountain, Somersby, Kulnura; these are identified hot spots for wild dog activity. Wild dogs are known to traverse through Jilliby State Conservation Area, Ourimbah and Olney state forests leading down to Yarralong and Dooralong valleys. Wild dogs are also patchily present through Watagans National Park and the adjoining communities of Martinsville, Mandalong, Congewai, Quorrobolong, Murrays Run and Laguna. They are also in areas adjoining Yengo National Park, including Laguna and Wollombi.

Wild dogs are found throughout the Mid Coast LHPA area in the vicinity of most Upper Hunter Area national parks and across the landscape including the rural sector land Singleton army base, numerous large holdings of the mining sector.

### **Impacts**

Wild dogs can have significant impacts on livestock, especially sheep, and have been declared a pest under the RLP Act. Under the Act, 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.<sup>3</sup>

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

The dingo was introduced to Australia from Asia prior to European settlement and hence it is eligible to be listed as a threatened species under the TSC Act. Although the dingo has not been listed as a threatened species, predation and hybridisation by feral dogs (*Canis lupus familiaris*) is listed as a KTP under the TSC Act.

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

### **Priorities for control**

There are three wild dog management plans prepared by LHPA boards in cooperation with NPWS for areas in CCHR Region. These include Cumberland Wild Dog Management Plan,

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3 [www.gazette.nsw.gov.au/pdfs/2009/11th\\_September.pdf](http://www.gazette.nsw.gov.au/pdfs/2009/11th_September.pdf)

Barnard River and Mid Coast Wild Dog Management Plan. Priority areas (hot spots) for control are identified through historical impact data and patterns of livestock attacks in each of these plans and include sites on private land, state forest and NPWS estate.

Cumberland Wild Dog Management Plan control areas include:

- Mellong Area – Yengo National Park, Parr State Conservation Area and adjoining landholders
- Macdonald valley – Yengo National Park, Parr State Conservation Area, St Albans common and adjoining landholders
- Popran – Popran National Park, Glenworth Valley and adjoining private landholders
- Brisbane Waters – Brisbane Water National Park and adjoining landholders
- Mangrove – the community of Mangrove Mountain including Macpherson State Forest, Dubbo Gully, Mangrove Dam Catchment Area and adjoining landholders
- Ourimbah – Ourimbah state forest, Jilliby State Conservation Area and adjoining landholders
- Yarramalong – Olney state forest, Yarramalong Valley, Jilliby State Conservation Area and adjoining landholders
- Dooralong – Jilliby State Conservation Area, Olney State Forest and adjoining landholders
- Yango – Yengo National Park and adjoining landholders
- Watagans – Watagans National Park including Mandalong and Martinsville valleys
- Cessnock – Werekata State Conservation Area and National Park, Sugarloaf State Conservation Area, Heaton State forest and adjoining landholders
- Black Hill – Black Hill, Minmi, new NPWS additions, for example Stockrington.

Mid Coast Wild Dog Management Plan control association areas include:

- Wybong – Manobolai National Park and surrounding agricultural and mining lands
- Mount Arthur – mainly mining lands and farms, and includes Martindale valley which adjoins Wollemi National Park
- Singleton North East – Belford and Mount Royal national parks
- Lower Hunter – Bulga/Broke/Milbrodale – Putty community including Wollemi and Yengo national parks
- Rouchel – Mount Royal and landholders to the north.
- Murrurundi WDA - Murrurundi/Timor Area
- Ellerston WDA – Ellerston Area east of Scone
- Hebden WDA – Hebden Area
- Lower Hunter WDA – Putty Area
- Scone WDA
- Mt Hungerford WDA

These plans will be reviewed every five years and priorities may change.

## **Control**

Strategic proactive and reactive wild dog control programs will be undertaken in accordance with the relevant wild dog management plans for each LHPA area. Many reserves are routinely baited biannually as part of larger cooperative programs.

In Mid Coast LHPA area, NPWS Upper Hunter Area joins with other stakeholders and local Wild dog associations in an annual aerial baiting campaign coordinated by the board in May–June each year. Two large-scale ground baiting programs are also undertaken in spring and autumn by landholders and NPWS ground bait certain reserves continually for three months over autumn and winter. Across all areas of CCHR, NPWS try to bait twice a year for routine programs in identified hot spot areas.

NPWS staff will work with LHPA rangers and landholders to respond to incidents involving wild dogs and livestock, people and pets. Where a reactive response is required to a wild dog incident that adjoins a reserve, NPWS officers will make contact with the landholder within 48 hours of the initial report.

The methodology for a reactive wild dog program is as follows:

- 1 In collaboration with the LHPA and the landholder, inspect the place of incident, identify the target (in some incidents domestic dogs are likely), and determine an appropriate course of action.
- 2 Implement control option (emergency baiting or trapping) suited to the situation and ensure landholder involvement. Run the program according to mutual agreement or until resolution of the problem.
- 3 Monitor the situation after program implementation through remote digital cameras and landholder reporting. Present information on all options for stock protection and wild dog control available to landholders.
- 4 Control of wild dogs in Schedule 2 areas will focus on the interface and boundary of parks with neighbouring properties, to target wild dogs where the result and benefit will be greatest to neighbours and to also minimise hybridisation with dingoes in core areas.
- 5 All baiting is done using 250 g dried meat baits and Doggone manufactured baits prepared in accordance with the Pesticide Control (1080 Dog Bait) Order 2002.
- 6 M44 ejectors will be implemented during targeted fox programs and trialled on wild dog programs.

## **Monitoring**

Monitoring of presence/absence is undertaken in some reserves using the sand padding technique and remote digital cameras. Control programs are initiated when presence of dogs is recorded in areas where wild dog issues have been identified. Post-baiting monitoring is also required using the sand padding technique which allows for the evaluation of baiting success. Ongoing liaison with neighbours, the LHPA and established wild dog associations will strengthen communication between all stakeholders. The key to improving wild dog management in the coastal zone lies in reproducing the success of the wild dog association concept in Mid Coast LHPA and the establishment of community wild dog groups within the designated control areas identified in the Cumberland North Wild Dog Management Plan.

All data will be collected using standard monitoring forms and forwarded to LHPA as required.

