



Central Coast Hunter Range Region

Draft Regional Pest Management Strategy

Part B: 2012-2015



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Summary

The Central Coast Hunter Range (CCHR) Region of the NSW National Parks and Wildlife Service (NPWS) extends from the Hawkesbury River in the south to the Hunter River in the north, and past Muswellbrook in the north-west. The Region contains approximately 431,000 ha of NPWS estate across a very diverse landscape in terms of both topography and land use.

The main focus of pest management on NPWS estate is to minimise the impacts of pest species on reserve values and neighbouring landuse and to work cooperatively with other agencies and landholders to achieve these aims. However, given the complexity of species, environments and impacts and the limit of 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 Range 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 both 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 on the level of risk that they present, our high priority pest species are wild dogs, foxes, bitou, lantana and asparagus species.

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

Table of Acronyms

The following acronyms are used throughout this document.

Acronym	Expanded Text
AMS	Asset Maintenance System
BPWW	Biodiversity Priorities for Widespread Weed
BMAD	Bell Miner Associated Die Back
CAP	Catchment Action Plan
CCHR	Central Coast Hunter Range Region
CMA	Catchment Management Authority
DECCW	NSW Department of Environment, Climate Change & Water
KPI	Key Performance Indicator
KTP	Key Threatening Process under the TSC Act
LGA	Local Government Area
MER	Natural Resource Management Monitoring, Evaluation and Reporting
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NP	National Park
NPWS	NSW National Parks and Wildlife Service
NR	Nature Reserve
NRM	Natural Resource Management
NSW	New South Wales
OEH	Office of Environment and Heritage
PAS	Priorities Action Statement
PMP	Park Management Program
POM	Plan of Management
PWG	Parks and Wildlife Group, the internal name within OEH for NPWS
RLP Act	<i>Rural Lands Protection Act 1998</i>
ROP	Regional Operations Plan
RPMS	Regional Pest Management Strategy
SCA	State Conservation Area
SOP	Standard Operating Procedure
TAP	Threat Abatement Plan
TSC Act	<i>Threatened Species Conservation Act 1995</i>
WHA	World Heritage Area

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.*
- The *NSW Invasive Species Plan* provides specific goals, objectives and actions in relation to Invasive Species management.

This document is Part B of the CCHR Region Pest Management Strategy and contains the regionally specific components of the strategy including the Region's prioritised pest programs.

Part A of the strategy provides the broader planning framework for the management of pests by NPWS. It documents the corporate environment, legislation and policy context and describes the logic used for identifying, prioritising and monitoring pest management programs. It also establishes Service-wide pest management goals, objectives and actions.

Part B describes the local circumstances within the Region and applies the Part A framework to prioritise specific pest management programs. These priorities will be included in Regional Operations Plans (ROPs) and implemented through the Assets Maintenance System (AMS). It also broadly identifies pest distribution and associated impacts across the Region.

2. Regional overview

The Central Coast Hunter Range (CCHR) Region of the National Parks & Wildlife Service (NPWS) extends from the Hawkesbury River in the south to the Hunter River in the north, and past Muswellbrook in the north-west (see Map). The Region covers the local government areas (LGA) of Gosford, Wyong, Lake Macquarie, Newcastle, Cessnock, Maitland, Singleton, Muswellbrook, and part of Hawkesbury; and the Awabakal, Bahtabah, Darkinjung, Mindaribba, Wanaruah, Worimi and Metropolitan Local Aboriginal Land Councils.

The reserve system within CCHR Region covers approximately 431,000 hectares and consists of:

- 13 national parks
- 16 nature reserves
- Eight state conservation areas
- One regional park
- Four Aboriginal areas
- One Aboriginal place

Approximately half of the reserved area (215,130 ha) within the region is declared wilderness within Wollemi NP, Yengo NP and Mt Royal NP.

CCHR 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 within the Hunter Valley can be seen in the reserves within the north-west of CCHR, particularly Wollemi National Park and Manobolai Nature Reserve.

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

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

The Central Coast Hunter Range Region comprises five NPWS Management Areas, Gosford, Lakes, Newcastle, Hunter Range and Yango.

A number of pest species are present in Central Coast Hunter Range Region and their impacts can be observed at varying levels in different reserves (see section 7. Pest Distribution Tables). The different types of species that will be covered by this plan include both terrestrial and aquatic weeds, vertebrate pests and plant diseases/soil pathogens. Urban and semi rural development impacts heavily upon the Region's reserves as it creates conditions favourable for weed invasion (including nutrient enriched run-off, sewerage 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. Declared noxious weeds, environmental weeds and garden escapes pose one of the greatest threats to the conservation of biodiversity and cultural heritage and recreational values in the Region.

Wild dogs are present in the CCHR, 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 pest across the entire landscape, whilst rabbits are generally confined to areas of grazing availability in open areas, mainly the coastal and urban interface.

CCHR has been managing an isolated occurrence of the soil pathogen *Phytophthora cinnamomi* for a number of years in Dharug National Park, whilst the plant disease Myrtle Rust is quite a recent challenge, coming to the attention of land management agencies on the Central Coast in 2010.

Central Coast Hunter Range Region reserves are also regularly impacted upon by fire both as wildfire and through hazard reduction burning. Fire has been 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.

More than two hundred volunteers provide support through a remarkably diverse group of programs. The Region engages community volunteers for Bushcare with over 20 groups active across the region.

The Hawkesbury Nepean and Hunter Central Rivers 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.

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3. Central Coast Hunter Range Regional Map

Below is a map of Central Coast Hunter Range Region showing the reserves system, management areas and regional boundary.



4. Regional Prioritisation

The following key factors are considered when determining priorities for pest management within the Region. However, a precautionary approach using risk management (as described in the risk management policy) will be applied where there is uncertainty about the impacts of the pest to 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/communities. These include the highest priorities identified in the TAPs, PAS and BPWW. e.g. undertake fox control at the Watagans priority site for brush-tailed rock wallaby 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 e.g. outbreak of foot and mouth disease or control of feral pigs in a urban interface area

C-EC (Economic)

Programs targeting pests that impact significantly on economic enterprises e.g. 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), 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, e.g. control of wild pigs impacting on World Heritage values of Wollemi NP; pest control in RAMSAR wetlands;

H-CH (Cultural Heritage)

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

Medium Priority

M-WNH (Wilderness and National Heritage)

Programs that target pests that impact significantly on Wilderness, Wild Rivers, national heritage values or other important listed values e.g. 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, e.g. control of blackberry on the margins of camping areas; control of weeds in an area of natural beauty that is visited frequently;

M-CP (Cooperative programs)

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

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, e.g. 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, e.g. the maintenance of areas treated previously for serrated tussock to continue keeping them weed free.

In some circumstances, new programs may be introduced, or priority programs extended to target pests where a control “window of opportunity” is identified e.g. 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.

5. Table of prioritised regional pest programs

Live versions of this table will be kept on OEH intranet and updated annually over the four year period of the strategy.

