NSW GOVERNMENT
Office of Environment & Heritage
NSW National Parks & Wildlife Service

Regional Pest Management Strategy 2012–17: Western Rivers Region

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

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

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Cover photos, main: river red gums (S Cohen/OEH); small: equipment used for Yathong Fox TAP program (R Hurst/OEH); removing African boxthorn in Oolambeyan National Park (J Balnaves/OEH); aerial weed control preparation in Eusdale Nature Reserve (Jason Neville/OEH); feral pigs in Yanga National Park (J Balnaves/OEH).

Summary

Western Rivers Region has evolved over recent years due to new reserve establishment and amalgamations. Part of this process has been the merger of Central West and Riverina regions in 2005, the addition of existing areas (former Cobar Area in 2009), the inclusion of new reserves with direct property purchases, and outcomes from regional forest agreements. These purchases include Oolambeyan Station near Carrathool, Yanga Station near Balranald, Norwood and Darcoola near Maude, and Booligal and Hunthawang Stations on the Lachlan River near Hillston. New reserves also resulted from the transfer of state forests following legislation in 2010 to protect river red gums and south-western cypress.

The reserve conservation network in Western Rivers Region represents the diverse landscapes in western NSW and includes submontane vegetation of Winburndale Nature Reserve and Mount Canobolas State Conservation Area, the extensive mallee woodland communities of Yathong, Nombinnie and Round Hill nature reserves, and the Riverina red gum communities of the Murrumbidgee, Edwards and Murray River systems. Some of the major reserves in this system include the Murray Valley regional and national parks and Yanga National Park.

The Region also has a history of reservation for cultural heritage conservation with Hill End Historic Site, Yuranigh's Grave Aboriginal Historic Site, Snake Rock Aboriginal Area, Mount Grenfell Historic Site, Koonadan Historic Site and a number of proposed Indigenous protected areas including Werai.

It is this complex mosaic of estate, with past land use histories including agricultural and forestry production and remnant vegetation of an 'island' reserve system, that makes the delivery of strategic and coordinated pest management operations a challenge.

To deliver effective pest management programs across the Region a number of significant programs have been established and new programs are being developed to address specific pest management issues, including:

- strategic fox control under the Fox Threat Abatement Plan – Oolambeyan National Park and Yathong, Nombinnie and Round Hill nature reserves
- strategic fox control for threatened species recovery with landholder group participation – Winburndale Nature Reserve, the Palmers Oaky Pest Animal Group, Weddin Mountains National Park and Friends of the Bush Stone-curlew
- strategic fox control for threatened species recovery at Willandra National Park, Ingalba Nature Reserve and Goobang National Park
- strategic, continuous feral pig control at Murrumbidgee Valley National Park – Yanga, Winburndale and Eusdale nature reserves
- strategic and planned feral goat management with the modification of habitat through fencing barriers, closing water points, mustering and live trapping programs on park and with neighbour support as well as aerial control programs, including Cocoparra National Park and Yathong Nature Reserve
- extensive rabbit control programs at Goobang, Lachlan Valley (Kalyarr precinct) and Oolambeyan national parks, in cooperation with Livestock Health and Pest Authorities coordinated landscape programs)
- initiation of coordinated noxious weed control programs to work on hotspot weed issues, including working with the Macquarie Valley Weeds Advisory Committee and Western Riverina Noxious Weeds Advisory Group.

Contents

Abbreviations

AA	Aboriginal area
BPWW	Biodiversity Priorities for Widespread Weeds (BPWW CC1-6 refers to control categories within BPWW Statewide Framework[1])
CAP	catchment action plan
CEEC	critically endangered ecological community
CMA	catchment management authority
EEC	endangered ecological community
FAAST	feral animal aerial shooting team
HS	historic site
KCR	karst conservation reserve
KTP	key threatening process
LHPA	Livestock Health and Pest Authority
NP	national park
NR	nature reserve
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PAS	Priorities Action Statement
PWG	Parks and Wildlife Group
PWIS	Pest and Weed Information System
RP	regional park
SCA	state conservation area
TAP	threat abatement plan
TSC Act	*Threatened Species Conservation Act 1995*

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

1 Introduction

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

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

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

This document is the Western Rivers Region Pest Management Strategy and contains regionally specific components including prioritised pest programs.

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

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

2 Regional overview

Western Rivers Region manages approximately 669,104 ha of the reserve system in the Central Western and Riverina landscapes. The Region stretches from Bathurst in the east to Balranald in the west, and from north of Cobar to south along the Murray River from Corowa to Swan Hill, covering 24% of NSW. The name for the Region reflects that it includes major stretches of the Lachlan, Murrumbidgee, Edward and Murray Rivers.

The Region contains five bioregions: Cobar Peneplain, Murray Darling Depression, NSW South Western Slopes, Riverina and South Eastern Highlands. The Riverina Bioregion remains one of the more poorly reserved bioregions within NSW, with 3.42% reserved. The reserve system conserves a diversity of plant and animal communities, including subalpine woodlands, dry sclerophyll forests, arid woodlands, mallee, modified grasslands and inland wetlands. There are extensive occurrences of threatened species, and significant Aboriginal and European heritage.

Regional context

The Region is responsible for 66 reserves (with 158 separate land parcels), comprising 13 national parks, three regional parks, 35 nature reserves, eight state conservation areas, five historic sites, one karst conservation area and one Aboriginal area and ungazetted Part 11 lands. The south-western cypress legislation in 2010 has resulted in an additional 40,872 ha in one national park, three state conservation areas and two nature reserves, the largest of which comprises 26 separate blocks across three management areas.

Major reserves include Hill End Historic Site, Mount Canobolas State Conservation Area, Goobang National Park, Oolambeyan National Park, Willandra National Park, Yanga National Park, State Conservation Area and Nature Reserve, Yathong–Nombinnie Nature Reserve and State Conservation Area and Murray Valley National Park. Recent acquisitions include Hunthawang and Mount Grenfell stations.

Community engagement

Regional staff continue to develop important partnerships with reserve neighbours, communities and government and non-government agencies. These include, but are not limited to, the Aboriginal community, local government, Rural Fire Service, Forests NSW, Livestock Health and Pest Authorities (LHPAs), noxious weeds advisory groups, conservation groups, local government and other special interest groups. We continue to learn from individuals and community groups who have a long involvement in the protection and conservation of the Region's natural and cultural heritage.

OEH staff work closely with the Regional Advisory Committee which represents a cross-section of the region's communities. The committee's input provides a community perspective in the regional and reserves operational plans.

The management issues in the Region are:

- implementation of the river red gum and south-western cypress legislations
- increasing engagement with rural stakeholders and traditional owners
- managing the new reserves in Mid West and South West Areas created from former agricultural lands
- developing tourism experiences and opportunities

- conservation of historic heritage at sites and collections at Hill End, Willandra, Oolambeyan, Hunthawang and Yanga
- managing visitation at Mount Canobolas, Yanga, red gum reserves and Hill End
- developing a cohesive regional team at all levels where long distances and isolated work place locations are involved
- balancing the Hill End community needs with the conservation, social and economic values of the village
- appropriate management of environmental water and the contributing impacts of pest and weed populations
- incorporating pest and weed management issues into individual reserve plans and implementing policies and actions
- foster and promote collaborative pest and weed programs with neighbours and other stakeholders to improve effectiveness of programs
- manage the legislative requirements of pest and weed activities
- ensuring application of the most appropriate chemical, pesticide or industry practice for the targeted weed species and similarly, the most appropriate action or program for the pest targeted.

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

Pest management highlights

To deliver effective pest management programs across the Region a number of significant programs have been built and new programs are developing to address very specific pest management issues, some flagship projects include:

- strategic fox control under the Fox Threat Abatement Plan (TAP) – Oolambeyan National Park and Yathong, Nombinnie and Round Hill nature reserves
- strategic fox control for Threatened species recovery with landholder group participation – Winburndale Nature Reserve and the Palmers Oaky Pest Animal Group, Weddin Mountains National Park and Friends of the Bush stone-curlew
- strategic fox control for Threatened species recovery at Willandra National Park and Ingalba Nature Reserve and Goobang National Park
- strategic, continuous feral pig control at Murrumbidgee Valley National Park – Yanga, Winburndale and Eusdale nature reserves
- strategic and planned feral goat management with the modification of habitat through fencing barriers, closing water points and live trapping programs on park and with neighbours support as well as aerial control programs, including Cocoparra National Park and Yathong Nature Reserve

- extensive rabbit control programs at Goobang, Lachlan Valley (Kalyarr precinct) and Oolambeyan national parks (cooperative with Livestock Health and Pest Authority – LHPA – coordinated landscape programs)
- initiation of coordinated noxious weed control programs to work on hot spot weed issues, including working with the Macquarie Valley Weeds Advisory Committee and Western Riverina Noxious Weeds Advisory Group.

3 Regional prioritisation

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

Critical priority

C-TSC (Threatened Species Conservation)

Programs targeting pests which are, or are likely to be, significantly impacting on threatened species, populations or communities. These include the highest priorities identified in the threat abatement plans (TAPs), Priorities Action Statements (PAS) and Biodiversity Priorities for Widespread Weeds (BPWW). For example, undertake fox control at Yathong, Nombinnie and Round Hill nature reserves and Oolambeyan National Park priority site for ground nesting birds – malleefowl and plains-wanderer – as identified in the Fox TAP.

C-HD (Health and Disease)

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

C-EC (Economic)

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

C-NE (New and Emerging)

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

High priority

H-IH (International Heritage)

Programs that target pests that impact significantly on world heritage or international heritage values, for example pest control in Ramsar wetlands of the South West Area, principally the Millewa Precinct of the Murray Valley Regional and National Park.

H-CH (Cultural Heritage)

Programs targeting pests that impact significantly on important cultural heritage values, for example control of feral goats, feral pigs and rabbits where they are inhabiting an area containing important Aboriginal Cultural Heritage, and control of rabbits undermining a historic built heritage. Programs include new works at Mid West Area Mount Grenfell Station Part 11 lands, Central West Area Snake Rock Aboriginal Area, South West Area Lachlan Valley Norwood, Darcoola and Murrumbidgee Valley (Yanga) national parks and Werai Indigenous Protected Area.

Medium priority

M-WNH (Wilderness and National Heritage)

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

M-RA (Recreation and Aesthetic Values)

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

M-CP (Cooperative Programs)

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

M-II (Isolated Infestations)

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

Lower priority

L-LP (Localised Programs)

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

L-PP (Previous Programs)

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

In some circumstances, new programs may be introduced, or priority programs extended to target pests where a control window of opportunity is identified. These may arise where burnt areas become more accessible for ground control of weeds, where drought makes control of feral pigs and feral goats more efficient because they congregate in areas where water is available, or when a new biocontrol agent becomes available. Future priorities for pest control will need to reflect changes in the distribution, abundance or impacts of pests that may occur in response to environmental changes, including climate change. NPWS is supporting research to understand the interaction between climate change, pests and biodiversity.