CCH Region has also commenced the collection of DNA samples from wild dogs that are captured or shot during control programs. This program relies on the contribution of samples from all land managers and agencies and is directed by a standard operating procedure. The goal is to deliver a coordinated approach to identifying the genetic composition of wild dogs and dingoes to inform wild dog control and the management of Schedule 2 lands for dingo conservation.

## Rabbit (*Oryctolagus cuniculus*)

### Distribution and abundance

Rabbits are found in most habitats throughout Australia below the Tropic of Capricorn, except for densely forested areas, above 1500 m or on black soil plains. CCH Region is similar to the whole coastal zone of NSW where rabbits are vigilant in built-up urban areas, and where they have the potential to occupy any sites that provide shelter and grazing. The distribution and abundance of rabbits has changed dramatically since the introduction of rabbit haemorrhagic disease (RHD), also known as calicivirus virus. The distribution of rabbits on NPWS estate in the CCH Region is limited to some coastal reserves and a limited number of inland reserves that offer a balance of open space, grazing opportunity through short young grasses and harbour.

Occasional sightings of hares (*Lepus europaeus*) are reported in some reserves, but due to their low numbers their impacts are not prevalent and are controlled only during programs targeting key species such as foxes and rabbits.

### Impacts

Rabbits have significant impacts on native vegetation through selective grazing and browsing of the more palatable species, which leads to changes in species composition and habitat structure. Even at low densities, rabbits can prevent the regeneration of impacted species through consumption of seeds and seedlings. During drought, rabbits will also eat the bark and roots of native species, resulting in the death of large numbers of plants.

Their digging scratches out seedlings and damages root systems and, combined with the damage they cause to above- and below-ground vegetation, can lead to increased soil erosion. The resulting habitat degradation in turn affects native fauna, which may also be impacted by rabbits through competition for food and shelter. Rabbits are a declared pest animal under the RLP Act and landholders have a statutory responsibility to control them. Rabbits also compete with native species for grazing areas and harbour and their removal has resulted in the growth of bandicoot populations at some sites.

Competition and grazing by the feral European rabbit is listed as a KTP under the TSC Act, and rabbits are declared a pest animal under the RLP Act.

Rabbits can also cause damage to Aboriginal heritage sites, compete with neighbouring livestock and impact forestry operations. The impacts of rabbits have been reduced since the release of myxomatosis and, more recently, RHD; however, even at low densities rabbits can prevent the regeneration of impacted plant species and recent reports suggest rabbit numbers may be increasing again.

### Priorities for control

Priorities for rabbit control are targeted at key assets for protection, such as at sites that contain impacted threatened species and EECs, and to alleviate damage to bush regeneration and planting programs.

NPWS will also assist and participate in cooperative programs where rabbits are impacting on neighbours.

The control of hares is a low priority program in the Region.

### Control

Localised control programs have been implemented in Munmorah State Conservation Area, Werekata National Park and Yengo National Park (Big Yango precinct). Opportunistic Rabbit Control is undertaken across CCH Region where necessary. Best practice methods include

Pindone baiting, shooting and warren fumigation. RHD release may be viable in some situations.

### **Monitoring**

NPWS staff will liaise with LHPA and monitor local rabbit populations for growth, using signs of presence from landholder reporting and spotlight counts, and will respond with timely best practice control.

Best practice options, such as Pindone baiting, will be used as a primary method, followed by shooting and warren location and fumigation. A risk assessment will determine off target risks from the use of Pindone to macropods and domestic dogs.

## **Feral deer (Cervidae)**

### **Distribution and abundance**

Six deer species are known to have established feral populations in Australia. These are fallow deer (*Dama dama*), red deer (*Cervus elaphus*), sambar deer (*Cervus unicolour*), chital deer (*Axis axis*), rusa deer (*Cervus timorensis*) and hog deer (*Axis porcinus*).

Deer live in herds with complex social organisation, often involving considerable competition between males in the breeding season. They are generally cryptic and, although there is no state-wide census of numbers, deer populations in NSW are believed to have increased dramatically in recent years. This is mainly attributed to escapes and deliberate releases from deer farms, expansions of acclimatisation herds and these sources are definitely the cause of establishment in CCH Region. Deer are nocturnal or semi-nocturnal, sheltering by day in forest or woodland and emerging to graze from late afternoon to early morning in native grassland, improved pasture, crop or other agricultural land. Habits are altered by hunting pressure or proximity to people.

Fallow deer are the most abundant and distributed species across the Region, and especially abundant in the northern half of CCHR, followed by red deer and localised populations of sambar deer. Isolated small populations of rusa and chital deer are also known.

### **Impacts**

Herbivory and environmental degradation caused by feral deer is listed as a KTP under the TSC Act. Feral deer can have major impacts through:

- destroying native plants
- fouling waterholes through wallowing
- causing soil erosion
- transmitting diseases, such as foot-and-mouth disease
- spreading weeds
- acting as unmanaged exotic disease vectors
- impacting the stone fruit and citrus industries through grazing and destroying young plants
- impacts to wine growers
- impacts to the nursery industry to unfenced stock trees
- damaging rural fencing
- aggression towards and wounding of livestock (horse and cattle) during rutting
- serious, sometimes fatal, vehicle accidents.

Deer can trample and graze plants, and ringbark young trees especially during antler development in males when they rub extensively on trees. They can have a major impact on the variety and abundance of plant species where populations are high.

High densities of feral deer have been found to reduce understorey plant species in the Littoral Rainforest EEC by as much as 70%. Feral deer populations elsewhere in the state have had significant impacts on the rare temperate and sub-tropical Illawarra rainforest, the threatened species *Syzigium paniculatum*, littoral rainforest around Port Macquarie, and trampling and browsing of threatened species in the Oxley Wild Rivers National Park. The dietary overlap between rusa deer and the swamp wallaby (*Wallabia bicolor*) is estimated to be 15–50%, with one deer eating approximately the same amount of vegetation as three swamp wallabies.

Feral deer crossing roads have caused several major car accidents in the Region in recent years.

### **Priorities for control**

Priorities for control are where deer are impacting on threatened species, or where routine crossing points on roadways are causing dangerous road conditions.