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Hunter Range	Yengo National Park	Broke/ Milbrodale	fox	Brush-tailed Rock-wallaby	Asset protection	Baiting, Trapping, Shooting Sand pad Monitoring, Monitoring Brush tailed Rock Wallabies	C-TSC
Hunter Range	Wollemi National Park	Martindale	fox	Brush-tailed Rock-wallaby	Asset protection	Predator Monitoring – sand pads, Monitoring Brush tailed Rock Wallabies	C-TSC
Hunter Range	Werekata National Park	Werekata	wild deer	Adjacent private landholdings e.g horticulture, vineyards, olives etc	Asset protection	Strategic shooting, monitoring	C-EC
Hunter Range	Wollemi NP	Putty	feral pigs	World Heritage Area	Asset protection	Trapping/shooting/monitoring	C-TSC
Hunter Range	Mt Royal NP	Royal	feral pigs	Neighbouring private landholdings	Asset protection	Foliar spraying, physical/mechanical control	C-EC
Hunter Range	Wollemi National Park, Yengo National Park, Belford National Park, Mt Royal National Park Werekata National Park and State Conservation Area, Sugaloaf State Conservation Area, Manobolai Nature Reserve.	All Sites	wild dogs	Neighbouring private landholdings. Biodiversity, Dingos.	Asset protection	Cooperative control programs and response to incidents - Baiting, trapping, shooting as per Hunter Coast WDP	C-EC
Hunter Range	Werekata NP	Abermain no 2	rabbits	Kurri swamp sand woodland	Asset Protection	Foliar spraying, physical/mechanical control	C-TSC
Hunter Range	Werekata SCA	Quorrobolong	goats	Lower Hunter Spotted Gum Iron bark Woodland	Asset protection	Strategic shooting	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Hunter Range	Belford NR	Belford	african olive	Lower Hunter Spotted Gum Iron bark Woodland	Asset protection	Basal bark/spraying/splatter gun	C-TSC
Hunter Range	Belford NR	Belford	mother of millions	Lower Hunter Spotted Gum Iron bark Woodland	Asset protection	Prescribed burn, post burn spraying	C-TSC
Hunter Range	Werekata NP	Swamp Creek	salvinia	Kurri swamp sand woodland	Asset protection	Survey, ground truth, map, plan control and undertake control	C-TSC
Hunter Range	Wollemi NP	Wirriba Clear	blackberry	World Heritage Area	Asset protection	Aerial spraying followed up with Ground spraying/splatter gun	C-TSC
Hunter Range	Wollemi NP	Putty Creek	blackberry	World Heritage Area	Asset protection	Ground spraying /splatter gun	C-TSC
Hunter Range	Wollemi NP	Wollemi Creek	blackberry	World Heritage Area	Asset protection	Ground spraying /splatter gun	C-TSC
Hunter Range	Wollemi NP	Jerry Plains	mother of millions	World Heritage Area	Asset protection	Prescribed Burn follow up ground spraying.	C-TSC
Hunter Range	Sugaloaf State Conservation Area	Eastern Domain	lantana	<i>Tetradlea juncea</i>	Asset protection	Foliar spraying / splatter gun	C-TSC
Lakes	Munmorah State Conservation Area	Fraser's, Tee Tree, Freeman's, Birdie Beach	rabbits	Themeda Grassland on seacliffs and coastal headlands EEC (TSC-e), <i>Pultenea maritima</i> (TSC-v), <i>Caledonia tessellata</i> (EPBC-v; TSC-e), <i>Eucalyptus camfieldii</i> (EPBC-v; TSC-v), <i>Acacia quadrilateralis</i>	Asset protection	Baiting, Shooting Fumigating Warrens.	C-TSC
Lakes	Colongra Swamp Nature Reserve	Budgewoi	pigs	Swamp sclerophyll forest on coastal floodplains EEC (TSC-e), Swamp oak floodplain forest EEC (TSC-e) fringing the lake River Flat Eucalypt Forest EEC (TSC-e), Freshwater wetlands on coastal floodplains EEC	Asset protection	Trapping, shooting, baiting	C-TSC
Lakes	Watagans National Park	Bowmans	fox	Brush Tailed Rock Wallaby	Asset protection	Baiting, Trapping, monitoring – sand pads	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Lakes	Tuggerah Nature Reserve and State Conservation Area	Pioneer Dairy	fox	Powerful Owl (TSC-v) <i>Ninox strenua</i>	Asset protection	Baiting, Trapping, Shooting	C-TSC
Lakes	Jilliby State Conservation Area, Watagans National Park	Kulnura, Yarramalong Valley, Dooralong Valley, Martinsville, Congewai Valley	wild dog	Neighbouring private landholders, local biodiversity	Asset protection	Baiting, Trapping	C-EC
Lakes	Jilliby State Conservation Area	Dooralong Valley	deer	Neighbouring private landholders, local biodiversity	Asset protection	Strategic Shooting Program	C-EC
Lakes	Wollarah NP	Pinny Beach	bitou bush	Cultural Heritage Lowland Rainforest EEC , Grassy headland complex	Asset Protection	Volunteers, Aboriginal land council, contractors, aerial spray , bush regen , fire and erosion work	H-CH
Lakes	Wollarah NP	Palm Gullies	lantana	Lowland Rainforest EEC	Asset protection	Regen, splatter Spraying	C-TSC
Lakes	Watagans NP	Barraba Lane and slippery rock rd	lantana	Lowland Rainforest EEC, mesic spotted gum blackbutt forest, <i>Eucalyptus fergusonii</i>	Asset protection	Bush regen , vehicle spray as appropriate spraying	C-TSC
Lakes	Wyrabalong NP	Wetlands North	ipomoea sp., bitou, lantana camara, senna pendula, anredera cordifolia, watsonia sp., acetosa sagittata, alternanthera philoxeroides	Freshwater wetlands on coastal floodplains EEC (TSC-e), Swamp oak floodplain forest EEC (TSC-e), Swamp sclerophyll forest on coastal floodplains EEC	Asset Protection	Spraying , cut and paint , splatter gun (as appropriate)	C-TSC
Lakes	Wyrabalong NP	Rainforest North	bitou, asparagus sp., lantana camara, senna pendula, acetosa sagittata,	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 + others FIN	Asset Protection	Spraying , cut and paint Spraying , cut and paint , splatter gun (as appropriate)	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
			conyza sp., ipomoea sp., bidens pilosa				
Lakes	Wyrabalong NP	South Wyrabalong	bitou bush	Themeda Grassland EEC; many orchids - Caladenia (FIN), <i>Diuris praecox</i> (EPBC-v;TSC-v),	Asset Protection	Aerial spraying	C-TSC
Lakes	Tuggerah NR	Whole site except for ox bow	blackberry	Swamp schlerophyll Forest EEC (TSC), Swamp oak floodplain forest EEC (TSC-e), Coastal saltmarsh EEC (TSC-e), River Flat Eucalypt Forest EEC (TSC-e) EEC (TSC), spotted gum forest (signif patch on clay lens)	Asset Protection	Spraying, hand removal scrape and paint	C-TSC
Lakes	Tuggerah NR	Hyacinth site	water hyacinth	Swamp schlerophyll Forest EEC (TSC), Swamp oak floodplain forest EEC (TSC-e), Coastal saltmarsh EEC (TSC-e), River Flat Eucalypt Forest EEC (TSC-e) EEC (TSC)	Asset Protection	Mecahical Harvesting follow up spraying	C-TSC
Lakes	Munmorah SCA	Southern precinct	bitou bush	Swamp sclerophyll forest on coastal floodplains EEC (TSC-e), Littoral Rainforest EEC (EPBC-ce; TSC-e), Swamp oak floodplain forest EEC (TSC-e), coastal sand dune complex [Bitou - Medium]	Asset Protection	Spraying , barrel mulching , splatter gun, cut and paint	CTSC
Lakes	Munmorah SCA	Elizabeth Bay Drive	mud plantain	Swamp sclerophyll forest on coastal floodplains EEC (TSC-e), Littoral Rainforest EEC (EPBC-ce; TSC-e), Swamp oak floodplain forest EEC (TSC-e), coastal sand dune complex	Asset Protection	Off park monitoring Spraying	C-NE
Newcastle	Glenrock State Conservation Area	Scenic Drive	bitou bush, lantana, asparagus fern and senna	<i>Tetratheca juncea</i> and <i>Macrozamia flexuosa</i>	Asset Protection	Ground spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Themeda Grassland Burwood Beach	bitou bush and invasive	Themeda Grass Land on Sea Cliffs and Coastal Headlands.	Asset protection	Ground spraying	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
			grasses.	<i>Pultenaea maritima</i>			
Newcastle	Glenrock State Conservation Area	Hickson St Landcare Group site	bitou bush, lantana, and invasive grasses	Littoral Rainforest	Asset protection	Spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Lower Flaggy Creek / Yuelarbah	bitou bush, lantana, morning glory, palm grass, asparagus fern.	Littoral Rainforest(also Federal threatened community Littoral Rainforest and Coastal Vine thickets) <i>Syzygium paniculatum</i> , <i>Cynanchum elegans</i>	Asset protection	Spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Leggy Point Car Park to Leggy Point – Leggy Point Loop Track	bitou bush	<i>Macrozamia flexuosa</i> , <i>Tetradlea juncea</i>	Asset Protection	Spraying, Bush Regeneration	C-TSC
Newcastle	Glenrock State Conservation Area	Bahai Landcare Group	bitou bush	<i>Diuris praecox</i> , <i>Tetradlea juncea</i> and <i>Macrozamia flexuosa</i>	Asset Protection	Spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Dudley Beach	bitou bush, lantana, blackberry, pampas grass	Littoral Rainforest (also Federal threatened community Littoral Rainforest and Coastal Vine thickets)	Asset Protection	Spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Dudley rainforest	bitou bush, lantana, morning glory, senna	Littoral Rainforest (also Federal threatened community Littoral Rainforest and Coastal Vine thickets)	Asset protection	Spraying	C-TSC
Newcastle	Glenrock State Conservation Area	Bombala Track	bitou bush, asparagus fern, senna	Ongoing Landcare site	Asset protection	Hand removal	L-LP
Newcastle	Pambalong Nature Reserve	Pambalong Nature Reserve and adjoining private property	water hyacinth	Freshwater Wetlands Coastal Floodplains	Asset Protection	Ground spraying	C-TSC
Newcastle	Pambalong Nature Reserve	Pambalong Nature Reserve	alligator weed	Freshwater Wetlands Coastal Floodplains	Asset Protection	Ground spraying	C-TSC
Newcastle	Awabakal Nature Reserve	Redhead Lagoon	bitou bush	Fresh Water Wetlands on Coastal Floodplains, Swamp Sclerophyll	Asset Protection	Ground spraying	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
				forest on Coastal floodplains			
Newcastle	Hunter Wetlands NP	Stockton sand spit	juncus acuitus, bitou bush and mangroves	Coastal Saltmarsh Migratory shorebirds	Asset Protection	Cut and paint, spraying cut and removal	C-TSC
Newcastle	Hunter Wetlands NP	Kooragang dykes	juncus acuitus, bitou bush and mangroves	Coastal Saltmarsh Migratory shorebirds	Asset Protection	Cut and paint, spraying cut and removal	C-TSC
Gosford	Wamberal Lagoon NR	Spoon bay	bitou bush	EEC Littoral Rainforest, <i>magenta lilipilli</i> , <i>chamasyce psammogoten</i>	Asset protection	Spraying splatter gun, aerial spraying , follow up	C-TSC
Gosford	Bouddi NP	Box Head to Macmasters Beach	bitou bush	EEC Themeda grasslands	Asset Protection	Aerial spraying	C-TSC
Gosford	Cockle Bay Nature reserve	Empire bay	blackberry, honey suckle and lantana	Saltmarsh, swamp sclerophyll forest, swamp oak forest	Asset protection	Spraying, cut and paint hand removal	C-TSC
Gosford	Cockle Bay Nature reserve	Shelly Beach Rd	asaragus fern , bridal creeper	Saltmarsh swamp sclerophyll forest	Asset Protection	Spraying and hand removal	C-TSC
Gosford	Cockle Bay Nature reserve	Palmers lane	blackberry, bridal creeper and lantana	Swamp sclerophyll forest, salt marsh	Asset protection	Spraying, cut and paint hand removal	C-TSC
Gosford	Wambina NR	matcham	lantana	Lowland rainforest	Asset protection	Spraying, cut and paint hand removal	C-TSC
Gosford	Pelican Island NR	Woy woy	juncus acuitus and asparagus fern	Salt marsh	Asset protection	Spraying and hand removal	C-TSC
Gosford	Rileys Island	Woy woy	juncus acuitus and asparagus fern	Salt marsh swamp sclerophyll forest, swamp oak forest	Asset protection	Spraying and hand removal	C-TSC
Gosford	Bouddi NP	7 sites	bitou, lantana, asparagus fern and blackberry	Swamp sclerophyll, littoral rain forest	Asset protection	Spraying, cut and paint hand removal	C-TSC
Gosford	Palmgrove NR	Challenge Ranch	lantana	Lowland rainforest EEC	Asset protection	Spraying, cut and paint	C-TSC
Gosford	Brisbane Water NP	Calga, Peats Ridge,	wild dogs	Neighbouring landholders	Asset	Baiting and trapping	C-EC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
		Central Mangrove and Somersby			Protection		
Gosford	Brisbane Water NP	Central Mangrove and Somersby	deer	Neighbouring landholders	Asset Protection	Shooting program	C-EC
Gosford	Bouddi NP	All sites	fox	Neighbouring landholders	Asset protection	Baiting	M-CP
Gosford	Bouddi NP	All sites	deer	Motorists and neighbours	Asset protection	Shooting Program	C-HD
Yango	Yengo National Park	Big Yango St Albans	fox	Brush-tailed Rock-wallabies	Asset Protection	Baiting – M44 ejectors Monitoring -Sand pads Monitoring scat counts	C-TSC
Yango	Yengo National Park	Big Yango	wild cattle	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), <i>Oleria cordata</i> (v TSC, v EPBC), freshwater wetlands EEC (TSC) - swamp oak World Heritage Area, Aboriginal Cultural Heritage – Mt Yengo	Asset Protection	Trapping and strategic shooting	C-TSC
Yango	Yengo National Park	Macdonald River	wild cattle	Riparian vegetation, <i>E. deanei</i> and <i>E. michaeleana</i> , wet eucalypt (part of riparian veg), World Heritage Area	Asset protection	Lick block stations, strategic ground shooting aerial shooting	M-WNH
Yango	Yengo National Park, Parr State Conservation Area, Dharug National Park, Popran National Park, Finchley Aboriginal Area	Mellong, Macdonald Valley, St Albans, Boree Valley Calga/Peats Ridge, Ironbark Ck, Mangrove Mountain	wild dog	Neighbouring private Landholders, livestock etc	Asset Protection	Baiting, trapping	C-EC
Yango	Yengo National Park	Macdonald River	black wattle	Riparian vegetation, <i>E. deanei</i> and <i>E. michaeleana</i> , wet eucalypt (part of riparian veg), World Heritage Area	Asset protection	Annual spraying event with Willow Warrior Volunteers Program	M-WNH
Yango	Yengo National Park	Mt Yengo Aboriginal Place	lantana	Cultural Heritage site, Dry rainforest, <i>Acacia fulva</i> , Ironbark-bloodwood ridge top	Asset Protection	Ground spraying, splatter gun	H-CH