These park management programs will be orientated to addressing resource auditing requirements in many of the new reserves of the Central West Area – Cypress woodlands acquisition process, and Mid West and South West Areas new reserve acquisitions under the river red gum conservation strategy.

4 Prioritised regional pest programs

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

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Central West	Winburndale NR	73 – Clear, Baldhill Creek upper	Blackberry	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC and Bursaria – habitat for purple copper butterfly (BPWW – CC1)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Winburndale NR	72 – Clear Creek Ruins	Blackberry, serrated tussock, St John's wort	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC, riparian vegetation – riparian *Allocasuarina cunninghamii* (BPWW – CC1)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Goobang NP	1117 – Lake Metcalfe	Blackberry, St John's wort, horehound, khaki weed, sweet briar, Paterson's curse, African boxthorn, Californian stinkweed	Inland Grey Box Woodland EEC (TSC-e) (BPWW – CC*)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Winburndale NR	2680 – Mount Horrible	Blackberry, St John's wort, serrated tussock, broom, gorse, willow, tree of heaven	Mountain Gum/ Ribbon Gum EEC and Bursaria – habitat for purple copper butterfly; BPWW – CC2	Asset protection	Herbicide application – high volume hand gun	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Central West	Winburndale NR	98 – Palmers Oaky Creek	Blackberry, St John's wort, serrated tussock, broom, gorse, willow, weeds of opportunity	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC, White Box Yellow Box Blakely's Red Gum Woodland EEC, riparian vegetation – moist forest to dry sclerophyll and grassy understorey and a different Bursaria and various acacias (BPWW – CC2)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Borenore KCR	1110 – Eastern section	Blackberry, St John's wort, serrated tussock, hawthorn, sweet briar	White Box Yellow Box Blakely's Red Gum Woodland EEC (BPWW – CC1)	Asset protection	Mechanical slashing, herbicide application – high volume hand gun	C-TSC
Central West	Mount Canobolas SCA	93 – *Eucalyptus canobolensis* area	Blackberry, St John's wort, serrated tussock, hawthorn, sweet briar	White Box Yellow Box Blakely's Red Gum Woodland EEC, *Eucalyptus canobolensis* (EPBC-v; TSC-v) (BPWW – CC2)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Eusdale NR	109 – Western boundary	Blackberry, St John's wort, serrated tussock, hawthorn, sweet briar, weeds of opportunity, horehound	White Box Yellow Box Blakely's Red Gum Woodland EEC (BPWW – CC3)	Asset protection	Herbicide application – high volume hand gun, aerial spot spraying	C-TSC
Central West	Mount Canobolas SCA	92 – *Eucalyptus saxicola* site	Blackberry, St John's wort, serrated tussock, Paterson's curse, pine wildlings	*Eucalyptus saxicola* (BPWW – CC3)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Winburndale NR, Eusdale NR, Mount Canobolas SCA	WRR Annual FAAST program	Feral goat, feral pig, feral deer	White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	Aerial Shooting	C-TSC
Central West	Eusdale NR	Eusdale	Feral pig	White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	1080 baiting and live trapping with neighbours	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Central West	Goobang NP	Goobang NP	Feral pig	Box Gum Woodland EEC	Asset protection	1080 baiting, trapping	C-TSC
Central West	Mount Canobolas SCA	Mount Canobolas	Feral pig	White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	1080 baiting, trapping	C-TSC
Central West	Winburndale NR	Winburndale NR	Feral pig	White Box Yellow Box Blakely's Red Gum Woodland EEC	Asset protection	1080 bating, trapping	C-TSC
Central West	Goobang NP, Nangar NP, Conimbla NP, Weddin Mountains NP, Tollingo and Woggoon NR	WRR annual FAAST	Feral pig, feral goat	Grassy Box and Gum Woodland EEC, pine and eucalypt woodlands	Asset protection	Aerial Shooting	C-TSC
Central West	Winburndale NR	111 – Winburndale Rivulet	Gorse, blackberry, willow	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC, riparian vegetation – riparian *Allocasuarina cunninghamii* (BPWW – CC2)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Goobang NP	1126 – Wanda Wandong campground	Khaki weed, Paterson's curse, thistle	Inland Grey Box Woodland EEC (TSC-e) (BPWW – CC1)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Goobang NP	Goobang NP	Rabbit	Box Gum Woodland EEC	Asset protection	Static fumigation and rabbit warren destruction by ground ripping	C-TSC
Central West	Weddin Mountains NPs	Weddin Mountains NP	Rabbit	Fuzzy Box Woodland on Alluvial Soils EEC, woodlands and grass communities	Asset protection	Static fumigation and rabbit warren destruction by ground ripping	C-TSC
Central West	Winburndale NR	87 – Mavericks Trail	Serrated tussock	Tablelands Snow Gum EE (BPWW – CC4)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Weddin Mountain NP	1121 – Seaton's farm and Ben Halls campground	St John's wort, Paterson's curse	Fuzzy Box Woodland on Alluvial Soils EEC (TSC-e), bush stone-curlew habitat (TSC-e) (BPWW – CC3)	Asset protection	Herbicide application – high volume hand gun	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Central West	Goobang NP	1109 – Eastern boundary Barber and Bill Henry section	St John's wort, sweet briar, blackberry, blue heliotrope, Paterson's curse, khaki weed, horehound	Conserving the integrity of native vegetation in Goobang NP – mixture of Box Gum Woodland EEC (EPBC-ce; TSC-e) and ironbark (BPWW – CC1)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Goobang NP	1108 – Eastern boundary Belmore and Evandale section	St John's Wort, sweet briar, blackberry, blue heliotrope, Patersons's curse, khaki weed, horehound	Conserving the integrity of native vegetation in Goobang NP, a mixture of Box Gum Woodland EEC (EPBC-ce; TSC-e) and ironbark (BPWW – CC1)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Central West	Winburndale NR	85 – Lagoon Creek	Willow, blackberry, St John's wort, hemlock	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC and Bursaria – habitat for purple copper butterfly (BPWW – CC2)	Asset protection	Herbicide application – high volume hand gun	C-TSC
Mid West	Oolambeyan NP	1156 – Alps Paddock	African boxthorn, horehound, Noogoora burr, Bathurst burr, thistles, devil's claw, thornapple	Myall Woodland EEC, Sandhill Pine EEC (TSC-e), black box woodland (BPWW – CC1)	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	C-TSC
Mid West	Willandra NP	1118 – Open Areas	African boxthorn, horehound, Noogoora burr, Bathurst burr, thistles, devil's claw, thornapple	Conservation of habitat for plains-wanderer (EPBC-v; TSC-e), cotton bush, grassland (BPWW – CC2)	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	C-TSC
Mid West	Cocoparra NP, Cocopara NR	Cocoparra	Feral goat	*Pomadrris cocoparrana* (ROTAP), Inland Grey Box Woodland EEC	Asset protection	Cooperative passive live trapping program with neighbours, also aerial control programs	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Yathong, Round Hill NRs, Nombinnie NR and SCA	Yathong, Nombinnie	Feral goat	Curly-bark wattle (*Acacia currannii*), mallee fauna: malleefowl, shy heathwren, Gilbert's whistler, red-lored whistler, chestnut quail-thrush, southern scrubwren and *Ningaui yvonneae* (Marsupialia: Dasyuridae), declining woodland birds: grey-crowned babbler, brown treecreeper, speckled warbler, varied sittella, hooded robin	Asset protection	Live trapping, shooting, mustering	C-TSC
Mid West	Oolambeyan NP	Oolambeyan	Fox	Plains-wanderer	Asset protection	1080 at bait stations	C-TSC
Mid West	Yathong, Round Hill NRs, Nombinnie NR and SCA	Central Mallee	Fox	Malleefowl, southern scrub robin and chestnut quail thrush, red-lored whistler, Gilbert's whistler. Declining woodland birds: grey-crowned babbler, brown tree creeper, speckled warbler, varied sittella, hooded robin. *Ningaui yvonneae* (Marsupialia: Dasyuridae)	Asset protection	Aerial transect 1080 baiting complemented with 1080 poison at bait stations	C-TSC
Mid West	Murrumbidgee Valley NP – MIA1, MIA2 and Cuba	2679 – Sandhills	Horehound, nightshade spp, boxthorn and sweet briar	Sandhill Pine Woodland EEC (BPWW – CC*)	Asset protection	Herbicide application and mechanical removal	C-TSC
Mid West	Cocoparra NP, Cocopara NR	1261 – Woolshed Flat	Horehound, Paterson's curse, bridal creeper	Valley floor – originally grassland. Regenerating back to grassy woodland – bimble box, cypress, yellow box, wilga, rosewood, hopbush (BPWW – CC3)	Asset protection	Strategic mechanical control and herbicide application	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Oolambeyan NP	1197 – Home site	Naturalised grasses (such as wild oats, thread iris, rye), African boxthorn, Bathurst burr	Grasslands, black box depressions and boree woodland – Myall Woodland EEC (TSC-e), grassland dominant (BPWW – CC2)	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	C-TSC
Mid West	Cocoparra NP, Cocopara NR	Cocoparra	Rabbit	*Pomadrris cocoparrana* (ROTAP), Inland Grey Box Woodland EEC	Asset protection	Rabbit warren destruction by ground ripping, strategic use of pesticide (Pindone and 1080)	C-TSC
Mid West	Oolambeyan NP	Northern Paddocks	Rabbit	Sandhill Pine Woodland EEC in the Riverina; Murray–Darling Depression and NSW South Western Slopes bioregions	Asset protection	Mechanical rabbit warren destruction, strategic use of pesticide (Pindone and 1080)	C-TSC
Mid West	Willandra NP	Willandra	Rabbit	Sandhill Pine Woodland EEC, shrub regeneration	Asset protection	Mechanical rabbit warren destruction, strategic use of pesticide (Pindone and 1080)	C-TSC
Mid West	Murrumbidgee Valley NP	2625 – MIA1 sand hills	Spiny burrgrass	Sandhill Pine Woodland EEC (BPWW – CC4)	Asset protection	Herbicide application and mechanical removal, exclusion fencing, possible ecological burning	C-TSC
South West	Murrumbidgee Valley NP	1262 – Yanga Lake and ephemeral wetlands	African boxthorn	Ephemeral lake – waterbirds, red gums surrounding the lake (BPWW – CC1)	Asset protection	Mechanical removal and herbicide application	C-TSC
South West	Lachlan Valley NP	2645 – Booligal Station	African boxthorn	Black box woodland, declining woodland birds (TSC-e), grey-crowned babbler, brown treecreeper, hooded robin, varied sittella (BPWW – CC2)	Asset protection	Mechanical control	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
South West	Lachlan Valley NP - Kalyarr	1184 – Darcoola Sand Hills	African boxthorn	Sandhill Pine Woodland EEC, pied honeyeater (TSC-v) (BPWW –CC3)	Asset protection	Mechanical control and herbicide application via high volume hand gun Potential for biological control released	C-TSC
South West	Murray Valley NP/RP	2681 – Murray Valley	African Boxthorn	Red gum, black box, Lignum and Myall woodland and Sand hill pine EEC (BPWW – CC*)	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	C-TSC
South West	The Rock Nature Reserve	1196 – Rocky outcrops	Bridal creeper	*Senecio garlandii* (EPBC-v; TSc-v) and glossy black cockatoo habitat (TSC-v) (BPWW – CC1)	Asset protection	Mechanical control and herbicide application	C-TSC
South West	The Rock Nature Reserve	1229 – Picnic area flat, low area	Bridal creeper, Paterson's curse, St John's wort	Inland Grey Box Woodland EEC (TSC-e) (BPWW – CC1)	Asset protection	Mechanical control and herbicide application	C-TSC
South West	Murray Valley NP, RP	Aquatic and ephemeral systems	European carp (noxious fish class 3 NSW)	Ramsar site and nationally significant wetland protecting trout cod, Macquarie perch (TSC-e), Murray hardyhead and Murray cod (TSC-v)	Asset protection	Adaptive Management Unit program leader, mechanical extraction through approved fish trap	C-TSC
South West	Murrumbidgee Valley NP – Yanga	Aquatic and ephemeral systems	European carp (noxious fish class 3 NSW)	Listed in the Directory of Important Wetlands of Australia protecting trout cod, Macquarie perch (endangered), Murray hardyhead and Murray cod (vulnerable), southern bell frog	Asset protection	Mechanical extraction through approved fish trap	C-TSC
South West	Murrumbidgee Valley NP, SCA, NR	Yanga	Feral pig, deer	Southern bell frog, migratory wetland birds	Asset protection	Baiting (pigs only), shooting, trapping	C-TSC
South West	Murray Valley RP	2624 – Millewa precinct	Patterson's curse	Sandhill Pine Woodland EEC (TSC-e) (BPWW - CC3)	Asset protection	Biocontrol	C-TSC