Investigate reports and, where appropriate, implement species-specific control programs to remove feral deer populations from NPWS lands in association with other land management agencies and private landholders.

### **Control**

A number of techniques available for the control of feral deer should be assessed against each situation. These include shooting, fencing, which is a very successful and long-term option, and trapping using feed-based lures, but this is a very resource- and time-consuming option.

NPWS has initiated and undertaken successful deer removal programs in many reserves across the Region. Strategic shooting programs have been implemented to protect EECs, reduce numbers near 'hot spot' accident sites and assist with reducing impacts to neighbours.

### **Monitoring**

Appropriate monitoring techniques include surveys in conjunction with relevant land management agencies and more specific site-based spotlight transect counts, sand plots and scat count transects as necessary.

## **Feral cat (*Felis catus*)**

### **Distribution and abundance**

Feral cats have been observed during monitoring programs targeting other species in most reserves in CCH Region. Due to their cryptic and elusive nature their true distribution and abundance is largely unknown.

Free roaming domestic cats are known to be periodically present in reserves that adjoin residential zones.

The increased use of surveillance cameras for monitoring has revealed the presence of cats in bushland reserves.

### **Impacts**

Predation by feral cats is listed as a KTP under the TSC Act and the EPBC Act.



Feral cats are known to cause local impacts on populations of native species, particularly small mammals. Feral cats have been implicated as one of the causes of the decline of native species, particularly in the arid zone. They also act as a reservoir for infectious diseases such as toxoplasmosis and sarcosporidiosis which can be transmitted to native fauna, domestic stock and humans.

### **Priorities for control**

Undertake targeted control when required in areas where cat populations are likely to be directly impacting on a threatened species and neighbours.

### **Control**

Control of feral cats is difficult due to their cryptic nature and preference for live prey.

Primary control methods include trapping and shooting. No pesticides are currently available for use on cats in NSW although there is ongoing work developing suitable bait palatable to cats.

Cats are regularly taken as bi-catch during trapping programs targeting wild dogs.

CCH Region is currently trialling a volunteer trapping program in Dharug National Park targeting an isolated population of feral cats that was identified during the biannual predator monitoring program.

### **Monitoring**

Monitoring of key sites using surveillance cameras to estimate presence has proven effective. Cat presence on sand pads will be monitored. All control will be recorded and information maintained in PWIS.

## **Feral cattle (*Bos taurus*)**

### **Distribution and abundance**

Feral cattle are present in isolated populations on NPWS parks and local council-managed catchment land in CCH Region. Establishment of these populations was initiated by a combination of poor management by a neighbouring enterprise, cattle being run in unfenced, rough and inaccessible connective country adjoining parks and, in the case of Big Yango, introduction through the acquisition of a cattle enterprise which was a remote inholding in Yengo National Park. These populations are unmanaged and unbranded bush-bred cattle which involve different issues from those of stock straying from neighbouring properties.

Feral cattle are an identified issue in Yengo National Park around the Big Yango precinct, in isolated pockets along the Macdonald River, and in Yengo National Park adjoining Mangrove Dam catchment area.

Feral cattle are also found in isolated populations in Wollemi National Park, Mount Royal National Park and Parr State Conservation Area.

### **Impacts**

Feral cattle have numerous impacts on the natural environment, including:

- selective grazing pressure on native species
- damage to native vegetation and soil by bulls, for example ant hills, dust baths
- soil compaction and erosion
- weed dispersal
- increased nutrient loadings

- establishment of movement trails
- potential spread of exotic diseases
- threats to public safety in camping grounds from bulls
- impacts to neighbours' livestock operations and fencing.

### **Priorities for control**

When feral cattle present a risk to a threatened species, EEC, public safety, (motor vehicle collision or public nuisance in a camping area) or impacts to neighbours, animals will be removed as a high priority.

### **Control**

Wild cattle will be removed from parks by aerial shooting, mustering by contractors, trapping with portable panels using molasses and salt blocks, or ground shooting by authorised NPWS staff or approved contractors in accordance with an approved shooting operations plan.

### **Monitoring**

Monitoring involves:

- checking for the presence of livestock in known sites
- collating park user reports
- documenting relevant information regarding control programs, including the number of individuals removed.

## **Feral pig (*Sus scrofa*)**

### **Distribution and abundance**

The distribution of feral pigs in CCH Region is limited to two core populations and random introductions into reserves by deliberate release. In the two core areas, Wollemi National Park and Mount Royal National Park, feral pig distribution is seasonal and is dependant on climatic conditions and food supply. Feral pigs from deliberate release many years ago are in low unconfirmed numbers in Watagans National Park, Sugarloaf State Conservation Area and Hunter Wetlands National Park.

The deliberate introduction into bushland close to urban centres has seen feral pigs in Tuggerah Nature Reserve and State Conservation Area, Colongra Nature Reserve and Werekata National Park.

Feral pigs are both localised and widespread in many of the Upper Hunter reserves.

### **Impacts**

Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a KTP under the EPBC Act and TSC Act.

Feral pigs use a wide range of habitats. They can cause environmental damage by selective feeding on plant communities, creation of drainage channels in swamps, soil erosion, fouling of watering points by their habit of wallowing and rooting, and are an agent in the spread of weeds such as Scotch broom (Parsons and Cuthbertson 1989).

When pigs are introduced into reserves on the urban fringe they present a serious biosecurity risk in cohabitation with local communities.

## **Priorities for control**

Priorities for feral pig control include:

- programs to protect threatened species and EECs in reserves.
- Programs that support reducing the impacts to neighbours
- eradication of feral pigs in semi urban reserves that pose biosecurity issues.
- education and enforcement program with LHPAs and local authorities targeting feral pig introduction and unlawful hunting in NPWS reserves
- timely response to new incursions.

## **Control**

Current control programs include trapping, baiting and ground shooting programs. Aerial shooting has been implemented very successfully in Upper Hunter Area reserves.

## **Monitoring**

All control of feral pigs will be recorded and information maintained in PWIS, including sex and size of animals trapped and shot.

## **Feral goat (*Capra hircus*)**

### **Distribution and abundance**

Feral goats in CCHR Region are largely restricted to isolated populations on both reserve and private land.