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
				vegetation			
Yango	Yengo National Park	Big Yango	blackberry	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), <i>Oleria cordata</i> (v TSC, v EPBC), freshwater wetlands EEC (TSC) - swamp oak	Asset Protection	Ground spraying, splatter gun	C-TSC
Yango	Dharug National Park	Mill Creek	bridal creeper	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e), rainforest	Asset protection	Ground spraying, splatter gun, hand pulling removal	C-TSC
Yango	Dharug National Park	Mill Creek, Wiseman's Ferry Rd	lantana	River-Flat Eucalypt Forest on Coastal Floodplains EEC (TSC-e)	Asset Protection	Ground spraying splatter gun	C-TSC

6. Consultation

The Central Coast Hunter Range Regional Pest Management Strategy was developed through consultation with the community and internal staff. Two Pest Management Strategy Stakeholder Consultation Forums were conducted at Cessnock and Gosford on the 19th and 20th September 2011. A diverse range of community representatives were represented including members of local Councils, Livestock Health and Pest Authorities, neighbouring landholders, Local wild dog associations, NSW Farmers Association, Catchment Management Authorities and several other stakeholder groups. A summary of key issues and strategies from both meetings have been summarised in the *NSW Regional Pest Management Strategy Consultation Forum Report* (refer appendix 1).

Listed below are an example of some of the key issues put forth and how they are addressed in the strategy;

- **new and emerging pests** - the importance of identifying new threats, incursions and delivering a timely response (refer goal 1 Objective 1.1 in part A)
- **resources** - the need for appropriate and long term resources to be available for pest management programs (refer to Goal 3 Objective 3.1 in Part A);
- **coordination between stakeholders** - the requirement for cooperation, and landscape scale pest management programs (refer to Goal 2 Objective 2.2 Action - KPI Number of cooperative programs in Part A);
- **risk assessment** - the need for a risk assessment approach to pest management (refer to Goal 2 Objective 2.1 in Part A);
- **learning/training** - the development of staff, communities and volunteers skills in order to build the capacity of NPWS to identify and treat pests (refer to Goal 3 Objective 3.3 in Part A);
- **communication between stakeholders** - the need for communication and education of stakeholders (refer to Goal 3 Objective 3.2 in Part A);
- **wild dogs** - the identification of key pest issues of wild dogs in Central Coast Hunter Range Region (refer to table of priority programs Section 5 and section 7 wild dog species profile of Part B).

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 (refer to Sections 5 & 7 Part B). Two stand out issues that were 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 that was suggested to achieve this was to use the broad representation of the stakeholders that attended the forums to form the foundation of 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 LHPA, will endeavour to establish community control groups in key areas to improve the overall management response to **wild dogs** in the CCHR.

The importance of **prioritising pest programs** has also been addressed in this strategy and is defined in section 4 and demonstrated in section 5, where our priority programs are tabled. NPWS will identify with important assets like threatened species, cultural heritage and neighbouring landholders and will adopt an **asset protection** approach to

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 five operational Areas within CCHR with key Ranger's and Field Staff in order to accurately identify and prioritise pest management programs. Following the preparation of this draft Pest Management Strategy, the document was placed on public exhibition and comments were invited from the community, other government agencies and stakeholder groups.

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7. 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 including the following web pages:

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/general-information/pest-animal-survey>

<http://environment.gov.au/biodiversity/invasive/publications/humane-control.html>

<http://www.invasiveanimals.com/>

<http://www.environment.gov.au/biodiversity/invasive/ferals/index.html>

<http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles>

<http://www.weeds.org.au/WoNS/>

http://www.rirdc.gov.au/programs/national-rural-issues/weeds/weeds_home.cfm

<http://www.weeds.gov.au/>

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Alligator Weed (*Alternanthera philoxeroides*) for Central Coast Hunter Range Region

Distribution and abundance

Hunter Wetlands National Park and Pambalong Nature Reserve are the only reserves in CCHR 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 facilitates rapid spread and increases the difficulty of control. Alligator weed is a Weed of National Significance and in the CCHR Region is declared Class 2 or Class 3 under the *Noxious Weeds 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 NR and private landholdings, in the upstream catchment through a cooperative approach seems to be the most productive concept.

Control

The use of biological control, with the flea beetle (*Agasicles hygrophila*), in the core infestations in Hunter Wetlands NP. NPWS will work with local control authorities, CMA and neighbouring land holders 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, landuse, access issues and the aquatic form is very difficult to control. When control is undertaken it must happen in collaboration with other stakeholders to have any benefit.

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

Bitou bush (*Chrysanthemoides monilifera* subsp. *Rotundata*) for Central Coast Hunter Range Region

Distribution and abundance

CCHR Region manages a large section of coastal reserve where bitou bush is a common weed. The distribution of bitou bush includes all coastal local government areas; Gosford, Wyong, Lake Macquarie and Newcastle.

A large proportion of the coastal parks were formerly sandmined. These areas in particular have extensive areas of bitou bush both in distribution and density.

Areas affected by bitou bush include: Bouddi NP, Wamberal Lagoon NR, Wyrabalong NP, Munmorah SCA and Glenrock SCA

Impacts

Invasion of native plant communities by bitou bush and 'bone seed' is listed as a KTP under the TSC Act 1995. Bitou bush is also listed as a Weed of National Significance.

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. It is an aggressive invader and coloniser of dunal systems and nearby coastal environments. It is a prolific seeder with a seed viability of up to three years.

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

Priorities for control

Priorities for control will focus on asset protection and endangered Ecological Communities such as themeda grasslands and littoral rainforest, as identified in the site plans for TAP sites.

Control

- Aerial spraying is a large component of control in CCHR. Switching from glyphosate to Metsulfuron methyl is a new strategy to be implemented and trialed over the next years application.
- Metsulfuron methyl, application by cut and paint and splatter gun work using 5% glyphosate.
- Biological- the bitou seed fly (*Mesoclanis polana*), 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

CCHR Region will implement identified monitoring techniques outlined in the Bitou Bush TAP and best practice guidelines. Nested quadrats have been established at Munmorah SCA and Wamberal Lagoon NR. Daily records sheets are kept in accordance with the Pesticides Act. Extensive mapping in both aerial and ground photography has been taken at key photo points to show changes over time, to monitor effectiveness of control programs and re-establishment of native vegetation communities.

Blackberry (*Rubus fruticosus aggregate*) for Central Coast Hunter Range Region

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 lands, 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 larger infestations in known locations in Yengo NP 'big yango' precinct and Wollemi NP and is present in various smaller densities throughout many other reserves in CCHR Region.