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
South West	Murrumbidgee Valley NP, SCA, NR	Yanga	Rabbit	Sandhill Pine Woodland EEC	Asset protection	Rabbit warren destruction by ground ripping, Pindone and 1080	C-TSC
South West	South West Woodlands NR	South West Woodlands	Rabbit	Myall Woodland and Sandhill Pine EECs	Asset protection	Rabbit warren destruction by ground ripping, Pindone and 1080	C-TSC
South West	Murray Valley NP, RP	Sandhills and wetlands	Willow, pines, peppercorn, osage orange, olives	Sandhill Pine Woodland EEC, Ramsar sites in wetlands (BPWW – CC*)	Asset protection	Mechanical removal and selective herbicide	C-TSC
Mid West	Lachlan Valley SCA – Hunthawang, Willandra NP	Heritage gardens and established orchards	Queensland fruit fly		Containment	Specific insecticide control techniques	C-NE
South West	Murray Valley NP, RP	Moira/Millewa	Honey locust		Containment	Determine extent and appropriate management	C-NE
South West	Murrumbidgee Valley NP – Yanga	Yanga Lake and ephemeral wetlands – Tamarix eradication	*Tamarix rammossima*		Eradication	Mechanical and chemical control	C-NE
Central West	Hill End Historic Site	Hill End Historic Site	St John's wort, serrated tussock, Paterson's curse, exotic grasses	Hill End Historic Site	Asset protection	Mechanical slashing, herbicide application – high volume hand gun	H-CH
Mid West	Yathong Nature Reserve	2597 – Homestead precinct	African boxthorn	Homestead precinct	Asset protection	Chemical application by low pressure spot gun and mechanical removal	H-CH

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Mount Grenfell Historic Site	Mount Grenfell Historic Site	African boxthorn, Bathurst burr, Noogoora burr, nodding thistle, Paterson's curse, onion weed, rosy dock	Significant cultural sites, poplar box and western red box open woodland, western red and white cypress pine open woodland, mulga and grey mallee shrubland	Asset protection	Strategic application of herbicide via boom and high volume hand gun	H-CH
Mid West	Mount Grenfell HS and Part 11 Lands	Mount Grenfell	Feral goats	Significant cultural sites, semi-arid shrublands, wooded grasslands, water courses and significant cultural sites	Asset protection	Live trapping, mustering and shooting	H-CH
Mid West	Mount Grenfell HS and Part 11 Lands	Mount Grenfell	Feral pig	Significant cultural sites, semi-arid shrublands, wooded grasslands, water courses and significant cultural sites	Asset protection	1080 at bait stations, strategic live trapping with neighbours	H-CH
Central West	Tollingo and Woggoon NR	Boundary and internal trails	Feral pig	Threatened mallee birds: malleefowl, shy heath wren, southern scrub robin, chestnut quail-thrush	Asset protection	1080 at bait stations	M-CP
Central West	Goobang NP	Goobang NP	Fox	Native fauna	Asset protection	1080 at bait stations	M-CP
Central West	Mount Canobolas SCA	Mount Canobolas	Fox	Native fauna	Asset protection	1080 baiting	M-CP
Central West	Mullion Range SCA	Mullion Range	Fox	Native fauna including the yellow footed antechinus	Asset protection	Strategic application of 1080	M-CP
Central West	Tollingo and Woggoon NR	Boundary and internal trails	Fox	Malleefowl, shy heath wren, southern scrub robin, chestnut quail-thrush and other native fauna	Asset protection	1080 at bait stations	M-CP
Central West	Weddin Mountain NP	Weddin Mountain NP	Fox	Bush stone-curlew recovery and other native fauna	Asset protection	1080 at bait stations	M-CP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Central West	Winburndale NR	Winburndale NR	Fox	Powerful owl recovery, small to medium sized fauna including the yellow footed antechinus	Asset protection	Strategic application of 1080, continue participation with Palmers Oaky Pest Animal Group	M-CP
Central West	Nangar NP	Dripping Rock	Rabbit	Woodlands and grass communities	Asset protection	Static fumigation and rabbit warren destruction by ground ripping	M-CP
Central West	Eusdale NR	77 – Eusdale Creek	Scotch broom, blackberry, serrated tussock, St John's wort	Whole creek line is contained within park 20–100 m wide. Moist forest into dry forest system	Asset protection	Herbicide application – high volume hand gun, aerial spot spraying	M-CP
Central West	Eusdale NR	102 – Southern	Serrated tussock, St John's wort, blackberry, Scotch broom	Peppermints, mountain gum, dry sclerophyll and themeda grassland	Asset protection	Herbicide application – high volume hand gun, aerial spot spraying	M-CP
Mid West	Oolambeyan NP	1201 – Jacksons	African boxthorn	Sandhill Pine Woodland (TSC-e), Myall Woodland EECs (TSC-e), habitat for threatened species such as painted honeyeater (TSC-v) and superb parrot (EPBC-v; TSC-v), BPWW – CC3	Asset protection	Mechanical control and Herbicide application via boom and high volume hand gun	M-CP
Mid West	Oolambeyan NP	1202 – James	African boxthorn	Sandhill Pine Woodland (TSC-e) and Myall Woodland EECs (TSC-e), habitat for threatened species such as painted honeyeater (TSC-v) and superb parrot (EPBC-v, TSC-v), BPWW – CC3	Asset protection	Mechanical control and Herbicide application via boom and high volume hand gun	M-CP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Oolambeyan NP	1212 – Millers	African boxthorn	Sandhill Pine Woodland (TSC-e) and Myall Woodland EECs (TSC-e), habitat for threatened species such as painted honeyeater (TSC-v) and superb parrot (EPBC-v; TSC-v). BPWW – CC3	Asset protection	Mechanical control and Herbicide application via boom and high volume hand gun	M-CP
Mid West	Oolambeyan NP	1232 – Powers	African boxthorn	Sandhill Pine Woodland (TSC-e) and Myall Woodland EECs (TSC-e). Habitat for threatened species such as painted honeyeater (TSC-v) and superb parrot (EPBC-v, TSC-v), BPWW – CC3	Asset protection	Mechanical control and Herbicide application via boom and high volume hand gun	M-CP
Mid West	Oolambeyan NP	1237 – Ridge	African boxthorn	Sandhill Pine Woodland (TSC-e) and Myall Woodland EECs (TSC-e), habitat for threatened species such as painted honeyeater (TSC-v) and superb parrot (EPBC-v, TSC-v), BPWW – CC3	Asset protection	Mechanical control and Herbicide application via boom and high volume hand gun	M-CP
Mid West	Quanda NR	2608 – Quanda NR	Bathurst burr, Noogoora burr, thistle, prickly pear, pepper tree	Old growth mallee - unburnt for 100 years. Important part of a wildlife corridor. Remnant - all surrounding areas cleared. Cultural significance - scar trees.	Asset protection	Strategic application of herbicide via boom and high volume hand gun	M-CP
Mid West	Murrumbidgee Valley NP/RP/NR	Murrumbidgee Riparian zone	Boxthorn, mesquite, European olive, sweet briar, willow, date palm, ossage, orange, pepper corn, white cedar, silky oak, domestic fruit trees	Riparian landscapes including river red gum (BPWW – CC*)	Asset protection	Mechanical control and herbicide application	M-CP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Lachlan Valley SCA – Hunthawang	Hunthawang	Feral goat	Weeping Myall Woodland, Sandhill Pine Woodland EECs, open grasslands	Asset protection	Trapping, mustering and shooting	M-CP
Mid West	Lachlan Valley SCA – Hunthawang	Hunthawang	Feral pig	Riparian landscapes including river red gum	Asset protection	1080 bait stations, trapping and shooting techniques	M-CP
Mid West	Yathong, Round Hill NRs, Nombinnie NR and SCA	Central Valley	Feral pig	Woodlands communities and erosion control	Asset protection	1080 at bait stations, strategic live trapping with neighbours	M-CP
Mid West	Ingalba NR	Ingalba	Fox	*Antechinus flavipes*: isolated local population, native fauna	Asset protection	1080 bait stations	M-CP
Mid West	Murrumbidgee Valley NP, RP and NR	Willbriggie	Fox	Bush stone-curlew (TSC-e)	Asset protection	1080 bait stations	M-CP
Mid West	Murrumbidgee Valley NP, RP and NR	MIA1	Fox	Bush stone-curlew (TSC-e)	Asset protection	1080 bait stations	M-CP
Mid West	Willandra NP	Willandra	Fox	Plains-wanderer	Asset protection	1080 at bait stations	M-CP
Mid West	Lachlan Valley SCA – Hunthawang	Hunthawang	Rabbit	Sandhill Pine Woodland, Myall Woodland EECs	Asset protection	Harbour destruction through rabbit warren ripping	M-CP
Mid West	Yathong, Nombinnie, Round Hill NRs	Yathong	Rabbit	Semi-arid woodlands, threatened woodland birds: grey-crowned babbler, brown tree creeper, speckled warbler, varied sittella, hooded robin	Asset protection	Rabbit warren destruction by ground ripping	M-CP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Yathong Nature Reserve	Yathong NR	Thorn apple	Bimble box open woodland, red box woodland, threatened woodland birds: grey-crowned babbler, brown tree creeper, speckled warbler, varied sittella, hooded robin	Asset protection	Biological control	M-CP
South West	Murray Valley NP, RP and Werai Group	Murray Valley and Werai	Boxthorn	River red gum areas, box woodlands and Sandhill Pine Woodland EEC	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	M-CP
South West	South West Woodland NR, Booroorban, Edgar, Mairjimmy, Berrigan, Kulki, Lake Urana NR	South West Woodland	Boxthorn	Blackbox, Lignum and Myall woodland and Sandhill Pine Woodland EEC	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	M-CP
South West	Murray Valley NP, RP and Werai Group	Murray Valley	Feral pig	Aquatic ecosystems	Asset protection	1080 at bait stations, strategic live trapping with stakeholders, shooting	M-CP
South West	Murray Valley NP, RP and Werai Group	Murray Valley and Werai	Fox	River red gum areas which include colonial bird nesting sites and aquatic habitats with tortoise breeding sites	Asset protection	1080 at bait stations	M-CP
South West	Murray Valley NP, RP and Werai Group	Murray Valley	Sagittaria	Watercourses in the red gum wetlands, Ramsar site	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	M-CP
Mid West	Lachlan Valley SCA – Hunthawang	Hunthawang	Deer	Riparian landscapes including river red gum	Asset protection	Aerial and ground shooting	L-LP
Mid West	Willandra NP	Willandra	Feral goat	Black box riparian landscapes	Asset protection	Trapping, mustering and shooting	L-LP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
Mid West	Willandra NP	Willandra	Feral pig	Black box riparian landscapes, grasslands, canegrass, saltbush and lignum communities	Asset protection	Trapping, 1080 bait stations and shooting	L-LP
Mid West	Lachlan Valley SCA – Hunthawang	Hunthawang	Fox	Riparian landscapes including river red gum	Asset protection	1080 bait stations	L-LP
Mid West	Murrumbidgee Valley NP, RP and NR	MIA1, MIA2 and MIA3	Horehound and Patterson's curse	Sandhill Pine Woodland EEC	Asset protection	Potential release of biological control agent	L-LP
Mid West	Oolambeyan NP	1157 – Arnolds	Naturalised grasses (wild oats, thread iris, rye), African boxthorn, Bathurst burr	Myall Woodland EEC, grasslands (BPWW – CC6)	Asset protection	Herbicide application	L-LP
Mid West	Oolambeyan NP	1188 – Four Corners	Naturalised grasses (wild oats, thread iris, rye), African boxthorn, Bathurst burr	Myall Woodland EEC, grasslands; (BPWW – CC6)	Asset protection	Herbicide application	L-LP
Mid West	Oolambeyan NP	1195 – Gumtree	Naturalised grasses (wild oats, thread iris, rye), African boxthorn, Bathurst burr	Grasslands (BPWW – CC6)	Asset protection	Herbicide application	L-LP
South West	Murray Valley NP, RP and Werai Group	Murray Valley	Horehound and Patterson's curse	Sandhill Pine Woodland EEC, red gum wetlands	Asset protection	Herbicide application via boom and high volume hand gun, biological control	L-LP
South West	Lachlan Valley NP – Booligal	Booligal	Horehound, African boxthorn	Red gum, lignum and saltbush communities	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun, potential for biological control released	L-LP