### **Impacts**

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

In CCH Region, feral goats have the potential to compete with the brush-tailed rock-wallaby for habitat in reserves.

Grazing and browsing by feral goats has significant impacts on native vegetation as it can lead to changes in species composition when more palatable species are eaten and removed preferentially. Feral goat grazing and browsing may also lead to changes in vegetation structure. Areas with a high density of goats have a conspicuous browse line, as all foliage within their reach is consumed. Grazing can lead to a decrease in overall cover and an increase in bare ground which, combined with trampling and soil surface damage caused by their hooves, may result in significant increases in soil erosion. These habitat changes in turn affect native fauna, which may also be impacted by feral goats through competition for food and shelter.

Feral goats also cause damage to Aboriginal heritage sites, compete with neighbouring livestock and are potential vectors of livestock diseases.

## **Priorities for control**

Priorities for control include:

- removal of goats in brush-tailed rock-wallaby habitats
- removal of goats in threatened species sites, including EECs
- cooperative programs with neighbours.

## **Control**

Effective control requires an integrated approach using several complementary techniques which include mustering and removal of goats in easy access locations by contractors, trapping using molasses and salt lick blocks, and ground shooting by NPWS staff.

## **Monitoring**

The distribution and numbers of local herds can be ascertained easily through reporting, observations and use of surveillance cameras at sites.

## **Cane toad (*Bufo marinus*)**

### **Distribution and abundance**

Cane toad populations are restricted to the northern part of NSW, with well-established colonies in the Tweed River Valley and Lismore area. Their range extends along the coast as far south as Yamba, with isolated colonies around Angourie, Brooms Head and Port Macquarie. Established colonies have been found up to 90 km west of Ballina with the western boundary currently situated around Kyogle/Casino.

Individual toads are regularly reported in Sydney, Wollongong, Coffs Harbour and in the Central Coast area. Vagrant reports are typically of only one animal, often found near tourist parks, landscape/nursery supplies or along railway or highway corridors.

### **Impacts**

The cane toad is poisonous at all stages of its life (eggs, tadpoles, toadlets and adult toads) and they impact on native fauna during all of these stages. Their ability to survive in a range of habitats and wide temperature ranges (5–40°C) increases their threat to native species. Insects, smaller toads and native frogs, small snakes and the occasional small mammal are all part of the cane toads' diet. Not only do they prey on native fauna, but they also compete for food, shelter and breeding sites. Summers in northern NSW provide ideal breeding conditions. Females lay 8000–35,000 eggs at a time and may lay two clutches each year.

The invasion and establishment of cane toads is listed as a KTP under both the TSC Act and EPBC Act.

The native species most likely to be impacted at the population level in CCH Region include spotted-tailed quolls (*Dasyurus maculatus maculatus*) and green and golden bell frogs.

### **Priorities for control**

The OEH Cane Toad Management Policy guides priorities and actions for NPWS and other agencies in dealing with cane toads in NSW. The primary objective of management in CCH Region has been to prevent cane toads establishing outside their existing range. This objective has generally been implemented through the promotion of community education and awareness.

## **Control**

Control measures include:

- capture and identification of individuals reported to NPWS CCHR

## **Monitoring**

NPWS staff will respond to reports from the community of cane toad sightings or capture in a timely manner where they impact NPWS estate. Where feasible, NPWS staff, volunteers or

organisations skilled in identifying amphibians will collect cane toads to ensure correct identification and reporting.

All records of positively identified cane toads outside their known distribution will be included in the NPWS Wildlife Atlas database to assist with future control prioritisation and management. In the Region, raising community awareness and encouraging members of the public to correctly identify cane toads and undertake appropriate control remains to be the main focus of monitoring.

Sightings reported by the public are crucial in providing a quick response to new incursions. NPWS staff will seek to confirm the status of new sightings.