Impacts

Blackberry is a Weed of National Significance because of its invasiveness, potential for spread, and economic and environmental impacts. It is listed as a Class 4 weed under the Noxious Weeds Act throughout 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; what it is impacting on, its location and the size of infestation.
- Assets for protection include threatened species, EECs and where blackberry is impacting on neighbouring properties.

Control

- Control blackberry in identified areas of Wollemi and Yengo NP's in accordance with approved herbicides as per the label directions.
- Control in early spring at Cockle Bay NR
- Control in Tuggerah NR ground spraying when opportune
- Survey previously treated areas and implement follow-up treatment as required

Monitoring

- NPWS staff and contractors to document treatment details on chemical users forms in accordance with the Pesticides Act including GPS locations and lengths of roadsides treated.
- NPWS staff to assess known infestations and identify follow-up treatment requirements for identified areas
- Liaise with local Councils regarding coordinated management where relevant.

Lantana (*Lantana camara*) for Central Coast Hunter Range Region

Distribution and abundance

Lantana is a widespread, commonly occurring weed throughout all parks from the coast to the western areas of CCHR. It occurs as both an edge and understorey species in a range of vegetation communities in varying densities. Lantana has vigorous growth habits particularly in high rainfall coastal parks such as Jilliby SCA, Wambina NR, Wallarah NP, Sugarloaf SCA, Watagans NP, Bouddi NP and Glenrock SCA. It readily invades disturbed plant communities particularly post fire.

Impacts

Lantana invades both disturbed and undisturbed bushland. In moister environments, lantana is a particularly aggressive coloniser and forms extremely dense infestations that totally 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 also protect the vegetation from drying winds, excessive sunlight penetration etc. 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.

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 Rd Watagans NP, Wallarah NP, Lemon Tree area adjoining Jilliby SCA, Sugarloaf SCA, Watagans NP, Bouddi NP and Glenrock SCA,

Biological control agents have been released as part of the NSW lantana bio-control 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 CCHR, 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. 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 re-visited periodically for follow-up treatment and maintenance.

Spiny Rush (*Juncus acutus*) for Central Coast Hunter Range Region

Distribution and Abundance

Juncus acutus is abundant in southern zone of south western Australia and the east coast of Australia including coastal areas of Victoria and NSW. In CCHR Region it has established isolated pockets in Bouddi NP, Cockle Bay NR, Pelican Island NR and Riley's Island NR and Hunter Wetlands NP. It can be hard to differentiate between the native sedges to the untrained eye.

Impacts

Juncus acutus is a new and emerging pest. It's 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 etc.

Management Objectives

Increase knowledge of identification to NPWS staff and all people working within NPWS estate and reduce and contain the spread through EECs.

Priorities for Control

Priorities for control in CCHR Region should address the threat juncus poses to salt marsh endangered ecological communities.

Control Techniques

- Spraying using glyphosate at 1-2% during flowering before it sets seed.
- Using hedge trimmers cut plant back and spray.

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 site, including the extent of weed distribution and control implemented. Sites are re-visited periodically for follow-up treatment and maintenance.

Asparagus Species for Central Coast Hunter Range Region

- *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. Infestations exist at Cockle Bay NR, Wyrabalong NP and with Bridal Creeper at Yengo NP (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 CCHR Region. It invades undisturbed environments where its climbing stems and foliage smother native plants and form thick dense mats (ARMC 2001).
- Ground asparagus mostly occurs in coastal reserves. The plant quickly establishes in both disturbed and undisturbed sites and competes with native ground cover species.
- Climbing asparagus occurs in coastal reserves adjacent to urban areas. The stems of the plant 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 Salt marsh and fresh water wetland EECs.

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 a glyphosate and metsulfuron methyl and also using the crowning technique.

In regards to biocontrol, the bridal creeper rust *Puccinia mysiphylli* has been really effective at some sites in the region by limiting flowering and even spreading between locations.

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 site, including the extent of weed distribution and control implemented. Sites are re-visited periodically for follow-up treatment and maintenance.

Water Hyacinth (*Eichhornia crassipes*) for Central Coast Hunter Range Region

Distribution and Abundance

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

Impacts

Water hyacinth is declared a Class 2 noxious weed under the NSW *Noxious Weeds Act 1993* and is recognised as one of the world's worst aquatic weeds. It infests nutrient rich rivers, dams, lakes and irrigation channels rapidly on every continent except Antarctica. It devastates aquatic environments by altering the hydrology and smothering aquatic life by deoxygenating the water, and it reduces nutrients for young fish and other aquatic plants.

Water hyacinth is native to the Amazon basin in South America and was brought to Australia in the 1890s as an ornamental plant.

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.

Management Objectives

- To prevent the spread of water hyacinth into uninfected areas.
- To manage the impacts of water hyacinth on waterways, particularly where it significantly threatens EECs threatened species e.g Freshwater wetlands

Priorities for Control

- Removal of water hyacinth from isolated satellite infestations e.g 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
- Cooperative with other agencies and neighbours in identified catchments

Control Techniques

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 between 600 and 900 hours to harvest one hectare of dense water hyacinth – which 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, or all terrain vehicle or

from the banks. Treatments 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 deoxygenating 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 containing the spread temporarily whilst control is being undertaken.

Works on water hyacinth are being undertaken in Pambula and Tuggerah nature reserve's (mechanical harvesting and spraying).

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 site, including the extent of weed distribution and control implemented. Sites are re-visited periodically for follow-up treatment and maintenance.

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Red Fox (*Vulpes vulpes*) for Central Coast Hunter Range Region

Distribution and abundance

Foxes occur in most environments in Australia, however, they are probably most abundant where 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 the Central Coast Hunter Range 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 *key threatening process* to be listed under the NSW Threatened Species Conservation 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 native species most likely to be impacted at the population level in CCH region include brush tailed rock wallaby, rufous bettong, green and golden bell frogs ground nesting migratory waders pied oyster catcher and little tern. Foxes also pose a threat to bush-stone curlew that nest in the Gosford Brisbane Water area. However, the species of greatest concern is the brush tailed rock wallaby *Petrogale penicillata*. Listed as endangered under the TSC Act, brush tailed rock wallabies are distributed patchily through Wollemi, Yango and Watagans national parks and Sugaloaf State Conservation Area. Despite their low numbers, Watagans National Park site is one of the strongest in NSW. The impact of foxes to the community is very prevalent through urban centres where bushland fragments through residential areas. Foxes taking chickens, rabbits, guinea pigs and other small domestic pets is common and a complex issue faced by urban land managers and councils.

Priorities for control

Under the Fox TAP, 2010, five sites have been identified as priority targeting the protection of the Brush Tailed Rock Wallaby. Three sites are listed as treatment sites, Broke/Milbrodale, Watagans 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

Under the plan, intensive broad-area 1080 baiting is being undertaken within all sites nominated above. Baiting for foxes at Fox TAP sites is continuous and ongoing only ceasing in the warmer months when goannas are prevalent.

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 area e.g. 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 tail habitat in high sandstone escarpments. Fox and other medium-sized mammal populations are being measured biannually via track counts on sandpads and

motion-triggered cameras. Data is analysed by the Pest Management Unit and published periodically as part of the review of the Fox Threat Abatement Plan.

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Wild Dogs (*Canis lupus spp.*) for Central Coast Hunter Range Region

Distribution and abundance

Populations of wild dogs (including dingoes) occur mainly along the Great Dividing Range, coastal hinterlands, and in north-western NSW. Wild dogs are a declared pest under the Rural Lands Protection Act 1998. Dingo conservation areas have been identified for NRs and NPs within the Region, known as Schedule 2 Areas under the RLP Act.

Wild dog distribution in the CCHR region has been identified and is cooperatively managed by Mid Coast LHPA, Cumberland LHPA, Wild Dog Associations and Wild dog groups within CCHR and NPWS.

Wild dogs are known to occur sporadically throughout CCHR. The abundance of wild dogs is greatest surrounding rural residential areas where food sources are abundant.

In the Cumberland LHPA Areas where wild dogs are present include all lands around Mellong/putty Rd, Peats Ridge, Mangrove Mountain, Somersby, Kulnura are identified hot spots for wild dog activity. Wild dogs are also known to traverse through Jiliby SCA, Ourimbah and Olney State forests leading down to Yarramalong and Dooralong Valleys. Wild dogs are also present randomly through the Watagans NP and adjoining communities of Martinsville, Mandalong, Congewai, Quorrobolong, Murrays Run and Laguna. Additionally areas adjoining Yengo NP include Laguna, and Wollombi.

Wild dog distribution throughout the Mid Coast LHPA area is the areas of Wybong including Manobolai NP, Wollemi and Yengo NPs around Putty north to Broke/Milbrodale areas, lands adjoining the township of Denman, Jerrys Plains and Singleton, Singleton Army base, numerous large holding by the mining sector, Mt Royal NP and adjoining rural areas.

Impacts

- Wild dogs have a number of impacts including:
- predation on native fauna
- vectors for disease that affects native fauna and humans e.g. hydatid;
- cause of significant economic impact to rural landholders by killing livestock such as sheep, goats and cattle; and
- hybridisation with dingoes
- Social value of safety and wellbeing of the community.
- Predation on domestic pets particularly dogs

Priorities for control

There are two wild dog management plans prepared by LHPA boards in co-operation with the NPWS for areas within the CCHR Region. These include Cumberland Wild dog Management Plan and the 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 the above mentioned plans including sites on private lands, state forest and NPWS estate.