Area	Reserve(s)	Site name	Target pests or weeds	Asset at risk	Aim of Control	Action	Priority
South West	Lachlan Valley NP – Kalyarr	Kalyarr	Horehound, African boxthorn	Saltbush, red gum and black box communities	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun, potential for biological control release	L-LP
South West	Murrumbidgee Valley NP – Yanga	1161 – Big Cultivation	Spiny burrgrass, African boxthorn	Grassy woodland communities (BPWW – CC4)	Asset protection	Chemical control – herbicide control via boom applications	L-LP
Mid West	Yathong Nature Reserve	2596 – Homestead creek	African boxthorn	Bimblebox open woodland, red box woodland, regenerating acacia species; BPWW – CC5	Asset protection	Chemical application with low pressure spot gun	L-PP
Mid West	Willandra NP	1128 – Willandra Creek	African boxthorn, horehound, Noogoora burr, golden dodder	Black box woodland, riparian vegetation; BPWW – CC5	Asset protection	Mechanical control and herbicide application via boom and high volume hand gun	L-PP
Mid West	Cocoparra NP, Cocopara NR	1198 – Homestead creek	Bridal creeper	Habitat for woodland birds; BPWW – CC2	Asset protection	Strategic mechanical control and herbicide application	L-PP
Mid West	Boginderra Hills NR	Boginderra	St John's wort	White cypress pine (*Callitris columellaris*)	Asset protection	Herbicide application	L-PP

* Not yet ranked as of June 2012

5 Consultation

This report provides the outcomes of the Western Rivers Region stakeholder consultation forum held Wednesday, 31 August 2011 at Bathurst. This forum was held as part of wider stakeholder consultation forums held in 14 NPWS regions across the state to inform the preparation of draft regional pest management strategies. The outcomes of these forums will also be used to provide feedback to a state consultation forum to be held following the regional consultation forums.

The following sections were part of the stakeholder consultation

- What are regional pest management strategies? Their purpose, scope and objectives.
- What informs the preparation of a strategy?
- Key areas covered by a regional pest management strategy.
- Key stages of the consultation process in preparation of a strategy: research and reference, internal consultation, external stakeholder consultation forums, preparation and public exhibition of the draft strategy, receive and review submissions, finalise and publish the strategy.

Questions were asked by attendees to clarify or confirm information provided in the presentation.

Attendance

Despite about 25 invitations being issued, only approximately 12 people attended the consultation, along with six NPWS staff.

Issues raised in the forum

- City people as new rural landholders may not be fully aware of their responsibilities in managing pest plants and animals on their land.
- Weeds
    - Serrated tussock
    - We need better approach to mapping across the landscape
    - If mapping was coordinated, data on weeds could be shared
    - Privacy issues affect information about weeds on properties
    - Some councils never put weed notices on properties
    - Real estate agents can only access weed notices to see what weed issues exist on properties for sale
- Animal pests
    - Feral pigs and their pests
    - Deer are an emerging problem
    - Foxes
    - Dogs, both wild dogs and dogs lost by pig hunters
    - Sleeper pests, cats, deer and mice
    - Flying foxes are native pests off park, and being a threatened species impacts on control options, but there are increasing losses on orchards
    - There is a potential for kangaroos to become a pest for graziers

Associated issues

- Communication
- NPWS needs communication with neighbours at community forums
- NPWS messages need to be 'tweaked' to suit each audience of landholders
- NPWS needs to communicate with 'neighbours' not just adjacent landholders
- Farmers wives are an important resource in community
- Communication with LHPA

Legislation

- Lack of penalties for trespass on private land
- Legislation, on making landholders do pest works, has lost its 'teeth'
- If LHPA gets more 'teeth', landholders will get bitten
- Separation between LHPA (animal pests) and local government (weeds)
- Federal legislation has effects on farmers, and issues such as foot and mouth disease

Other issues

- 'Cowboy' pig hunters
- Lack of coordination across all landholders
- Economics of pest control
- Social issues, being a 'good neighbour'
- Forests NSW work under the Forestry Act, and their authorisations.
- Forests NSW priorities are economic, and pests can be lower priority.

Forum Session Two Outcomes

Focus Question Session 2.

What do you see as some of the strategies to help address these important areas or issues in the regional pest management strategy?

Strategies suggested by forum participants included:

Weeds:

- Strategic use of grazing would be a method to reduce weed loads and reduce fire fuels at the same time

Animal pests:

- Use Pest Smart, an online resource from Invasive Animals CRC

Both weeds and animal pests:

- Maintain pressure on pest populations to keep numbers low
- Strategies for control need to use a variety of methods, choose the best one for the time and situation
- Share reporting of pest numbers, and control results: there is potential for a multi-agency data base
- Identify a lead agency for pest and weed control

- NPWS could have ‘Pest Mitigation teams’ especially for first response on newly acquired areas with large pest loads, or specific issues
- The new Fire Mitigation Teams can be used to report the occurrence of pests and weeds
- Use a mixture of staff and contractors for pest works
- Contractors shared by NPWS and neighbours can increase the size of the job and reduce costs

Communication:

- Improve dialogue with adjacent neighbours and those further away
- ‘gum tree’ meetings as organised by RFS could be a model for communication
- Catchment Action Plans can include NPWS actions on reserves
- Use Regional Advisory Committees to engage with neighbours
- Get other govt agencies to help NPWS with extension messages
- Communication must include perceptions
- Communication must lead to actions
- Improve education to park visitors on pest issues as well as nature
- Deal with public perceptions over killing of animal pests.

Legislation:

- There may need to be an ‘enforcement’ provision over NPWS and Crown land

A number of management strategies were raised during the forum. These included (with reference to the state strategy):

- The need for cooperative management with neighbours and other agencies (Goal 2 Objective 2.2)
- Management to include planning and prioritisation (Section 4)
- Recording, monitoring and evaluation of pest control programs (Section 7)
- Adoption of integrated pest management (Goal 2 Objective 2.2)
- Use of volunteers to assist with pest management programs (Goal 3 Objective 3.2)
- Education of staff to recognise and report new weed incursions (Goal 1 Objective 1.1)

Ongoing stakeholder engagement during the implementation of this strategy will include discussion of issues and information relating to pest management plans and programs at Western Rivers Regional Advisory Committee meetings. NPWS staff will report to and attend meetings of regional pest animal and weeds advisory committees that comprise local government and Livestock Health and Pest Authority delegates.

In addition, ongoing stakeholder engagement will occur through regular informal consultation with organisations such as local government, Livestock Health and Pest Authorities, Catchment Management Authorities and neighbours in relation to specific issues that arise and programs that are being undertaken.

6 Pest species overviews

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

Red fox (*Vulpes vulpes*)

Distribution and abundance

Foxes are found in most environments in Australia; however, they are probably most abundant in agricultural areas with patches of uncleared vegetation, 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 in urban areas and bushland reserves throughout the Western Rivers Region.

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 (KTP) to be listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act). Foxes are also significant predators of domestic stock including lambs and poultry; predation by foxes has the potential to reduce lambing rates significantly.

The native species most likely to be impacted at the population level in Western Rivers Region include ringtail and brush-tail possums, swamp wallabies, plains-wanderers, bush stone-curlew, malleefowl and other ground-nesting birds such as superb lyrebirds and powerful owls near Winburndale Nature Reserve.