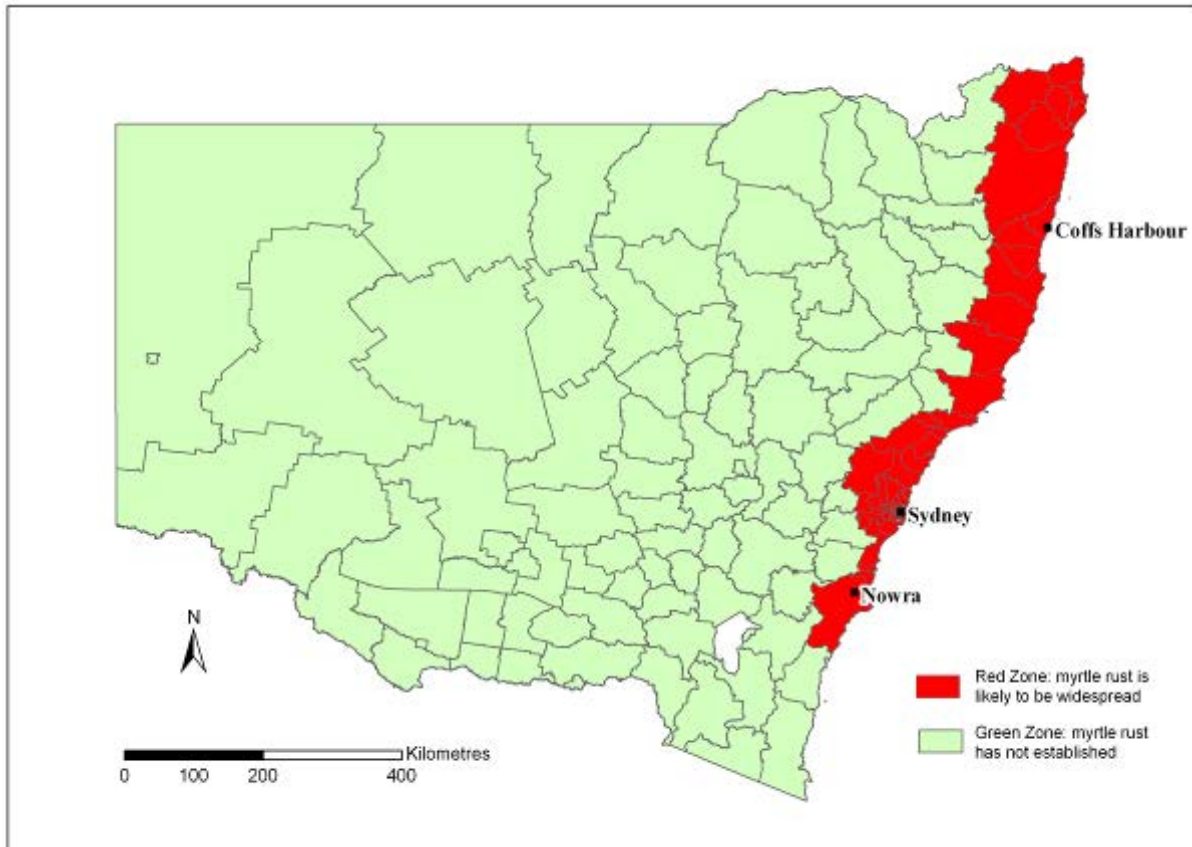
## **Myrtle rust (*Uredo rangelii*)**

### **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 and discovered in bushland at Wambina Nature Reserve on 28 October 2010.

Myrtle rust has established in coastal NSW from the Clyde River north into Queensland. It is likely to spread rapidly to the extent of its biological range as the spores are dispersed readily by wind. Eradication is unfeasible.

*Uredo rangelii* 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](http://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 and 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. Like *P. psidii*, 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 myrtle 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

The Management Plan for Myrtle Rust on National Parks outlines how myrtle rust will be managed on national park estate in NSW, 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 management plan are to:

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

## Control

The Management Plan for Myrtle Rust on National Parks includes eight actions:

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

Specific actions for CCH Region are:

- monitor key reserves, such as Wambina Nature Reserve, Mill Creek and Tuggerah Nature Reserve
- minimise the likelihood of spread by cutting back and treating infected plant material and maintaining buffer zones on fire trails and walking tracks
- check and monitor threatened species with high of risk of infection
- treat infection at threatened species sites
- report activities and monitoring results to Pest Management Unit.

## 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 kept for all control programs in accordance with the Pesticides Act. 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 cinnamomi*)

### Distribution and abundance

Phytophthora is a soil-borne pathogen belonging to the water mould group whose growth and reproduction is favoured by moist soil conditions and warm temperatures. The spores can be dispersed over relatively large distances by surface- and sub-surface water flows and can also be readily transported in contaminated soils. People have the potential to spread

phytophthora further and faster than any other vector through the movement of infested soil, water or plant material. Once inside a host plant, phytophthora spores colonise the vascular tissue and restrict the uptake of water and nutrients, killing the host plant.

The pathogen is well-known in Western Australia, Victoria and Tasmania, and has caused significant impacts to native forest timber resources. It is also present in coastal Queensland and eastern NSW; however, disease expression in these areas is more cryptic and the extent of the threat is not known.

Known occurrences in CCHR Region are found on the Simpsons Track in Dharug National Park and in the sub-alpine Barrington Tops plateau.

### Impacts

*Phytophthora cinnamomi* is the most widespread and destructive of the 32 *Phytophthora* species in Australia and is listed as a KTP under both state and federal legislation.

Susceptible species display a range of symptoms: some die, some are damaged but endure, and some show no apparent symptoms. In some circumstances, *P. cinnamomi* may contribute to plant death where there are other stresses present (for example waterlogging, drought and wildfire). Infection of native plants by *P. cinnamomi* has been identified as a KTP for a number of threatened species resulting in a national threat abatement plan for phytophthora<sup>4</sup> prepared in 2001 and a statement of intent<sup>5</sup> prepared for NSW in 2008.

### Priorities for control

Priorities for control include to:

- identify the presence of phytophthora by conducting surveys and sampling areas of poor tree health or dieback
- implement appropriate containment and hygiene protocols when entering and leaving the infected sites at Dharug National Park and Barrington Tops National Parks.

### Control

Control strategies include:

- containment through the use of quarantine areas
- provision of signage and hygiene facilities
- possible treatment of key individual plants.

### Monitoring

Monitoring strategies include:

- soil sampling in key locations to determine pathogen movement
- monitoring of vegetation in key locations to determine impacts on vegetation and priority species.

## Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*)

### Distribution and abundance

Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis*. Believed to have evolved in Africa, the earliest recorded case of amphibian chytrid fungus infection was in South Africa in 1938. The fungus was

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<sup>4</sup> [www.environment.nsw.gov.au/biodiversity/threatened/publications/tap/phytophthora.html](http://www.environment.nsw.gov.au/biodiversity/threatened/publications/tap/phytophthora.html)

<sup>5</sup> [www.environment.nsw.gov.au/resources/threatenedspecies/08119soipc.pdf](http://www.environment.nsw.gov.au/resources/threatenedspecies/08119soipc.pdf)



introduced into Australia in the late 1970s and has since spread to four major geographic areas, including a large east coast zone from northern Queensland to Victoria. The majority of reported chytridiomycosis cases in this zone have been between the Great Dividing Range and the coast with high altitude populations appearing to be more severely affected.<sup>6</sup>

## Impacts

The disease affects amphibians worldwide and has been identified as a major cause of the decline and extinction of species. It has caused the extinction of one species of Australian frog and has been implicated in the extinction of three others. Some 20 species in NSW have been found to be infected, almost a quarter of the total number of species in the state. Of these, 13 are listed as threatened under the EPBC Act and 15 are listed as threatened under the TSC Act. Chytridiomycosis also has the potential to cause a number of NSW frog species which are currently not listed as threatened to become threatened.

As no methods are yet available to treat amphibian populations in the field, susceptible populations may persist only where conditions are not favourable for disease outbreaks or when they can evolve an evolutionary response to the threat imposed by the emergence of chytridiomycosis.

## Priorities for control

Priorities for control include:

- containment
- management of the threat of chytridiomycosis posed to threatened species and populations of frogs at key locations
- research into and monitoring of the pathogen to further investigate effective management approaches.

## Control

Control strategies include:

- promotion and implementation of effective hygiene protocols<sup>7</sup>
- threat abatement for key threatened species or populations including habitat modification, captive breeding programs, translocations and treatment of individuals.