Cumberland Wild Dog Management Plan control areas include;

- Mellong Area – Yengo NP and Parr SCA and adjoining landholders.
- Macdonald valley – Yengo and Parr SCA the St Albans common and adjoining landholders.
- Popran – Popran NP, Glenworth Valley and adjoining private landholders
- Brisbane Waters – Brisbane Water NP and adjoining landholders

- Mangrove - The community of Mangrove Mountain including Macpherson State Forest, Dubbo Gully and Mangrove Dam Catchment Area and adjoining landholders.
- Ourimbah – Ourimbah State forest, Jiliby SCA and adjoining landholders
- Yarramalong – Olney State forest , Yarramalong Valley and Jiliby SCA adjoining landholders
- Dooralong – Jiliby SCA , Olney State Forest and adjoining landholders
- Yango – Yengo NP including adjoining landholders
- Watagans – Watagans NP including Mandalong and Martinsville valleys.
- Cessnock – Werekata SCA and National park, Sugaloaf SCA, Heaton State forest and adjoining landholders
- Black Hill – Black Hill, Minmi, new NPWS additions e.g. Stockrington

Mid Coast Wild Dog Management Plan control association areas include;

- Wybong – Manobolai NP and surrounding agricultural and mining lands.
- Mt Arthur - Mainly mining lands, and farms does take in Martindale valley which adjoins Wollemi NP
- Singleton North East – Belford NP and Mt Royal are included in this zone.
- Lower Hunter – Bulga/Broke/Milbrodale – Putty community including Wollemi and Yengo NPs
- Rouchel – Mt Royal and landholders to the north

These plans will be reviewed every five years and priorities may change during or after this time.

Wild dogs will also be managed in nominated Fox TAP sites e.g. Broke/Milbrodale and Watagans NP sites.

Control

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

In the southern end of Mid Coast LHPA board area NPWS with Yengo and Wollemi NPs join in with many other stakeholders (Forest NSW, in an annual aerial baiting campaign coordinated by the board in May/June of each year. Two large-scale ground baiting programs are also undertaken in spring and autumn.

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 wild dog incident that adjoins a reserve, NPWS officers will make contact with the landholder with 48hrs of initial report.

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

1. In collaboration with LHPA and the respective landholder, inspect the place of incident, identify the target (in some incidents domestic dogs are likely) determine course of action suited to the situation presented.
2. Implement control option (emergency baiting/trapping) suited to the situation, ensure landholder involvement. Program to run mutual agreement/resolvement.
3. Monitor the situation post program through remote digital cameras and landholder reporting. Present information on all options of 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 neighboring 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 of the areas.

5. All baiting is done using 250g 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 - Wild Dogs

Monitoring of presence/absence is undertaken 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. This technique allows for the evaluation of baiting success. Ongoing liaison with neighbours, LHPA and established wild dog associations will strengthen communication between all stakeholders. The key to improving wild dog management in Cumberland LHPA Board area lies with reciprocating 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 WDMP.

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

Monitoring Dingoes

CCHR Region has commenced to collect data on the genetic integrity of wild dog/dingo populations across the region through strategic trapping programs. The Collection of DNA samples is coming from wild dogs that are captured/shot during control programs across the landscape and relies on the contribution of samples from all land managers and agencies to assist this process.

Rabbit (*Oryctolagus cuniculus*) for Central Coast Hunter Range Region

Distribution and abundance

Rabbits are found in most habitats throughout Australia below the Tropic of Capricorn, except for densely forested areas, above 1500m or on black soil plains. The Central Coast Hunter Range Region is not dissimilar to the whole coastal zone of NSW rabbits where rabbits are vigilant in built up urban areas where they have the potential to occupy very any areas that provide shelter and grazing opportunities. The distribution and abundance of rabbits has seen dramatic changes since the introduction of RHD. The distribution of rabbits in NPWS estate 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 are reported within some reserves but due to their low numbers their impacts are not prevalent and are targeted only during control programs targeting key species like foxes and rabbits.

Impacts

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

Their digging activities also scratch out seedlings and damage root systems and combined with the damage they cause to both above and below ground vegetation, can lead to increased soil erosion. The resultant 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 1998 and landholders have a statutory responsibility to control them. Rabbits are also highly competitive for grazing areas and harbour and their removal has resulted in the growth of local bandicoot populations at some sights

Competition and grazing by the feral European rabbit' has been listed as a KTP under the NSW TSC Act and rabbits are declared a pest animal under the Rural Lands Protection Act 1998.

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 rabbit haemorrhagic disease (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 on park at key identified assets for protection, e.g. sites that contain endangered ecological communities (EEC), 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 SCA, Werekata NP and Yengo NP (Big Yango precinct). Best practice methods used include Pindone baiting, shooting and warren fumigation. RHD realisation may be viable in some situations.

Monitoring

NPWS staff will liaise with LHPA and monitor local rabbit populations for growth, using sign of presence 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 to the use of Pindone e.g. macropods and domestic dogs.

DRAFT

Feral Deer (family *Cervidae*) for Central Coast Hunter Range Region

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 (*Cervu 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. Deer 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 acclimatization herds and is definitely the case of establishment in the Central Coast Hunter range region. They 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 due to hunting pressure or proximity to human presence.

Fallow deer are the most abundant and distributed species across the region followed by red deer and localised populations of sambar. Isolated small populations of rusa and chital deer are also known to occur.

Impacts

“Herbivory and environmental degradation caused by feral deer” have been declared a KTP under the TSC Act. Feral deer can have major impacts through:

- destroying native plants. Deer can trample plants; graze on them, and ringbark young trees especially during the antler development in males when they rub extensively on trees. Deer can have a major impact on the variety and abundance of plant species where populations are high
- fouling waterholes through wallowing
- Causing soil erosion
- Transmitting diseases such as foot-and-mouth disease
- Spreading weeds
- Unmanaged exotic disease vectors
- Impacting the Stone fruit and citrus industry through grazing and destroying young plants
- Impacts to wine growers during growing times
- Impact nursery industry to unfenced stock trees
- Rural fencing
- Aggression and wounding livestock (horse and cattle) during rutting periods.
- Serious vehicle accidents (some fatal).

High densities of feral deer have been found to reduce understorey plant species in the Endangered Ecological Community Littoral Rainforest 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 (Adam 2004). 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 (DEC 2005).

Feral deer crossing roads has caused several major car accidents in the region in recent years

Control

A number of techniques are available for the control of feral deer but should be assessed against each different situation including shooting, fencing is a very successful and long term option, trapping may be an option using feed based lures but is very resource hungry and time consuming.

NPWS have initiated and undertaken successful deer removal programs in Brisbane Water NP, Parr SCA, Yengo NP and Werekata NP. Strategic shooting programs have been implemented to protect EECs, reduce numbers near hot spot accident sites and assist with reducing impacts to neighbours.

Priorities for control

Priorities for control exist where deer are impacting on threatened species, where routine crossing points on roadways are causing dangerous

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.

Monitoring

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

DRAFT

Feral Cat (*Felis catus*) for Central Coast Hunter Range Region

Distribution and abundance

Feral cats have been observed, or picked up during monitoring programs targeting other species in most reserves in the Central Coast Hunter Range Region. Due to their cryptic and elusive nature their true distribution and abundance within the Region is largely unknown.

In the Regions more urban reserves, free roaming domestic cats are known to be periodically present in reserves that adjoining residential zones.

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

Impacts

Predation by feral cats has been listed as a KTP under the NSW TSC Act and the Commonwealth EPBC Act.

Feral cats are known to cause local impacts on populations of native species, particularly small mammals (Denny and Dickman 2010). Feral cats have been implicated as one of the causes in 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.

Management Objectives

Continue to monitor populations as part of a broader vertebrate pest monitoring program associated with the Fox TAP, threatened species and the management of EECs. When cats present a high threshold of activity, undertake control as appropriate.

Control Priorities

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

Control Techniques

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 for cats.

Cats are regularly taken during trapping programs targeting wild dogs.

Central Coast Hunter Range Region is currently trialling a volunteer trapping program in Dharug NP targeting an isolated population of feral cats identified during the biannual predator monitoring program.

Monitoring

Monitoring of key sites using surveillance cameras to estimate presence has proven effective. Cats will present on sand pads. All control will be recorded and information maintained on GIS.

Feral Cattle (*Bos taurus*) for Central Coast Hunter Range Region

Distribution and abundance

Feral cattle are present in isolated populations on NPWS parks and Council managed catchment land in CCHR region. Establishment of these populations were initiated by a combination of poor management by a neighbouring enterprise, cattle being run in unfenced rough inaccessible connective country joining park and in the case of 'Big Yango', introduction through the acquisition of a cattle enterprise which was a remote inholding in Yengo NP. These populations are unmanaged unbranded generation bush bred cattle which are different than issues involving straying stock in NPWS estate from neighbouring properties.

Feral cattle are an identified issue in Yengo NP around the Big Yango precinct, in isolated pockets along the Macdonald River and Yengo NP adjoining Mangrove Dam Catchment area where a known feral cattle population also exist.

Wild cattle are also known to exist in isolated populations in Wollemi NP, Mt Royal NP and Parr SCA.

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 e.g ant hills, dust baths etc
- soil compaction and erosion
- weed dispersal
- increased nutrient loadings
- establishment of movement trails
- potential spread of exotic diseases
- public safety in camping grounds – bulls
- impacts to neighbours livestock operations and fencing

Priorities for control

When feral cattle present a risk to a threatened species, EEC, a public safety risk, ie, motor vehicle collision or public nuisance in a camping area, or demonstrate 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, ground shooting using authorised NPWS staff or approved contractors in accordance with an approved Shooting Operations Plan.

Monitoring

- Monitor sign presence of livestock in known sites in the Region
- Collate park user reports
- Document relevant information regarding control programs including the number of individuals removed.