Priorities for control

Many of the Region's reserve systems have strategic and quite often cooperative fox management programs. Priorities for the conservation of biodiversity are set by the NSW Fox Threat Abatement Plan (TAP). Priority sites in the Region include Threatened Species Recovery Programs for malleefowl at the Yathong Nature Reserve complex, plains-wanderer and bush stone-curlews at Oolambeyan and Weddin Mountains national parks. Other priorities are the Region's concerted efforts in its approach to fox management through multiagency and landholder involvement with the Winburndale Nature Reserve and Palmers Oaky Pest Animal Committee,

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

the Mullion Range State Conservation Area and community group and the large ground baiting activities at Yanga National Park.

Control

Fox control is undertaken according to the Fox TAP guidelines.

Fox TAP programs for the protection of threatened species take place throughout the year. Other programs tend to be concentrated around autumn and spring, with some programs opting for a more intense baiting regime as identified within the current Oolambeyan National Park plains-wanderer recovery project.

Western Rivers Region has continued aerial baiting and ground baiting strategies using the accepted bait station technique together with a bait replacement approach that will allow monitoring over negotiated consecutive intervals.

New technologies that become available should support existing control efforts once appropriate environment risk assessments have been completed.

Monitoring

The impact of fox predation on malleefowl, plains-wanderer and bush stone-curlew, and the effectiveness of the control program are being assessed through long-term monitoring of plains-wanderer, bush stone-curlew and fox populations. Bird populations are being surveyed, with data analysed by the Operations Support and Coordination Unit and Area rangers and project reports will be prepared based on results.

Rabbit (*Oryctolagus cuniculus*)

Distribution and abundance

Rabbits are found in most habitats throughout Australia below the Tropic of Capricorn, except for the densest forests, above 1500 m or on black soil plains. Rabbit populations are essentially contiguous throughout Western Rivers Region, with their highest density in the south-west of the Region, and they are present in all Western Rivers Region parks and reserves.

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 seeds 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 resulting habitat degradation in turn affects native fauna, which may also be impacted by rabbits through competition for food and shelter. Rabbits also provide a food source for cats and foxes, maintaining high numbers of these introduced predators, which in turn impact native prey species.

Competition and grazing by feral European rabbits has been listed as a KTP, and rabbits have been declared a pest animal under the *Rural Lands Protection Act 1998*. In Western Rivers Region, there are 20 species listed as endangered or vulnerable under the TSC Act that are impacted by rabbits; these include birds, mammals, reptiles and plants, and two endangered ecological communities (EECs). 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

The highest priority sites in Western Rivers Region are Yanga, Kalyarr, Oolambenyan, Goobang and Nangar national parks and Yathong and Nombinnie nature reserves. In these parks rabbits are likely to have the highest impacts on listed species.

Lake Urana, Tollingo and Woggoon nature reserves, and Cocoparra and Weddin Mountains national parks are medium priority sites, where there are a lower number of threatened entities vulnerable to rabbit impacts.

Snake Rock Aboriginal Area, Hill End Historic Site and Narrandera and Winburndale nature reserves have a lower density of rabbits, and few threatened entities vulnerable to rabbit impacts and are considered low priority sites for rabbit control. Although it doesn't contain any threatened entities vulnerable to rabbit impacts, Yuranigh's Aboriginal Grave Historic Site is also a low priority site for rabbit control due to the presence of significant Aboriginal cultural heritage values, which are potentially vulnerable to rabbit impacts.

Control

Effective control of feral rabbits requires an integrated approach using several complementary control techniques. In Western Rivers Region, the main control techniques are warren ripping, warren fumigation, 1080 baiting and RHD baiting.

Monitoring

During field inspections, GPS will be used to collect raw data, such as the location of warrens and above ground harbours where rabbits are seen to shelter. This data will be incorporated into management maps generated using GIS.

Rabbit populations will be monitored using spotlight counts, walk transect counts, counts of warrens and of active entrances.

Changes in rabbit impact will be documented through a photo record library of vegetation recovery, from successional species establishment immediately after control through to site regeneration with native flora endemic to the immediate reserve.

Feral pig (*Sus scrofa*)

Distribution and abundance

Feral pigs are widely distributed in Queensland, the Northern Territory, NSW and the ACT, with isolated populations in other states. Critical factors affecting their distribution are the need for water, food and shelter. Provided these requirements are met, the density of populations is largely dependent upon the availability of preferred foods (Choquenot et al. 1996).

Western Rivers Region has a long established history of feral pig control programs in all areas. The most extensive populations are in and around those reserves with permanent water; these reserves include Winburndale Nature Reserve, Goobang National Park, Yanga National Park and many of the new red gum acquisitions.

Impacts

Feral pigs cause habitat degradation through selective feeding, trampling and rooting for underground parts of plants and invertebrates. They can also impact a number of native species through either predation or aggressive competition. They eat newborn

lambs, reduce crop yields, damage fences, foul water sources and compete with stock for feed. Feral pigs are a potential carrier of a number of endemic and exotic parasites and diseases (Choquenot et al. 1996).

Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a KTP. Feral pigs are a declared pest under the *Rural Lands Protection Act 1998*. Public land managers such as NPWS are required to eradicate (continuously suppress and destroy) declared pest animals to the extent necessary to minimise the risk of the pest causing damage to any land.

Priorities for control

Initiate strategic control programs in the South West Area and other high profile reserves. Some of these reserves include Winburndale Nature Reserve, Eusdale Nature Reserve, Goobang National Park, Lachlan Valley State Conservation Area, and Hunthawang, Booligal, Yanga and Kalyarr national parks.

Other priorities

Strategic control is a priority in Mount Canobolas State Conservation Area, Yathong and Nombinnie nature reserves, Willandra National Park and in other reserves where there is documented damage. These reserves have a history of feral pig control; however, the occurrence of feral pigs in these areas is intermittent.

Control

Control programs for feral pigs will use humane and approved control techniques, including live trapping, strategic poisoning and ground-shooting. Some aerial control programs will complement on-ground control.

During significant flooding and subsequent waterbird breeding in the Mid West and South West Areas, the control effort will be increased to afford greater protection of nesting waterbird species.

Monitoring

Feral pig impacts will be monitored using the following on park methods.

Technique	Advantage
Catch per unit effort	Can be incorporated into control program Removes feral pigs
Bait-take	No need to handle feral pigs Can be incorporated into control program
Dung counts	Inexpensive Can be used in difficult terrain Schedule flexible
Spotlight counts	Quick rapid assessment of multiple species including the target species
Track counts	Can count several species at once Quick and simple Target animal not required to be sighted
Sign	Inexpensive Difficult in terrain Schedule flexible
Vulnerable flora and fauna species	Vulnerable species may be easier to count then feral pigs

Feral goat (*Capra hircus*)

Distribution and abundance

Feral goats flourish in a range of habitats. Populations are essentially contiguous in the arid and semi-arid pastoral lands of western NSW and are found throughout native vegetation remnants in hilly to mountainous areas of public and private land of the Region in various population sizes and park locations.

Feral goats are present in medium densities throughout some reserves of the Central West Area, prominently inhabiting the Copperhannia and Winburndale nature reserves. Goobang, Nangar, Conimbla and Weddin Mountains national parks have had high populations, however the commitment to annual control programs have reduced these populations to medium to low densities. There are high to very high densities of goats in Yathong, Nombinnie and Roundhill nature reserves and Mount Grenfell Historic Site. There are also feral goat populations in Cocoparra National Park and Cocopara Nature Reserve, Willandra National Park and Lachlan Valley State Conservation Area, Hunthawang, with low occurrences of feral goats in Murrumbidgee Valley and Kalyarr national parks.

Impacts

Grazing and browsing by feral goats has a significant impact 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. Feral goats can survive on highly fibrous, low nutrient herbage, provided sufficient water is available and they will also consume litter, fruit fall, bark and sticks. This can lead to a decrease in overall cover and 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.

Competition and habitat degradation by feral goats has been listed as a KTP. Feral goats also cause damage to Aboriginal heritage sites, compete with neighbouring livestock and are potential vectors of livestock diseases. However, harvesting of feral goats has become an important income source for many landholders, meaning that this view of goats as a potential resource needs to be taken into consideration when conducting control programs.

Priorities for control

Feral goats occur throughout a wide variety of habitats within the Region. Control programs will continue to occur within Mid West Area: Cocoparra and Willandra national parks, Yathong, Nombinnie and Round Hill nature reserves and Mount Grenfell Part 11 Lands, within Central West Area: Winburndale, Copperhannia and Eusdale nature reserves, Conimbla, Goobang, Nangar and Weddin Mountains national parks, and periodically within the South West Area for Yanga National Park.

Control

Effective control of feral goats requires an integrated approach using several complementary control techniques. Within the Region, control techniques currently used include aerial shooting programs and where possible mustering/trapping programs. These techniques are complemented by the inclusion of passive removal and exclusion techniques with the construction of one way gates in strategic fence-lines in priority parks. In addition, landholders adjacent to Park boundaries are being encouraged to reduce feral goat numbers through mustering and trapping at watering points.

Monitoring

Changes in the relative abundance of feral goats are assessed during successive aerial shoots and animal removal programs by comparing kills or captures per unit effort (time).

During each year survey schedules are to be negotiated, comprising of transects to assess the abundances of feral goats and native herbivores. Variables will be assessed along set transects, these include changes in vegetation, dung counts and native bird abundances in prime habitat area within key parks.

Alternatively, photographic reference points can be established to monitor a response in vegetation recovery, decreases in soil erosion and or damage to fence structures and water points.

African boxthorn (*Lycium ferocissimum*)

Distribution and abundance

African boxthorn is a spiny shrub from South Africa. Introduced to Australia in the mid 1800s as a hedge plant, it has since spread into pastures, neglected areas, roadsides, railways and waterways. It produces a dense thicket 2–5 m tall and with spines longer than 35 mm it can form an impenetrable barrier to domestic stock and native fauna.

African boxthorn is a perennial shrub up with a deep and extensive branched root system. The main branches are drooped, widely spreading and carry numerous branchlets, each of which ends in a spine.

African boxthorn prefers subhumid and semi-arid subtropical regions where it occurs on drier soils. It grows on all soil types, but establishes best on lighter soils, particularly along dry creek beds. It has been used as a hedge plant from where it has spread into pastures, neglected areas, and along roadsides, railway reserves and waterways.

Impacts

In 2012, this weed became a Weed of National Significance (WoNS) as it has established dense thickets in many areas, impedes native revegetation recovery and can form solid masses that surround watering points and may deny fauna access to resources. African boxthorn also has the ability to dominate the shrub layer and impact vegetation due to its predominant height, hence excluding and competing against desirable native regrowth. In the BPWW, this weed was identified as a priority widespread weed impacting on biodiversity in the Murrumbidgee, Murray and Lachlan CMAs.