## Monitoring

Monitoring strategies include:

- monitoring key threatened frog populations to investigate transmission and dispersal of *B. dendrobatidis* to improve understanding of the disease
- support of research into understanding species resistance to *B. dendrobatidis*, both innate and acquired, to assess evolutionary responses and potentially improve the success of re-introduction programs.

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<sup>6</sup> NSW Statement of Intent 2: Infection of frogs by amphibian chytrid causing the disease chytridiomycosis, [www.environment.nsw.gov.au/resources/threatenedspecies/09479soi2chytrid.pdf](http://www.environment.nsw.gov.au/resources/threatenedspecies/09479soi2chytrid.pdf)

<sup>7</sup> [www.environment.nsw.gov.au/resources/nature/hyprfrog.pdf](http://www.environment.nsw.gov.au/resources/nature/hyprfrog.pdf)

## **Eucalypt dieback associated with over-abundant psyllids and bell miners**

### **Distribution and abundance**

Bell miner associated dieback (BMAD) is found in a number of eucalypt forest types between Victoria and southern Queensland. The spatial distribution of BMAD throughout NSW is not known in detail. Forests in CCH Region are at risk or have already been affected by BMAD. Although some areas of BMAD are known in a number of reserves, the true distribution and scope of the problem is largely unknown in CCH Region. All state forests and private forested lands are vulnerable and may be affected in the Region.

### **Impacts**

Forest eucalypt dieback associated with over-abundant bell miners and psyllids has been listed as a KTP under the TSC Act. BMAD is associated with the establishment of bell miner (*Manorina melanophrys*) colonies and an over-abundance of sap sucking psyllid insects in the forest canopy. The persistence of psyllids in the canopy leads to dieback and eventual death of the affected trees. The impacts of BMAD include loss of biodiversity and economic and recreational values. Forests affected by BMAD can become severely degraded with the loss of a significant proportion of overstorey species and in many cases subsequent invasion of the understorey by weeds, particularly lantana.

Avifauna are known to be affected by the presence of over-abundant bell miners. A number of eucalypt species such as *Eucalyptus dunnii*, *E. saligna*, *E. grandis*, *E. siderophloia*, *E. acmenoides*, *E. punctata* and *E. paniculata* are vulnerable to BMAD. EECs that are affected or potentially threatened by BMAD include Blue Gum High Forest of the Sydney Basin Bioregion, Blue Mountains Shale Cap Forest of the Sydney Basin Bioregion, White Gum Moist Forest of the North Coast Bioregion, and Grey Box – Grey Gum Wet Sclerophyll Forest of the North Coast Bioregion. The fauna at highest risk of BMAD are the eucalypt-dependent arboreal species and large forest owls. Koalas, greater-squirrels, yellow-bellied gliders and brush-tailed phascogales may all be at risk of decline due to poor forest health. The risk and danger of tree and limb fall is also an issue in some areas affected by BMAD, and in some areas the visual and recreational qualities of tourist sites are threatened by the loss of tree canopy and ecological integrity.

### **Priorities for control**

Control of BMAD is a difficult challenge in the absence of empirical evidence to confirm the cause. Current operational activities to prevent spread and assist ecosystem recovery include weed control and fire management. Using fire to manage lantana and manipulate bell miner habitat is the best tool available for mitigating BMAD impacts at present. Actions outlined in the draft statement of intent for this KTP will be implemented by OEH.

### **Control**

Little has been registered as effective against BMAD; however, targeting the control of climbing lantana understorey at affected sites may reduce bell miner capacity to nest and congregate (such as at Baraba Lane, off Watagans NP).

### **Monitoring**

Monitoring the size of BMAD-affected areas and outcomes of management actions on ecosystems will continue and will be used to assist with adapting future management. Communities at risk and new reports of BMAD will be assessed and mapped. The BMAD Working Group will provide advice and direction for future management.

## Appendix 1 New and emerging pest species

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

\* 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.

### Emerging pest species

In CCH 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.

### **Cane toad (*Bufo marinus*)**

Cane toad populations are restricted to northern NSW, with well-established colonies in the Tweed River Valley and Lismore area. Their range extends along the coast as far south as Yamba, with isolated colonies around Angourie, Brooms Head and Port Macquarie.

Individual toads are sometimes reported by members of the community in the Central Coast area. Reports are typically only one animal often found near tourist parks or landscape/nursery supplies or along railway or highway corridors.

NPWS staff will respond to reports from the community of cane toad sightings/capture in a timely manner where they impact NPWS estate. Where operationally feasible, NPWS staff or volunteers/organisations with amphibian identification skills will collect cane toads to ensure correct identification and reporting.

All records of positively identified cane toads outside their known distribution will be included in the NPWS Wildlife Atlas database to assist with future control prioritisation and management. In the Region, raising community awareness and encouraging members of the public to correctly identify cane toads and undertake appropriate control remains to be the main focus of control.

Sightings and new reports from the public are crucial in providing a quick response to new incursions. NPWS staff will seek to confirm the status of new sightings.

## **Appendix 2 Regional support and coordination of pest programs**

The role and charter of the position of Senior Ranger (pests) is to coordinate and support four local area offices ( Hawkesbury North, Lakes, Upper Hunter and Lower Hunter) in pest management planning and the implementation of local area programs.

CCH Region also has three volunteer and Bushcare coordinators in Hawkesbury North, Lakes and Lower Hunter Areas. The role of these three key positions is to manage all weeds-related functions, including the coordination of the Region's Bushcare volunteer programs in their respective Areas.

### **Bushcare**

CCH Region has over 200 volunteers in 20 groups, an invaluable resource. Volunteers come from a combination of corporate bodies, Landcare groups, green jobs participants, university students, Conservation Volunteers Australia and TAFE students. Bushcare coordinators target bush regeneration works to be undertaken at key sites throughout the Region with commendable results.

### **Threatened species management**

The Region has many rare or threatened species inhabiting coastal and escarpment ecosystems. The Fox TAP in CCH Region focuses on the recovery of the brush-tailed rock-wallaby and iconic species expected to benefit from broad-scale fox control.

### **Wild dog management**

Efforts to improve the management of wild dogs in CCHR Region has seen NPWS become a committed partner in the Mid Coast LHPA Wild Dog Management Plan and Barnard River and also the Cumberland North Wild Dog Management Plan. CCHR Region recognises the impacts that wild dogs have on the community and will keep improving relationships with local wild dog associations and neighbours to work directly on a cross tenure approach.