Feral Pig (*Sus scrofa*) for Central Coast Hunter Range Region

Distribution and abundance

The distribution of feral pigs in the Northern Rivers Region is limited to by two core populations and random introductions into reserves by deliberate release. In the two core areas, Wollemi NP and Mt Royal NP, feral pig distribution throughout these areas is seasonal and is dependant on climatic conditions and food supply. Feral pigs also occur in low unconfirmed numbers in Watagans NP, Sugaloaf SCA and Hunter Wetlands NP these populations were initiated from deliberate release many years ago.

The deliberate introduction into bushland close to urban centres has seen feral pigs occur in Tuggerah NR and SCA, Colongra NR and Werekata NP

Impacts

Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a KTP under the Commonwealth *EPBC Act* and NSW *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 (Hone 2002) 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.

Management Objectives

Implementation of programs in areas where threatened species and ecological communities are impacted.

Total removal of feral pigs in urban areas, enforcement and education to local hunters in cooperation with LHPA

Cooperative programs with neighbours where feral pigs impact on agriculture.

Control Priorities

- Feral pig programs to protect threatened species and endangered ecological communities in Wollemi and Mt Royal NP.
- Eradication/total removal of feral pigs in Tuggerah NR/SCA and Colongra NR.
- Education and enforcement program targeting feral pig introduction and unlawful hunting in NPWS reserves with LHPA and local authorities
- Respond to new incursions

Control Techniques

Current control programs utilise trapping and ground shooting programs. Aerial shooting has been implemented in Wollemi NP as opportunity arises. Other methods available include baiting using 1080.

Monitoring

All control of feral pigs will be recorded and information maintained on GIS. Information recorded for pigs trapped includes sex and animals size.

Feral Goat (*Capra hircus*) for Central Coast Hunter Range Region

Distribution and abundance

Within the CCHR Region, feral goat populations are largely restricted to small disjunct populations which occur on both reserve and private land. Isolated populations occur in Sugarloaf SCA, Watagans NP, Wollemi NP, Werekata NP and Yengo NP.

Impacts

Competition and habitat degradation by feral goats has been listed as a KTP under the *TSC Act* and a KTP under the Commonwealth *EPBC Act*.

In CCHR Region, they 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. It can lead to changes in species composition as more palatable species are eaten and removed, as well as 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.

Control Priorities

- Removal of goats in BTRW habitat
- Removal of goats in threatened species sights including endangered ecological communities
- Cooperative programs with neighbours

Control Techniques

Effective control of feral goats requires an integrated approach using several complementary control techniques. Mustering and removal of goats in easy access locations by contractors, trapping using molasses and salt lick blocks, ground shooting using 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*) for Central Coast Hunter Range Region

Distribution and abundance

Cane toad populations are restricted to the northern region of NSW, with well-established colonies occurring 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 of cane toads have been found up to 90km 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 only one animal often found near tourist parks or 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 (5-40oC) 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 for cane toads. Females lay between 8,000-35,000 eggs at a time and may lay two clutches each year.

The invasion and establishment of cane toads has been listed as a KTP under both NSW (TSC Act) and Australian (Environment Protection and Biodiversity Act 1999) threatened species legislation.

The native species most likely to be impacted at the population level in CCHR region include spotted-tailed quoll (*Dasyurus maculatus maculatus*) and green and golden bell frog.

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 CCHR 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.

The potential risk of invasive species being introduced onto Lord Howe Island has been recognised by the Lord Howe Island Board through the development of a quarantine strategy and identified quarantine officer. NPWS recognises the risk of cane toad introduction to Lord Howe Island as a priority for management.

Control

- Cane toads can be captured
- Some local councils such as Byron Shire Council have undertaken control in the form of community musters.

Monitoring

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/organizations 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.

DRAFT

Myrtle Rust (*Uredo rangelii*) for Central Coast Hunter Range Region

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 here on the NSW Central Coast. Myrtle rust was first discovered in bushland at Wambina Nature Reserve on 28 October 2010.

It has established in coastal NSW from the Clyde River north into Queensland (Figure 1). Myrtle rust is likely to spread rapidly to the extent of its biological range as the spores are dispersed readily by wind. Eradication is unfeasible.

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.

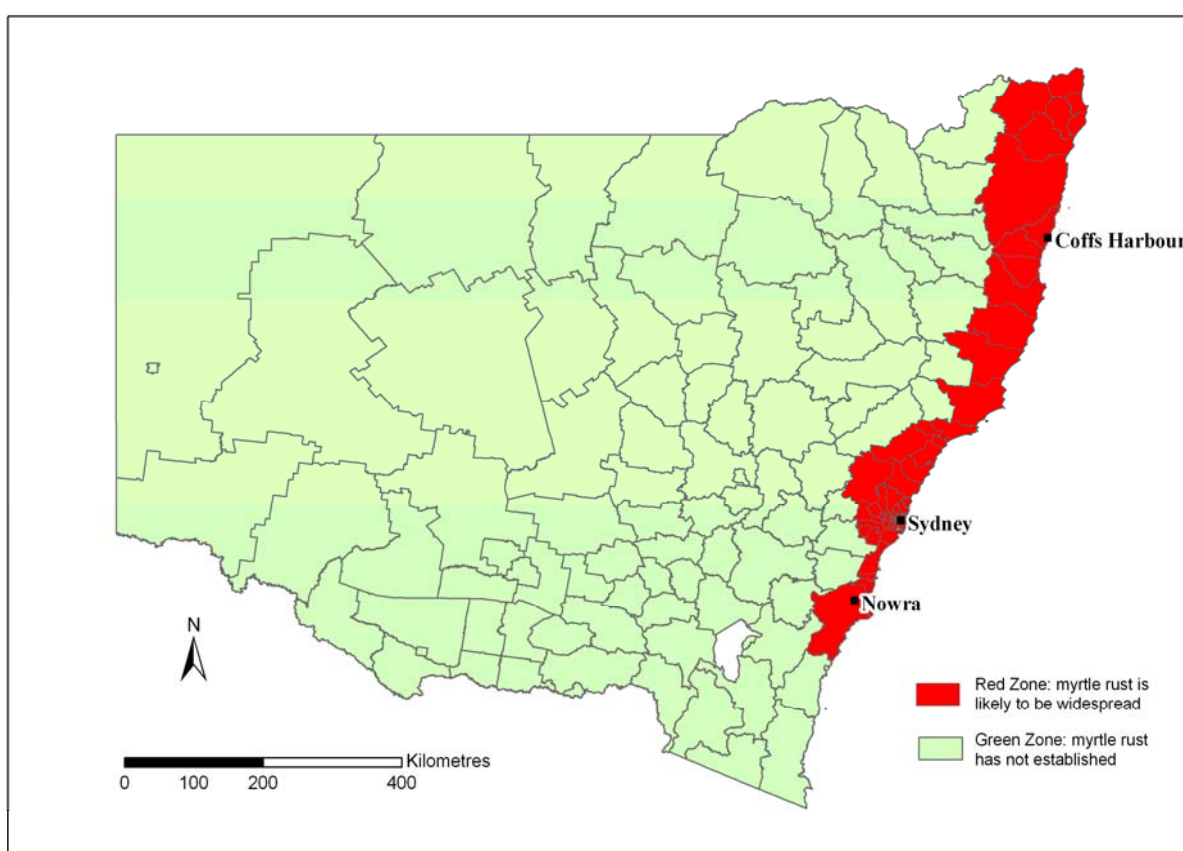


Figure 1: Approximate distribution of myrtle rust *Uredo rangelii* as of 24/01/2011. The red zone is comprised of local government areas where rust has been detected and is likely to be widespread. The green zone is comprised of local government areas where rust has not established. Data from NSW Department of Primary Industries (<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. It produces masses of powdery bright yellow or orange-yellow spores on the infected areas. Leaves may become buckled and twisted and die as a result of infection.

The likely impacts of myrtle rust on biodiversity in Australia are unknown. 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, i.e. threatened species. Reduced recruitment may also have severe impacts on the structure and function of the many natural ecosystems that depend on Myrtaceae. As at 28 March 2011, myrtle rust had been detected in 68 species of Myrtaceae, spanning 27 genera. Severe infection had been observed in relatively few species (most notably scrub turpentine *Rhodamnia rubescens* and native guava *Rhodomyrtus psidoides*) but the number of species so affected may increase as new strains of rust evolve. All five threatened species of Myrtaceae exposed to myrtle rust under laboratory test conditions became infected.

The 'Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is listed as a KTP under the TSC Act

Priorities for control

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 Plan are to:

1. Slow the establishment of myrtle rust on national park estate.
2. 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 8 action areas to manage Myrtle Rust on the NPWS estate:

1. Identify high value assets at risk
2. Limit the spread of myrtle rust
3. Monitor the spread of myrtle rust
4. Manage infections
5. Research the impacts of myrtle rust
6. Training, extension and external communication
7. Record the incidence of myrtle rust
8. Liaise and report on the spread and impacts of myrtle rust

Specific actions for CCHR Region are;

9. Monitor key reserves e.g. Wambina NR, Mill Creek, Tuggerah NR
10. Minimise the likelihood of spread by cutting back and treating infected plant material and maintaining buffer zones on fire trails and walking tracks etc.
11. Check and monitor threatened species with high of risk to infection
12. Treat infection at threatened species site if found present.
13. 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 re-visited periodically for follow-up treatment and maintenance.

DRAFT

Plant Pathogen (*Phytophthora cinnamomi*) for Central Coast Hunter Range Region

Information extracted from the NSW Statement of Intent 1: Infection of native plants by *Phytophthora cinnamomi* <http://www.environment.nsw.gov.au/resources/threatenedspecies/08119sojpc.pdf>

Distribution and abundance

Phytophthora cinnamomi (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 subsurface water flows and can also be readily transported in contaminated soils. Humans have the potential to spread *Phytophthora cinnamomi* 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 having 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.