Priorities for control

Primarily within the Mid West and South West Areas there are significant infestations of this weed in Oolambeyan and Yanga national parks. The extent and scale of these infestations warrant significant control efforts as this shrub will dominate and exclude native flora establishing within these environments and as a result will change the parks' biodiversity. Critical priorities for management will also be guided by the BPWW, such as at Oolambeyan National Park for the protection of Myall Woodland EEC.

Control

African boxthorn control will require the implementation of strategically timed, multi pronged techniques to address the established thickets throughout the identified parks.

Control techniques to be implemented will be the most innovative combination of mechanical and chemical techniques available using heavy plant through to pneumatic shears and spot chemical applicators.

Monitoring

The monitoring techniques to be implemented include the establishment of photo reference points, vegetation survey transects and GIS abundance/distribution and density indices for major infestations The Monitoring Manual for Bitou Bush Control and Native Plant Recovery provides guidance on this monitoring methodology and can easily be adapted for this weed.

The management of this weed needs to be addressed over multiple years, which will require annual effort against the suggested monitoring techniques. This monitoring will record the removal of the boxthorn, and the recovery of native flora in the control areas.

Blackberry (*Rubus fruticosus* agg.)

Distribution and abundance

Blackberry has managed to establish extensive infestations within many conservation reserves of the Central West Area, most prominently occurring within Winburndale and Eusdale Nature Reserve and well-established complex thickets at Mount Canobolas State Conservation Area and Borenore Karst Conservation Reserve and throughout the Central West. This weed causes significant problems for both agricultural production and conservation lands.

Impacts

Blackberry is a highly visible and invasive species which rapidly invades disturbed lands by forming massive thickets from underground suckers. It has the capacity to move into open forests and along creek lines. Hence it is a serious concern for the management of the catchment. Blackberry covers large areas with a dense canopy that excludes light from the soil surface. Few plants can compete with blackberry, and the regeneration of native plants is seriously impeded where blackberry occurs. This plant can also provide habitat and feeding opportunity for feral animals.

Blackberry is a WoNS and is included under the loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants KTP. In the BPWW, this weed was identified as a priority widespread weed impacting on biodiversity in the Murrumbidgee, Murray and Lachlan CMAs. At one site, blackberry actually impinges upon and threatens habitat of the Bathurst Copper Butterfly - a listed Threatened Species - within Winburndale Nature Reserve near Bathurst.

Priorities for control

Currently many of the reserves of the Region have ongoing weed management programs. This current commitment must be maintained to minimise the potential for reinfestation.

Priorities include: Winburndale and Eusdale Nature Reserve, Mount Canobolas State Conservation Area, Borenore Karst Conservation Reserve and Goobang National Park. Critical priorities for management will also be guided by the BPWW, such as at Mount Canobolas State Conservation Area for the protection of White Box Yellow Box Blakely's Red Gum Woodland EEC.

Control

Strategic herbicide application is the most effective, efficient and cost effective method to control infestations of blackberry within the protected area system. As robust biological control agents are approved and available the Region will look at establishing the right biological control agent in the correct locations throughout its areas and individual reserves.

Monitoring

Reduction in the infestation area both in density and size of the weed within identified reserves will be mapped through GIS tools and stored in PWIS. This will record annual progress with staged removal of the weed population and will be ranked against the establishment of more desirable native regeneration at control locations.

St John's wort (*Hypericum perforatum*)

Distribution and abundance

This weed is widespread and common throughout the local government areas of the Central West.

The majority of reserves within the eastern side of the Region have infestations of this weed as do the adjoining agricultural lands and lands of other agencies.

Impacts

This weed invades disturbed areas with the capacity to move into open forest and along creek lines, which causes problems for both the quality of conservation reserves and the viability of agricultural production country.

This noxious weed is poisonous to animals and native fauna and exhibits a photosensitisation chemical effect on the exposed skin of stock and native fauna which leads to the development of cancerous tumours.

St John's wort has the potential to cause skin irritation in humans that can result in mild skin redness to severe rashes, adjuration and respiratory discomfort in a small number of cases.

St John's wort competes throughout the year with other plant species for light and nutrients, and can eliminate almost all other plants. This weed also has the ability to germinate multiple times within a single growth year.

Priorities for control

Critical priorities have been determined through the BPWW. This includes management for the protection of threatened assets such as White Box Yellow Box Blakely's Red Gum Woodland EEC and *Eucalyptus saxicola*.

This weed will also be treated in highly accessible and/or recreational areas.

Management including strategic herbicide application will be undertaken in isolated infestations in coordination with other projects as they are identified.

There will also be a continuation of existing programs within the Regions with liaison with Local Control Authorities.

Investigation of the potential to strategically release biological control agents throughout the Region will be undertaken, subject to appropriate approval for releases.

Control

The Region will consider on a site-specific basis the release - where available - of multiple biological control agents in infestation zones within each park.

The primary control and containment strategy for small to large infestations of St John's wort will be physical removal or herbicide application in appropriate areas of the park.

Monitoring

Monitoring priorities are to reduce the density and extent of infestation and to investigate the effectiveness and practicality of the use of biological control agents.

Serrated tussock (*Nassella trichotoma*)

Distribution and abundance

This weed is primarily restricted to, though widely distributed in, the Central West Area.

Infestations are light to medium densities, scattered over cleared lands that have either been disturbed by agriculture, historic mining activities or natural and artificial non-canopy cover areas.

Impact

Serrated tussock is a WoNS and "Invasion of native plant communities by exotic perennial grasses" is listed as a KTP. Once established in conservation areas it greatly decreases biodiversity by dominating the grass layer and being a very competitive grass species, also with little nutritional value for native herbivorous wildlife.

Priorities for control

The Serrated Tussock WoNS Strategy has a containment line established. Most of the Region is west of this line, therefore most priorities are for outlier control. Therefore, management will be implemented at isolated infestations in coordination with other projects as they are identified.

Continue existing programs for infestations within the Region.

Control

Strategic ground applied herbicide techniques are the most effective, efficient and cost effective method to control infestations of serrated tussock within the protected area system.

Aerial application may be considered where appropriate controls can be assessed and implemented for an overall positive environmental outcome.

Monitoring

Reduction in the infestation area both in density and size of the weed within identified reserves will be mapped through GIS tools and stored in PWIS to record annual progress with staged removal of the weed population and ranked against the establishment of more desirable native regeneration at control locations.

Horehound (*Marrubium vulgare*)

Distribution and abundance

This weed was probably introduced into Australia in the 1840's as a garden or medicinal herb. The weed naturalised by 1848. This weed has become one of the most widespread weeds in south eastern Australia. As Western Rivers Region has an extensive Reserve network that once had grazing strategies, the horehound infestations can be quite extensive. In the BPWW, this weed was identified as a priority widespread weed impacting on biodiversity in the Murrumbidgee, Murray and Lachlan CMAs.

Impact

Many reserves are impacted with the occurrence of this weed within the Mid West, Central West and South West Areas.

Horehound can be a significant environmental weed of disturbed bushlands.

Priorities for control

Implement control and strategic herbicide application to isolated infestations in coordination with other projects as they are identified.

Continue existing programs for infested areas within the Regions and liaise with local control authorities and DPI.

Control

Strategic ground applied herbicide techniques are the most effective, efficient and cost effective method to control infestations of horehound within the protected area system.

Biological control agents can be released in reserves to manage infestations in difficult to access terrain.

Monitoring

Reduction in the infestation area both in density and size of the weed within identified reserves will be mapped through GIS tools and stored in PWIS (to record annual progress with staged removal of the weed population), and will be ranked against the establishment of more desirable native regeneration at control locations.

Sagittaria (*Sagittaria platyphylla*)

Distribution and abundance

This weed was probably introduced into Australia in the 1920s as a garden ornament and then escaped. The weed naturalised by the 1960s and there are now two species. It has become one of the most widespread of all weeds in some Mid West and South West Area reserves.

Impact

In 2012, sagittaria became a WoNS. It is a major problem in irrigation areas and naturally occurring and closed waters in the Murray River catchments. This emergent perennial aquatic herb can reproduce through rhizomes and by seed. This aquatic herb forms dense infestations which can block channels and drainage lines and degrade riparian landscapes.

Priorities for control

Implement control and strategic herbicide application (approved for aquatic environments) to isolated infestations in coordination with other projects as they are identified. Some of this control would focus on the Murray Valley regional and national parks, comprising the following precincts: Millewa, Gulpa Island and Moira.

Continue existing programs for all infestation areas within the South West Area's protected area system and liaise with local control authorities, DPI and the WoNS coordinator for this weed.

Control

Strategic ground-applied herbicide techniques are the most effective, efficient and cost effective method to control infestations of sagittaria within the protected area system. Caution should be exercised with any herbicide application near waterways.

Sagittaria is a dynamic weed in a highly sensitive environment and all control actions including the application of herbicide should be completed under the strict conditions of the label rates and critical comments.

Monitoring

Reduction in the infestation area both in density and size of the weed within identified reserves will be mapped through GIS tools and stored in PWIS to record annual progress with staged removal of the weed population and ranked against the establishment of more desirable native regeneration at control locations.

Australian plague locust (*Chortoicetes terminifera*)

Distribution and abundance

Although the Australian plague locust is endemic, in the right conditions it has the potential to devastate agriculture's grazing and cropping industry.

Geographically extensive outbreaks were reported from the 1870s and occurred with an apparent increase in frequency and intensity after 1900. Inland agricultural areas of NSW and Western Australia became suffered significant outbreaks in the 1920s. A pattern of high density populations developing in some locations in most years, with less frequent plague populations extending across several states for one or two years, has persisted in eastern Australia since that time.

The Australian plague locust can reach plague proportions within a year if a sequence of widespread heavy rains occur in inland areas, particularly during summer, allowing them to complete several generations of increase. Less regular rains, falling in both the interior and in the agricultural zone of eastern Australia, can maintain high density gregarious populations for several years, and continue a plague cycle. Prolonged dry periods usually result in a population decline to background levels.

Adults of the Australian plague locust can be readily distinguished from other species by the large dark spot on the tip of the hindwings and distinctive scarlet hindleg shanks. Adult body colour is variable and can be grey, brown or green. Adult males measure 25–30 mm long while females are 30–42 mm long. Dense bands of adults can be spotted from the air, looking almost like a burnt area edge.

The nymphs have five growth stages or instars. First instar nymphs are about 3 mm long, pale brown to dark brown or black, and sometimes have a white stripe along the back of the first body segment just behind the head. At each stage the developing wings become more noticeable and can be used to indicate which instar a locust nymph is in. Later instars are grey or brown and sometimes have a white stripe along the back.