## Appendix 3 Noxious weeds classification and control classes as at June 2012

The control classes of noxious weeds from Weed Control Order 28 in the NW Act. As noxious weed listings change refer to the DPI website for up to date listings.<sup>8</sup>

Control Class	Weed type	Example control requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the state or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant.  The weeds are also notifiable and there is a range of restrictions on their sale and movement.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant.  The weeds are also notifiable and there are restrictions on their sale and movement.
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.
Class 4	Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction.
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the state or an area of the state, to spread in the state or outside the state.	There are no requirements to control existing plants.  However, the weeds are notifiable and there are restrictions on their sale and movement.

The following table shows noxious weed control class by local authority area.

<sup>8</sup> [www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles](http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles)

Common name (Scientific name)	Cessnock	Newcastle	Gosford	Lake Macquarie	Maitland	Wyong	Upper Hunter County	Hawkesbury County
African boxthorn ( <i>Lycium ferocissimum</i> )	4	4	4	4		4	4	4
African feather grass ( <i>Pennisetum macrourum</i> )	5	5	5	5	5	5	5	5
African turnipweed ( <i>Sisymbrium runcinatum</i> )	5	5	5	5	5	5	5	5
African turnipweed ( <i>Sisymbrium thellungii</i> )	5	5	5	5	5	5	5	5
Alligator weed ( <i>Alternanthera philoxeroides</i> )	2	3	2	2	2	3	2	2
Anchored water hyacinth ( <i>Eichhornia azuerea</i> )	1	1	1	1	1	1	1	1
Annual ragweed ( <i>Ambrosia artemisiifolia</i> )	5	5	5	5	5	5	5	5
Arrowhead ( <i>Sagittaria montevidensis</i> )	4	4	4	4	4	4	4	4
Artichoke thistle ( <i>Cynara cardunculus</i> )	5	5	5	5	5	5	5	5
Athel tree ( <i>Tamarix aphylla</i> )	5	5	5	5	5	5	5	5
Bathurst burr ( <i>Xanthium</i> spp.)	4	4	4	4	4	4	4	4
Bear-skin fescue ( <i>Festuca gautieri</i> )	5	5	5	5	5	5	5	5
Black knapweed ( <i>Centaurea nigra</i> )	1	1	1	1	1	1	1	1
Blackberry ( <i>Rubus</i> spp.)	4	4	4	4	4	4	4	4
Bitou bush ( <i>Chrysanthemoides monilifera</i> ssp. <i>rotundata</i> )	4	4	4	4	4	4		
Boneseed ( <i>Chrysanthemoides monilifera</i> ssp. <i>monilifera</i> )	2	2	2	2	2	2	2	2
Bridal creeper ( <i>Asparagus asparagoides</i> )	4	4	4	4	4	4	4	4
Broomrapes ( <i>Orobanche</i> spp.)	1	1	1	1	1	1	1	1
Burr ragweed ( <i>Ambrosia confertiflora</i> )	5	5	5	5	5	5	5	5
Cabomba ( <i>Cabomba caroliniana</i> )	5	5	5	5	5	5	5	5
Cape tulip ( <i>Homeria</i> spp.)	4	4			4		4	4
Cayenne snakeweed ( <i>Stachytarpheta</i> <i>cayennensis</i> )	5	5	5	5	5	5	5	5
Chilean needle grass ( <i>Nassella neesiana</i> )	4	4	4	4	4	4	4	4
Chinese violet ( <i>Asystasia gangetica</i> ssp. <i>micrantha</i> )	1	1	1	1	1	1	1	1
Clockweed ( <i>Gaura parviflora</i> )	5	5	5	5	5	5	5	5
Columbus grass ( <i>Sorghum x almum</i> )	4	4	4	4	4	4	4	4
Corn sow thistle ( <i>Sonchus arvensis</i> )	5	5	5	5	5	5	5	5
Crofton weed ( <i>Ageratina adenophora</i> )	4	4	4	4	4	4	4	4
Dodder ( <i>Cuscuta</i> spp.)	5	5	5	5	5	5	5	5

Common name (Scientific name)	Cessnock	Newcastle	Gosford	Lake Macquarie	Maitland	Wyong	Upper Hunter County	Hawkesbury County
East Indian hygrophila ( <i>Hygrophila polysperma</i> )	3	3	3	3	3	3	4	3
Espartillo ( <i>Achnatherum brachychaetum</i> )	5	5	5	5	5	5	5	5
Eurasian water milfoil ( <i>Myriophyllum spicatum</i> )	1	1	1	1	1	1	1	1
Fine-bristled burr grass ( <i>Cenchrus brownii</i> )	5	5	5	5	5	5	5	5
Fountain grass ( <i>Pennisetum setaceum</i> )	5	5	5	5	5	5	5	5
Gallon's curse ( <i>Cenchrus biflorus</i> )	5	5	5	5	5	5	5	5
Giant Parramatta grass ( <i>Sporobolus fertilis</i> )	3	3	3	4	4	3	3	3
Glaucous starthistle ( <i>Carthamus glaucus</i> )	5	5	5	5	5	5	5	5
Golden dodder ( <i>Cuscuta campestris</i> )	4	4	4	4	4	4	4	4
Golden thistle ( <i>Scolymus hispanicus</i> )	5	5	5	5	5	5	5	5
Gorse ( <i>Ulex europaeus</i> )	2	2	2	2	2	2	2	2
Green cestrum ( <i>Cestrum parqui</i> )	3	3	3	3	3	3	3	3
Groundsel bush ( <i>Baccharis halimifolia</i> )	3	3	3	3	3	3	3	3
Harrisia cactus ( <i>Harrisia</i> spp.)	4	4	4	4	4	4	4	4
Hawkweeds ( <i>Hieracium</i> spp.)	1	1	1	1	1	1	1	1
Hydrocotyl ( <i>Hydrocotyl ranunculoides</i> )	1	1	1	1	1	1	1	1
Heteranthera ( <i>Heteranthera reniformis</i> )	1	1	1	1	1	1	1	1
Horsetail ( <i>Equisetum</i> spp.)	1	1	1	1	1	1	1	1
Hygro ( <i>Hygrophila polysperma</i> )	1	3	1	1	1	1	1	1
Hygrophila ( <i>Hygrophila costata</i> )	2	2	2	2	2	2		2
Hymenachne ( <i>Hymenachne amplexicaulis</i> ) and hybrids	1	1	1	1	1	1	1	1
Johnson's grass ( <i>Sorghum halepense</i> )	4	4	4	4	4	4	4	4
Karoo thorn ( <i>Acacia karroo</i> )	1	1	1	1	1	1	1	1
Kochia ( <i>Bassia scoparia</i> )	1	1	1	1	1	1	1	1
Kosters curse ( <i>Clidemia hirta</i> )	1	1	1	1	1	1	1	1
Lagarosiphon ( <i>Lagarosiphon major</i> )	1	1	1	1	1	1	1	1
Lantana ( <i>Lantana</i> spp.)	4	4	4	4	4	4	4	4
Leafy elodea ( <i>Egeria densa</i> )	4	4	4	4	4	4	4	4
Lippia ( <i>Phyla canescens</i> )	4	4	4	4	4	4	4	4
Long-leaf willow primrose ( <i>Ludwigia longifolia</i> )	4	4	4	4	4	4	4	4
Mexican feather grass ( <i>Nassella tenuissima</i> )	1	1	1	1	1	1	1	1