There is only one case of known in the CCHR is on the Simpsons Track in Dharug NP.

Impacts

Phytophthora cinnamomi is the most widespread and destructive of the 32 *Phytophthora* species that occur in Australia and is listed as key threatening process under both State and Federal legislation. Susceptible species display a range of symptoms; some are killed, 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 (e.g. waterlogging, drought, and wildfire). Infection of native plants by *Phytophthora cinnamomi* has been identified as a key threatening process for a number of threatened species resulting in a [national threat abatement plan for Phytophthora](#) was prepared in 2001 and a [Statement of Intent](#) was prepared for NSW in 2008.

Management Objectives

- Prevent further species or ecological communities from becoming threatened

Control Priorities

- Identify presence of *Phytophthora* by conducting surveys and sampling areas of poor tree health or dieback
- Identify and implement appropriate containment and hygiene protocols when entering and leaving infected site at Dharug NP.

Control Techniques

- Containment through the use of quarantine areas, signage and hygiene facilities
- Protection of key areas through signage and hygiene facilities prior to entry
- Possible treatment of key individual plants

Monitoring

- Soil sampling in key locations to determine movement
- Monitoring of vegetation to in key locations to determine impacts on vegetation and key species

Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) for Central Coast Hunter Range Region

Information extracted from the NSW *Statement of Intent 2: Infection of frogs by amphibian chytrid causing the disease chytridiomycosis*

<http://www.environment.nsw.gov.au/resources/threatenedspecies/09479soi2chytrid.pdf>

Distribution and abundance

Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus or *Batrachochytrium dendrobatidis* (Longcore et.al. 1999). Believed to have evolved in Africa, the earliest recorded case of amphibian chytrid fungus infection was in South Africa in 1938 (Weldon et.al. 2004). Evidence indicates the fungus was 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 (DEH 2006b). 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 (Speare 2001).

Impacts

The disease affects amphibians worldwide and has been identified as a major cause of the decline and extinction of species (Skerratt et.al. 2007). 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 EP&BC 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 (DEH 2006b).

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 (Bosch et al 2007; Walker et al 2010 in Mahony 2010) or when they can evolve an evolutionary response to the threat imposed by the emergence of chytridiomycosis (Mahony 2010).

Management Objectives

- Prevent the further spread of the pathogen into other uninfected areas and frog populations in NSW
- Prevent other species from becoming threatened
- Improve understanding of the disease through monitoring key threatened frog populations

Control Priorities

- Containment
- Manage the threat of chytridiomycosis posed to threatened species and populations of frogs at key locations
- Undertake research and monitoring of the pathogen to further investigate effective management approaches

Control Techniques

- Promote and implement effective hygiene protocols – copy available at: <http://www.environment.nsw.gov.au/resources/nature/hyprfrog.pdf>
- Threat abatement for key threatened species or populations including habitat modification, captive breeding programs, translocations and treatment of individuals

Monitoring

- Monitoring key threatened frog populations to investigate transmission and dispersal

- of *B. dendrobatidis* to improve understanding of the disease
- Support 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.

DRAFT

Eucalypt dieback associated with over-abundant psyllids and bell miners (*BMAD*) for Central Coast Hunter Range Region

Distribution and Abundance

Bell Miner Associated Dieback (BMAD) is found in a number of eucalypt forest types between Victoria and southern Queensland. The current spatial distribution of BMAD throughout NSW is not known in detail. Forests within the CCHR Region are at risk or have already been affected by BMAD. Some areas of BMAD are known in a number of reserves, the true distribution and scope of the problem is largely unknown in CCHR. All State Forest and private forested lands are vulnerable and maybe affected in the Region.

Impacts

'Forest eucalypt dieback associated with over-abundant bell miners and psyllids' has been determined as a KTP under the *TSC Act*.

The condition 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, 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 group of fauna at highest risk of BMAD are the eucalypt dependent arboreal species and large forest owls. Koala, greater-squirrel, yellow-bellied glider and brush-tailed phascogale 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 dieback and in some areas the visual and recreational qualities of known tourist sites are threatened by the loss of tree canopy and ecological integrity.

Management Objectives

Control priorities are currently limited to identifying the presence of BMAD and assessing the impact of BMAD at particular sites. Where the impact is significant, or could potentially become significant, site management plans will be prepared.

Control Priorities

Control of BMAD is a difficult challenge and in the absence of empirical evidence to confirm the causes. Current operational activities to prevent spread and assist ecosystem recovery include weed control and fire management. The use of fire to manage lantana and manipulate bell miner habitat is the more useful tool available for mitigating BMAD impacts at present. Actions outlined in the Draft Statement of Intent for this KTP will be implemented by OEH.

Monitoring

Monitoring of location 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 of BMAD and new reports of BMAD will be assessed and mapped. The BMAD Working Group will provide advice and direction for future management.

DRAFT

8. Pest Distribution Tables

The following pest distribution tables give an overview of significant pest species for each reserve within the Region. The data derived from a combination of systematic surveys, consultation with staff and other agencies and through planning processes. The tables are not comprehensive lists of all pest species within the Region.

- Denotes established widespread populations throughout a reserve
- Denotes scattered populations throughout a reserve
- ⊙ Denotes isolated populations restricted to a small geographic area of a reserve

Table 1. Vertebrate Pests

	Wild Dog	Fox	Feral Pig	Rabbit	Horse /Cattle	Goat	Deer	Cat
LAKES AREA								
Munmorah SCA		●		○				
Bird Island NR								○
Colongra Swamp NR		●	○					○
Lake Macquarie SCA		●		⊙				○
Moon Island NR								
Pulbah Island NR		○						
Tingara Heights NR		●						○
Tuggerah NR and SCA		●	⊙	⊙		⊙		○
Watagans NP	●	●				⊙	○	○
Wollarah NP		●		⊙				○
Wyrribalong NP		●		⊙				○
Jilliby SCA	○	●					⊙	○
YANGO AREA								
Dharug NP	○	●						○
Finchley AA	●	●						○
Parr SCA	○	●					⊙	○
Popran NP	○	●					⊙	○
Yengo NP	●	●	⊙	⊙	○	⊙	⊙	⊙
GOSFORD AREA								
Bouddi NP		●					⊙	○
Brisbane Water NP	○	●		⊙		⊙	⊙	⊙
Cockle Bay NR		⊙						○
Howe AA							⊙	○
Mooney Mooney AA								○
Pelican Island NR		⊙						○
Riley's Island NR		⊙						○
Wamberal Lagoon NR		⊙						⊙
Wambina NR		⊙		○				○
Saratoga Island NR		○						○
Palm Grove NR	○	○						○
HUNTER RANGE AREA								
Wollemi NP	●	○	○	⊙	⊙		⊙	⊙
Yengo NP	●	○	⊙	⊙				⊙
Mt Royal NP	●	⊙	○		⊙			○
Werekata NP and SCA	●	●	⊙	⊙			○	○

	Wild Dog	Fox	Feral Pig	Rabbit	Horse /Cattle	Goat	Deer	Cat
Manobalai NR	●	●		⊙				○
Sugarloaf SCA (Gazetted 1.7.07)	○	●	○					○
Belford NR		●		⊙				○
Appletree AA	●	○		⊙	⊙			○
NEWCASTLE AREA								
Awabakal NR		●		⊙				○
Blue Gum Hills Regional Park		●						○
Glenrock State Conservation Area		●						○
Hunter Wetlands NP		●	○					○
Pambalong NR		●						○

Table 2. Plant Diseases

	Myrtle Rust	Phytophthora Cinnamomi
LAKES AREA		
Munmorah SCA		
Bird Island NR		
Colongra Swamp NR		
Lake Macquarie SCA		
Moon Island NR		
Pulbah Island NR		
Tingara Heights NR		
Tuggerah NR and SCA		
Watagans NP	⊙	
Wollarah NP		
Wyrribalong NP		
Jilliby SCA	○	
YANGO AREA		
Dharug NP	⊙	⊙
Finchley AA		
Parr SCA		
Popran NP		
Yengo NP	⊙	
GOSFORD AREA		
Bouddi NP	⊙	
Brisbane Water NP		
Cockle Bay NR		
Howe AA		
Mooney Mooney AA		
Pelican Island NR		
Riley's Island NR		
Wamberal Lagoon NR	⊙	
Wambina NR	○	

	Myrtle Rust	Phytophthora Cinnamomi
Saratoga Island NR		
Palm Grove NR	⊙	
HUNTER RANGE AREA		
Wollemi NP		
Yengo NP		
Mt Royal NP		
Werekata NP and SCA	⊙	
Manobalai NR		
Sugarloaf SCA (Gazetted 1.7.07)		
Belford NR		
Appletree AA		
NEWCASTLE AREA		
Awabakal NR		
Blue Gum Hills Regional Park		
Glenrock SCA		
Hunter Wetlands NP	⊙	
Sugarloaf SCA (Gazetted 1.7.07)		
Pambalong NR		

DRAFT

- Denotes established widespread infestation throughout a reserve
- Denotes scattered infestation throughout a reserve
- ⊙ Denotes isolated infestation restricted to a small geographic area of a reserve (encompassing new weed incursions)