The eggs are laid in the soil. Females drill holes in the ground and lay pods of 30–60 eggs. Subsequent pods can be laid in five day intervals during summer or 10–14 days during autumn. It takes about 20–25 days for Australian plague locust nymphs (hoppers) to complete development in mid-summer.

Fledged, pre-reproductive adults often undertake wind-assisted long distance nocturnal migratory flights. Migrations of several hundred kilometres often occur on strong warm winds associated with rain-bearing fronts or low pressure systems.

Impacts

Locusts can be devastating pests of agriculture due to their ability to develop very large populations and to form dense and highly mobile swarms. The Australian Plague Locust Commission drives national and state responses to this threat. Throughout Australia, primary control of locusts is the responsibility of the landholder. Lead agencies in NSW are LHPA and Department of Primary Industry.

Priorities for control

- Vigilance: OEH staff need to regularly monitor their reserves and record or report any locust egg bed or insect populations.
- Monitor egg beds and nymph stages so that planning and consultation for timely treatment can occur.
- Where bands develop treat by spraying with Green Guard® (metarhizium), which is a bio-agent not an insecticide. Control will be in accordance with procedural guidelines developed within OEH.
- All monitoring and treatment activity is to be recorded in PWIS.
- It must be noted that some areas of reserve may be excluded from treatment because of cultural or endangered species concerns.

Control

Through an environmental risk assessment process, NPWS will identify environmentally sensitive areas on its reserves likely to be impacted by insecticides. Sensitive areas include wetlands, watercourses and other areas that are prime habitat for species vulnerable to insecticides. Spraying will not occur in these areas.

Control measures to be implemented on national park estate will be developed by the NPWS in consultation with the local LHPA and/or DPI and the Australian Plague Locust Commission. All control measures will be based on the following principles:

- locust control on national park estate will only be undertaken if it is considered essential for the overall success of a regional control program
- environmentally sensitive areas will not be sprayed
- the biological insecticide Green Guard®, applied either as a ground spray or aerial spray, is the preferred treatment for nymph band stages.

In all cases, application of insecticides will comply with the conditions specified on product labels, relevant Pesticide Control Orders or Material Safety Data Sheets.

Monitoring

The Australian Pest Locust Commission sends out regular newsletters, which indicate plague locust activity. OEH officers should still carry out regular observations in their reserves for locust activity from spring through summer into autumn and where populations have occurred search for, record and report egg beds which can be ongoing through the winter period.

Queensland fruit fly *(Bactrocera tryoni)*

Distribution and abundance

There are over 250 species of fruit fly in the family Tephritidae in Australia, but only about 10 are pests. The fruit fly of major concern in NSW is the Queensland fruit fly (*Bactrocera tryoni*) which is native to eastern Queensland and north-eastern NSW and has spread to urban and horticultural areas in Queensland, NSW, Victoria and the Northern Territory.

The adult Queensland fruit fly is about 7 mm long, and reddish brown with yellow markings. It is most often seen on the underside of leaves or on maturing fruit. When fully developed, larvae leave the fruit, fall to the soil and burrow about 5 cm into the soil. Each larva forms a hard, brown, barrel-like shell from its own skin. When ready, adult male and female flies emerge from their pupae cases in the soil and burrow towards the surface where they inflate their wings and fly away. Adults are able to mate within a week after emerging and, soon after, females are ready to lay eggs. The adults can live for many weeks and females continue to lay eggs. There may be five or more overlapping generations during one year in NSW.

Impacts

Queensland fruit fly has little if any environmental impact, however it has a major impact on the horticultural industry by rendering fruit and some vegetables unfit for human consumption and holds the potential to destroy markets and local economies. Western Rivers Region has several estates with orchards within fruit fly exclusion zones, which binds OEH by Department of Primary Industry regulation and community responsibility to be active in the control of Queensland fruit fly on those estates. Riverina Region has experienced large outbreaks in the 2010–11 season and Western Rivers Region has been active in controlling fruit fly on its estates.

Priorities for control

Mid West Area reserves, where historic orchards occur in Hunthawang, Oolambeyan and Willandra national parks.

Control

There are a number of aspects to fruit fly management:

- keeping the number of orchards to a minimum and keeping them well maintained
- correctly dispose of fallen and unwanted fruit, limbs and trees
- vigilance – use of traps and regular inspections to determine the presence of fruit fly

Control is achieved through a combination of:

- baiting (spray or splash with yeast/protein and maldison insecticide)
- individual baits which are accountable and obtained only from DPI
- cover spray foliar spray with insecticide such as fenthion, dimethoate or trichlorfon
- ground spray under orchard with chlorpurifos.

Monitoring

Fruit fly favours warm wet summers and will survive winter in the ground as well as in citrus; therefore all staff need to be vigilant and report any evidence or sightings of fruit fly to the Area ranger.

Appendix 1 New and emerging pest species

New pest species

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

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

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

** Noxious weeds in Control Classes 1, 2 and 5 are notifiable weeds under the *Noxious Weeds Act 1993.*

Emerging pest species

In Western Rivers Region there are a number of weeds and pest animals that pose a risk of invasion and/or further spread and establishment. Those listed below are not currently known to exist in reserves, exist in small isolated infestations or are only in a small number of reserves. These species and the locations of current infestations and/or where infestations may establish are highlighted below. Any new occurrences of these pests should be reported to the regional pest management officer, who will decide upon the appropriate course of action.

Pest	Locations in Western Rivers Region
Boneseed	Mid West Area
Parthenium weed	Mid West and South West Areas
St John's wort	Mid West Area
Willow spp.	All Areas
Alligator weed	Mid West Area
Athel pine (*Tamerix* spp.)	Central west, Mid West, South West Areas
Bridal creeper	Mid West Area
Mesquite/Honey Locust	Mid West and South West Areas
Chilean needle grass	Central West Area
African olive (*Olea europaea*)	Mid West and South West Areas
Hawthorn (*Cretaegus monogyna*)	Central West and Mid West Areas
Coolatai grass (*Hyparrhenia hirta)*	Mid West and Central West Areas
Blue heliotrope (*Heliotropium amplexicaule*)	Central West, Mid West and South West Areas
European carp	Mid West Area and South West Area
Red-ear slider turtles	All
Feral deer	All
Wild camel	Mid West Area (currently in the Byrock Area)
Australian plague locust	Central West, Mid West and South West Areas. OEH Western Branch has established approved control guidelines to respond to the occurrence of nymph activity on park through the controlled use of "Green Guard™" a biological control agent.
Feral bees	All
Fire Ants	Central West Area – Potential to invade all reserves. (Liaison with DPI about any sightings)
Queensland fruit fly	Mid West Area Lachlan Valley SCA – Hunthawang (Currently under control with an approved site plan)

Appendix 2 Regional coordination and support of pest control programs

The Western Rivers Regional office is based in Griffith and coordinates the operational activities for the region. The region also has offices at Bathurst, Forbes, Griffith, Hay, Cobar and Moama. In addition to this, the Region has eight existing works depots and seven remote reserves with resident staff.

The Region has an Operations Support and Coordination Unit and PWG's first Adaptive Management Unit, with both units based in the regional office, but some staff based in Area offices.

The Operations Support and Coordination Unit provides specialist advice and support for area-based pest activities.

Reserves in Western Rivers Region by management area

Reserves in more than one area are shown in the area with the greatest extent.

Area	Reserve name	Management section	Reserve area (ha)
Mid West	Balowra SCA		1685
Mid West	Bedooba SCA		1665
Mid West	Kajuligah NR		13876
Mid West	Morrisons Lake NR		320
Mid West	Mount Grenfell AA		18320
Mid West	Mount Grenfell HS		1367
Mid West	Nombinnie NR		72290
Mid West	Nombinnie SCA		53413
Mid West	Paddington NR		6568
Mid West	Quanda NR		4774
Mid West	Round Hill NR		13671
Mid West	Yathong		3706
Mid West	Yathong NR		113278
Mid West	Banandra		194
Mid West	Big Bush NR		644
Mid West	Boginderra Hills NR		801
Mid West	Buddigower NR		329
Mid West	Cocopara NR		4783
Mid West	Cocoparra NP		8378
Mid West	Combaning SCA	Combaning	766
Mid West	Gubbata NR		151
Mid West	Ingalba NR		4184
Mid West	Jimberoo NP		1171
Mid West	Koonadan HS		22
Mid West	Lachlan Valley RP	Hillston	1526
Mid West	Lachlan Valley SCA	Hunthawang	20582
Mid West	Langtree NR		233
Mid West	Loughnan NR		391
Mid West	Murrumbidgee Valley NP	Banandra	568
Mid West	Murrumbidgee Valley NP	Benerembah	1085
Mid West	Murrumbidgee Valley NP	Berry Jerry	1336
Mid West	Murrumbidgee Valley NP	Billenbah	98
Mid West	Murrumbidgee Valley NP	Boona	228
Mid West	Murrumbidgee Valley NP	Cararbury	223
Mid West	Murrumbidgee Valley NP	Cuba	1649
Mid West	Murrumbidgee Valley NP	Dunnoon Lagoon	147
Mid West	Murrumbidgee Valley NP	Euroley	140

Area	Reserve name	Management section	Reserve area (ha)
Mid West	Murrumbidgee Valley NP	Jurambula	132
Mid West	Murrumbidgee Valley NP	MIA I	3175
Mid West	Murrumbidgee Valley NP	MIA II	2527
Mid West	Murrumbidgee Valley NP	MIA III	760
Mid West	Murrumbidgee Valley NP	Uri	254
Mid West	Murrumbidgee Valley NP	Yarradda	1013
Mid West	Murrumbidgee Valley NR	Narrandera	59
Mid West	Murrumbidgee Valley RP	Narrandera	190
Mid West	Murrumbidgee Valley RP	Willbriggie	934
Mid West	Oolambeyan NP		21876
Mid West	Pucawan NR		287
Mid West	Pulletop NR		145
Mid West	South West Woodland NR	Blow Clear	129
Mid West	South West Woodland NR	Blue Mallee	284
Mid West	South West Woodland NR	Buddigower	428
Mid West	South West Woodland NR	Buggajool	390
Mid West	South West Woodland NR	Goolgowi	101
Mid West	South West Woodland NR	Hiawatha	762
Mid West	South West Woodland NR	Little Blow Clear	57
Mid West	South West Woodland NR	Meriwagga	169
Mid West	South West Woodland NR	Narraburra	57
Mid West	South West Woodland NR	Stackpoole	755
Mid West	South West Woodland NR	Wyalong	182
Mid West	The Charcoal Tank NR		84
Mid West	Willandra NP		18888
Central West	Blow Clear West		200
Central West	Conimbla NP		8843
Central West	Eugowra NR		116
Central West	Goobang NP		42440
Central West	Lachlan Valley NP	Gunning Gap	267
Central West	Lachlan Valley NP	Kiacatoo	129
Central West	Lachlan Valley NP	Towyal	141
Central West	Lachlan Valley NP	Wilbertroy	567
Central West	Nangar NP		9378
Central West	Snake Rock AA		61
Central West	South West Woodland NR	Blow Clear West	1241
Central West	South West Woodland NR	Cadow	58
Central West	South West Woodland NR	Cookamidgera	530
Central West	South West Woodland NR	Coradgery	785
Central West	South West Woodland NR	Killonbutta	1520
Central West	South West Woodland NR	Mandagery	1493