Common name (Scientific name)	Cessnock	Newcastle	Gosford	Lake Macquarie	Maitland	Wyong	Upper Hunter County	Hawkesbury County
Mexican poppy ( <i>Argemone mexicana</i> )	5	5	5	5	5	5	5	5
Miconia ( <i>Miconia</i> spp.)	1	1	1	1	1	1	1	1
Mikania ( <i>Mikania micrantha</i> )	1	1	1	1	1	1	1	1
Mint weed ( <i>Salvia reflexa</i> )							4	
Mimosa ( <i>Mimosa pigra</i> )	1	1	1	1	1	1	1	1
Mistflower ( <i>Ageratina riparia</i> )	4	4	4	4	4	4	4	
Mossman river grass ( <i>Cenchrus echinatus</i> )	5	5	5	5	5	5	5	5
Mother-of-millions ( <i>Bryophyllum delagoense</i> )	3	4	3	3	3	3	4	3
Pampas grass ( <i>Cortaderia</i> spp.)	4	4	4	4	4	4	4	4
Parthenium weed ( <i>Parthenium hysterophorus</i> )	1	1	1	1	1	1	1	1
Paterson's curse ( <i>Echium</i> spp.)	4	4	4	4	4	4	4	4
Pond apple ( <i>Annona glabra</i> )	1	1	1	1	1	1	1	1
Prickly acacia ( <i>Acacia nilotica</i> )	1	1	1	1	1	1	1	1
Prickly pear ( <i>Cylindropuntia</i> spp.)	1	4	4	4	4	4	4	4
Prickly pear ( <i>Opuntia</i> spp.)	4	4	4	4	4	4	4	4
Red rice ( <i>Oryza rufipogon</i> )	5	5	5	5	5	5	5	5
Rhizomatous bamboo ( <i>Phyllostahys</i> spp.)	4	4	4	4	4	4	4	4
Rhus tree ( <i>Toxicodendron succedaneum</i> )	4	4	4	4	4	4	4	4
Rubbervine ( <i>Cryptostegia grandiflora</i> )	1	1	1	1	1	1	1	1
Sagittaria ( <i>Sagittaria platyphylla</i> )	5	5	5	5	5	5	5	5
Salvinia ( <i>Salvinia molesta</i> )	3	3	3	3	3	3	2	2
Senegal tea plant ( <i>Gymnocoronis spilanthoides</i> )	1	1	1	1	1	1	1	1
Serrated tussock ( <i>Nassella trichotoma</i> )	4	4	4	4	4	4	3	3
Siam weed ( <i>Chromolaena odorata</i> )	1	1	1	1	1	1	1	1
Smooth-stemmed turnip ( <i>Brassica barraelieri</i> ssp. <i>oxyrrhina</i> )	5	5	5	5	5	5	5	5
Soldier thistle ( <i>Picnomon acarna</i> )	5	5	5	5	5	5	5	5
Spiny burrgrass ( <i>Cenchrus incertus</i> )	4	4	4	4	4	4	4	4
Spiny burr grass ( <i>Cenchrus longispinus</i> )	4	4	4	4	4	4	4	4
Spiny emex ( <i>Emex australis</i> )	4	4	4	4	4	4	4	4
Spotted knapweed ( <i>Centaurea longispinus</i> )	1	1	1	1	1	1	1	1
St John's wort ( <i>Hypericum perforatum</i> )	3	4	3	3	3	4	3	4

<b>Common name (Scientific name)</b>	<b>Cessnock</b>	<b>Newcastle</b>	<b>Gosford</b>	<b>Lake Macquarie</b>	<b>Maitland</b>	<b>Wyong</b>	<b>Upper Hunter County</b>	<b>Hawkesbury County</b>
Texas blueweed ( <i>Helianthus ciliaris</i> )	5	5	5	5	5	5	5	5
Tropical soda apple ( <i>Solanum viarum</i> )	2	2	2	2	2	2	2	2
Water caltrop ( <i>Trapa</i> spp.)	1	1	1	1	1	1	1	1
Water hyacinth ( <i>Eichhornia crassipes</i> )	4	4	3	3	3	4	2	2
Water lettuce ( <i>Pistia stratiotes</i> )	1	1	1	1	1	1	1	1
Water soldier ( <i>Stratiotes aloides</i> )	1	1	1	1	1	1	1	1
Willows ( <i>Salix</i> spp. except <i>S. babylonica</i> , <i>reichardtii</i> , <i>calodendron</i> )	5	5	5	5	5	5	5	5
Witchweed ( <i>Striga</i> spp.)	1	1	1	1	1	1	1	1
Yellow burrhead ( <i>Limnocharis flava</i> )	1	1	1	1	1	1	1	1
Yellow nutgrass ( <i>Cyperus esculentus</i> )	5	5	5	5	5	5	5	5

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