Table 3. Weeds

	Bitou Bush	Lantana	Blackberry	Asparagus	Bridal Creeper	Privet trees, Fruit, Cape Ivy	Crofton Weed	Willow	Xanthium species	exotic vines	Acacia , Robinia	Opuntia sp. Tree of Heaven	LSF Grass, Aquatic weeds	St Johns Wort	Mother of Millions	Wild tobacco Green Cestrum	African olive	Whiskey grass Coolatai grass	Watsonia lily Garden bulbs
LAKES AREA																			
Munmorah SCA	●	●	⊙				⊙	⊙		●	⊙	⊙	●					●	⊙
Bird Island NR		○																	
Colongra Swamp NR		●	○				⊙	⊙					⊙						
Lake Macquarie SCA	●	●	⊙	⊙		⊙	⊙			⊙		⊙			⊙			●	
Moon Island NR	●	●	○				○			○									
Pulbah Island NR	●	●		⊙								⊙							
Tingara Heights NR		⊙	○		⊙	⊙	⊙	⊙		⊙	○			⊙	○				
Tuggerah NR and SCA		○	○	⊙		○	⊙	⊙	○	⊙		○	●		○	○			○
Watagans NP		●	○			⊙	⊙		○			○			○		●		
Wyrribalong	●	○	○	●	⊙	⊙	⊙			●		○	⊙						
Jiliby SCA		⊙	⊙				●											⊙	⊙
Wallarrah NP	○	⊙																	
Sugarloaf SCA		○	⊙									⊙							
YANGO AREA																			
Dharug NP		⊙	○	⊙	⊙		⊙			⊙		⊙			⊙	⊙		⊙	
Finchley AA																			
Parr SCA		⊙	⊙	⊙								⊙							
Popran NP		⊙	○			⊙	●			○								⊙	
Yengo NP		⊙	○					⊙	○	⊙	⊙	⊙	⊙	⊙	⊙	○			
GOSFORD AREA																			

	Bitou Bush	Lantana	Blackberry	Asparagus	Bridal Creeper	Privet trees, Fruit,	Cape Ivy	Crofton Weed	Willow	Xanthium species	exotic vines	Acacia , Robinia	Opuntia sp.	Tree of Heaven	LSF Grass,	Aquatic weeds	St Johns Wort	Mother of Millions	Wild tobacco	Green Cestrum	African olive	Whiskey grass	Coolatai grass	Watsonia lily	Garden bulbs	
Bouddi NP	●	●	○	●	○	○	○	○			○	○	○		○			○	○	○		○	○	○	○	
Brisbane Water NP	○	○	○			○		●				○						○	○			○				
Cockle Bay NR		●	○	●	○			○	○									○	○					○		
Howe AA																										
Mooney Mooney AA																										
Pelican Island NR	○	○		○	○													○	○			○	○	○		
Riley's Island NR	○	○	○	○	○	○													○			○	○	○		
Wamberal Lagoon NR	●	●	○	○				○		○								○	○				○	○		
Wambina NR	○	●	○	○		○		○		○	○								○							
Saratoga Island NR	○																									
Palm Grove NR		○	○			○		○			○								○							
HUNTER RANGE AREA																										
Wollemi NP		○	○	○	○	○	○		○	○	○	○	○	○			○	○	○							
Yengo NP		○	○		○	○										○										
Mt Royal NP								○																		
Werekata NP		○	○		○	○		○		○				○	○			○	○							
Manobolai NR													○													
Belford NR		○											○					○			○					
Appletree AA													○													
NEWCASTLE AREA																										
Awabakal NR	●	○	○	○				○	○		○		○	●												
Blue Gum Hills Regional Park	○	●	○			○		○				●	○		○											
Glenrock SCA	●	●	○	●		●	○	●			○	●	○	●												
Hunter Wetlands NP	●	○	○					○		●		○	○													
Pambalong NR		○	○							○		○														

9. Appendices

Regional support and coordination of pest programs

The role and charter of the position senior ranger (pests) is to coordinate and support five local Area offices (Gosford, Yango, Newcastle, Lakes and Hunter Range) in the function of pest management planning and the implementation of local Area programs. The position of senior Ranger (pests) sits within the Operation and Coordination unit (OSCU) in the regional office at Gosford.

In addition to the function of senior ranger (pests), CCHR also have three volunteer and bushcare coordinators in the Area of Gosford, Lakes and Newcastle. The role of these three key positions is to manage all weeds related functions, including the coordination of the regions Bushcare volunteer programs in their respective Areas.

Bushcare: CCHR, have over two hundred volunteers in twenty groups and are a invaluable resource. Volunteers consist of a combination of corporate, Landcare ,green jobs, university, Conservation Volunteers Australia and TAFE students. Bushcare coordinators target bush regeneration works to be undertaken at key sites throughout the region with commending results being observed.

Threatened species management: The region also has many rare of threatened species that can be found inhabiting many of our coastal and escarpment ecosystems. The Fox threat Abatement program in CCHR focuses on the recovery of the Brush Tailed Rock Wallaby and iconic species that we hope will benefit from broad scale fox control. NPWS also work to aid the recovery of many other species of animals and plants.

Wild dog management: Efforts to improve the management of wild dogs in CCHR, has seen NPWS become a committed partner in the Mid Coast LHPA WDMP and also the Cumberland WDMP. NPWS CCHR recognises the impacts that wild dogs have on the community

Noxious Weeds Classification/Control Class

Noxious Weeds Listed in the Region and their Classification 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.
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 a range of restrictions on their sale and movement exist.
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 and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*
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 of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.
NOTE: All Class 1, 2 and 5 weeds are prohibited from sale in NSW. * In some cases the following wording has also been inserted "the plant may not be sold, propagated or knowingly distributed."		

Noxious Weed Control Class by Local Authority Area.

Common name (Scientific name)	Cessnock	Gosford	Lake Macquarie	Maitland	Muswellbrook	Wyong	Singleton	Hawkesbury
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
Aleman grass (<i>Echinochloa polystachya</i>)		2	2	2				
Alligator weed (<i>Alternanthera philoxeroides</i>)	2	2	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		
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
Broad-leaf pepper tree (<i>Schinus terebinthifolius</i>)		3	3	3				
Broomrapes (<i>Orobanche</i> sp.)	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 broom (<i>Genista monspessulana</i>)		2	2	2				
Cape tulip (<i>Homeria</i> spp.)	4					4		4
Cayenne snakeweed (<i>Stachytarpheta 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 celtis (<i>Celtis sinensis</i>)		3	3	3				
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
Corn sowthistle (<i>Sonchus arvensis</i>)	5	5	5	5	5	5	5	5
Croton weed (<i>Ageratina adenophora</i>)		4	4	4		4		
Dodder (<i>Cuscuta</i> spp.)	5	5	5	5	5	5	5	5
East Indian hygrophila (<i>Hygrophila polysperma</i>)	3	3	3	3	4	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
Galenia (<i>Galenia pubescens</i>)					4		4	
Gallon's curse (<i>Cenchrus biflorus</i>)	5	5	5	5	5	5	5	5
Giant Parramatta grass (<i>Sporobolus fertilis</i>)	3	3	4	4	3	3	3	3
Giant rat's tail grass (<i>Sporobolus pyramidalis</i>)		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
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		
Harrisia cactus (<i>Harrisia</i> sp.)	4	4	4	4	4	4	4	4
Hawkweeds (<i>Hieracium</i> spp.)	1	1	1	1	1	1	1	1
Hemlock (<i>Conium maculatum</i>)								4
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

Common name (Botanic name)	Cessnock	Gosford	Lake Macquarie	Maitland	Muswellbrook	Wyong	Singleton	Hawkesbury
Hydrocotyle (<i>Hydrocotyle ranunculoides</i>)	1	1	1	1	1	1	1	1
Hygrophila (<i>Hygrophila costata</i>)	2	2	2	2	1	2	1	2
Hymenachne (<i>Hymenachne amplexicaulis</i> & hybrids)	1	1	1	1	1	1	1	1
Johnsons grass (<i>Sorghum halepense</i>)	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
Long-style feather grass (<i>Pennisetum villosum</i>)					4			
Mesquite (<i>Prosopis</i> spp.)					2		2	2
Mexican feather grass (<i>Nassella tenuissima</i>)	1	1	1	1	1	1	1	1
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
Mimosa (<i>Mimosa pigra</i>)	1	1	1	1	1	1	1	1
Mistflower (<i>Ageratina riparia</i>)						4		
Mintweed (<i>Salvia reflexa</i>)			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	3	3	3	4	3	4	3
Nodding thistle (<i>Carduus nutans</i>)	4	4		4	4		4	4
Pampas grass (<i>Cortaderia</i> spp.)	4	4	4	4	4	4	4	4
Parkinsonia (<i>Parkinsonia aculeata</i>)					2		2	2
Parthenium weed (<i>Parthenium hysterophorus</i>)	1	1	1	1	1	1	1	1
Patersons curse (<i>Echium</i> spp.)	4	4	4	4	4	4		4
Perennial ragweed (<i>Ambrosia psilostachya</i>)					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
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	2	3	2	2
Scotch broom (<i>Cytisus scoparius</i>)	4	4			4		4	4
Scotch thistles (<i>Onopordum</i> spp.)					4		4	
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	3	4	3	3
Siam weed (<i>Chromolaena odorata</i>)	1	1	1	1	1	1	1	1
Silk forage sorghum (<i>Sorghum</i> sp. hybrid cultivar)					4			
Silver leaf nightshade (<i>Solanum elaeagnifolium</i>)					3		3	4
Smooth-stemmed turnip (<i>Brassica barrelieri</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
Spiny burrgrass (<i>Cenchrus longispinus</i>)	4	4	4	4	4	4		4
Spiny emex (<i>Emex australis</i>)	4					4		
Spotted knapweed (<i>Centaurea longispinus</i>)	1	1	1	1	1	1	1	1
St Johns wort (<i>Hypericum perforatum</i>)	3	3	3	3	3	4	4	4
Star thistle (<i>Centaurea calcitrapa</i>)					4			4
Sweet briar (<i>Rosa rubiginosa</i>)					4		4	4
Texas blueweed (<i>Helianthus ciliaris</i>)	5	5	5	5	5	5	5	5
Tree of heaven (<i>Ailanthus altissima</i>)								4
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