Area	Reserve name	Management section	Reserve area (ha)
Central West	South West Woodland NR	West Cookeys Plains	640
Central West	Tollingo NR		3253
Central West	Weddin Mountains NP		8713
Central West	Wilbertroy		998
Central West	Woggoon NR		6125
Central West	Barton NR		536
Central West	Borenore KCR		133
Central West	Copperhannia NR		3517
Central West	Eusdale NR		1886
Central West	Freemantle NR		357
Central West	Girralang NR		654
Central West	Hill End HS		146
Central West	Maynggu Ganai HS		16
Central West	Mount Canobolas SCA		1604
Central West	Mullion Range SCA		1059
Central West	Wambool NR		198
Central West	Winburndale NR		11086
Central West	Yuranighs Aboriginal Grave HS		2
South West	Lachlan Valley NP	Booligal	865
South West	Lachlan Valley NP	Darcoola	8202
South West	Lachlan Valley NP	McFarlands	612
South West	Lachlan Valley NP	Moon Moon	508
South West	Lachlan Valley NP	Oxley	1236
South West	Lachlan Valley NR	Goonawarra	411
South West	Lachlan Valley SCA	Booligal Station	6014
South West	Lachlan Valley SCA	Norwood	11725
South West	Murray Valley RP	Kyalite	606
South West	Murray Valley RP	Liewa	402
South West	Murrumbidgee Valley NP	Kieeta	625
South West	Murrumbidgee Valley NP	Pembelgong	51
South West	Murrumbidgee Valley NP	Yanga	38343
South West	Murrumbidgee Valley NR	Yanga	1940
South West	Murrumbidgee Valley RP	Hay	28
South West	Murrumbidgee Valley RP	Wooloondool	52
South West	Murrumbidgee Valley SCA	Yanga	34577
South West	Jerilderie NR		37
South West	Lake Urana NR		302
South West	Murray Valley NP	Barooga	1192
South West	Murray Valley NP	Boomanoomana	1011
South West	Murray Valley NP	Corowa	123
South West	Murray Valley NP	Cottadidda	658

Area	Reserve name	Management section	Reserve area (ha)
South West	Murray Valley NP	Gulpa Island	4689
South West	Murray Valley NP	Millewa	19436
South West	Murray Valley NP	Moira	9446
South West	Murray Valley NP	Native Dog	48
South West	Murray Valley NP	Niemur	1614
South West	Murray Valley NP	Noorong	1449
South West	Murray Valley NP	Tholobin	197
South West	Murray Valley NP	Thornley	69
South West	Murray Valley NP	Tuppal	977
South West	Murray Valley NP	Wetuppa	952
South West	Murray Valley NP	Whymoul	374
South West	Murray Valley NP	Woperana	243
South West	Murray Valley RP	Bama	3198
South West	Murray Valley RP	Benarca	209
South West	Murray Valley RP	Collendina	546
South West	Murray Valley RP	Deniliquin	425
South West	Murray Valley RP	Gulpa Island	1403
South West	Murray Valley RP	Horseshoe Lagoon	17
South West	Murray Valley RP	Millewa	1532
South West	Murray Valley RP	Moama	36
South West	Murray Valley RP	Moira	430
South West	Murray Valley RP	Mulwala	490
South West	Murray Valley RP	Quat Quatta	37
South West	Murray Valley RP	Quat Quatta East	138
South West	South West Woodland NR	Berrigan	290
South West	South West Woodland NR	Booroorban	1442
South West	South West Woodland NR	Edgar	637
South West	South West Woodland NR	Kulki	170
South West	South West Woodland NR	Lake Urana	213
South West	South West Woodland NR	Mairjimmy	454
South West	South West Woodland NR	Puckawidgee	427
South West	South West Woodland NR	Steam Plains	327
South West	The Rock NR		343
South West	Werai Group	Banangalite	1309
South West	Werai Group	Barratta Creek	238
South West	Werai Group	Morago	834
South West	Werai Group	Stevens Weir	94
South West	Werai Group	Werai	9317
Total area of Western Rivers Region as at 1 May 2012			**669,104**

Significant threatened taxa

Endangered ecological communities

Central West Area

Bathurst Landscape	Known or predicted to occur
Natural Temperate Grassland of the Southern Tablelands (NSW and ACT)	Predicted
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Predicted
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	Predicted
White Box Yellow Box Blakely's Red Gum Woodland	Known
Orange Landscape	
Mount Canobolas Xanthoparmelia Lichen Community	Known
Natural Temperate Grassland of the Southern Tablelands (NSW and ACT)	Known
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	Known
White Box Yellow Box Blakely's Red Gum Woodland	Known
Cowra Landscape	Known or predicted to occur
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Known
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Known
Natural Temperate Grassland of the Southern Tablelands (NSW and ACT)	Known
White Box Yellow Box Blakely's Red Gum Woodland	Known
Forbes Landscape	
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Known
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Known
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Known

Mid West Area

Acacia loderi Shrublands	Predicted
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	Known
Artesian Springs Ecological Community	Predicted
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions	Predicted
Brigalow-Gidgee woodland/shrubland in the Mulga Lands and Darling Riverine Plains Bioregions	Known
Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions	Known
Coolibah-Black Box woodland of the northern riverine plains in the Darling	Predicted

Riverine Plains and Brigalow Belt South bioregions	
Inland Grey Box Woodland in the Riverina; NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Predicted
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Known
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	Predicted
White Box Yellow Box Blakely's Red Gum Woodland	Known
Mallee and Mallee-Broombush dominated Woodland and Shrubland, lacking Triodia CEEC, in the NSW South Western Slopes Bioregion	Known

South West Area

Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	Known
Inland Grey Box Woodland in the Riverina; NSW South Western Slopes; Cobar Peneplain; Nandewar and Brigalow Belt South Bioregions	Known
Myall Woodland in the Darling Riverine Plains; Brigalow Belt South; Cobar Peneplain; Murray-Darling Depression; Riverina and NSW South Western Slopes bioregions	Known
Sandhill Pine Woodland in the Riverina; Murray-Darling Depression and NSW South Western Slopes bioregions	Known
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression bioregions	Known
Tablelands Snow Gum; Black Sallee; Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands; Sydney Basin; South East Corner and NSW South Western Slopes Bioregions	Known
White Box Yellow Box Blakely's Red Gum Woodland	Known

Key threatening processes

Invasion and establishment of exotic vines and scramblers	Weed
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	Weed
Invasion of native plant communities by bitou bush and boneseed	Weed
Invasion of native plant communities by exotic perennial grasses	Weed
Invasion of native plant communities by African olive (*Olea europaea* subsp. *cuspidata*)	Weed
Invasion, establishment and spread of Lantana (*Lantana camara*)	Weed
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Weed
Competition and grazing by the feral European rabbit (*Orychtolagus cuniculus*)	Pest animal
Competition and habitat degradation by feral goats, (*Capra hircus*)	Pest animal
Competition from feral honeybees (*Apis mellifera*)	Pest animal
Herbivory and environmental degradation caused by feral deer	Pest animal
Importation of red imported fire ants (*Solenopsis invicta*) into NSW	Pest animal
Introduction of the large earth bumblebee (*Bombus terrestris*)	Pest animal
Invasion and establishment of the cane toad (*Bufo marinus*)	Pest animal
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)	Pest animal
Predation by feral cats (*Felis catus*)	Pest animal
Predation by the European red fox (*Vulpes vulpes*)	Pest animal
Predation by the plague minnow (*Gambusia holbrooki*)	Pest animal
Predation, habitat degradation, competition and disease transmission by feral pig (*Sus scrofa*)	Pest animal

Hygiene protocols

Draft plant and equipment works hygiene protocol in Western Rivers Region

The issue: artificial spread of noxious and environmental weeds

The movement of vehicles and machinery for pest and earth works on reserves can be a contributing factor to the spread of weeds and spores (such as rust).

Whether using contractors, completing pest programs or undertaking normal activities on-park it is suggested that the hygiene protocols described below be followed.

Contaminants causing spread

Figure 1. Underside of a contaminated mower

The most common contaminants on machinery are weed seeds and other plant debris. Weed seeds and fruits, such as the spiny burr and khaki weed, can adhere to tyres of machinery or implements. Most weed seeds, such as Chilean needle grass, horehound and boxthorn, can enter equipment cavities. Fine seeds can prove difficult to remove as they can penetrate deep into machinery such as tractor/slasher combinations.

Plant fragments such as willow, mesquite, boxthorn and most aquatic varieties are viable for many days even without soil.

Minimise initial contamination

Machinery, equipment and vehicle users should aim to limit the initial contamination to help reduce clean-down procedures. When engaging contractors verify that they implement machinery hygiene protocols as a standard practice. Undertake physical inspections of their equipment to confirm weed-free status, *before and after the job is undertaken*.

Some useful practices include the following.

- Time and coordinate works prior to weed seeds maturing.
- Ensure machinery operators are familiar with hygiene protocols and weed identification.
- Map and monitor weed infestations.
- Strategically designate clean down sites to minimise weed spread.
- Work from non-infested areas into infested areas.

- Use the most appropriate machinery for the job to minimise soil disturbance and physical contact with seeds, for example offset mowers.
- Avoid work during inclement weather.

Machinery most at risk

The types of machinery and equipment that cause major weed contamination concerns are:

- tractors and implements (for example, slashers, cultivators)
- cars and motor bikes
- earthmoving machinery (for example, bulldozers)
- backhoes and other digging equipment
- graders
- trucks.

Clean down considerations

When implementing hygiene protocols a number of considerations need to be addressed to minimise further infestations and achieve maximum hygiene standards. These include:

- whether to clean down on or off site
- whether to use companies that provide portable machinery cleaning facilities and visit machinery on site
- choosing sites that limit potential spread by wind or run-off into watercourses and drainage lines
- cleaning down in degraded grassed areas on site where weed control can be most readily undertaken, for example by herbicide application; regularly monitor these areas for new infestations
- whether to use existing machinery wash bay facilities located at the local NPWS depot.

Footwear and clothing can carry seed and spores (for example, rust, golden dodder and khaki weed) and must also be cleaned before and after the job and equipment cleaning.

Note: contaminants resulting from clean-down procedures should be disposed off in an appropriate manner.

Critical contamination areas

When decontaminating machinery and implements, there are certain areas of the machine that require particular attention (Figure 2). These areas of critical contamination generally come into contact with the soil or plant material when the equipment is in use.

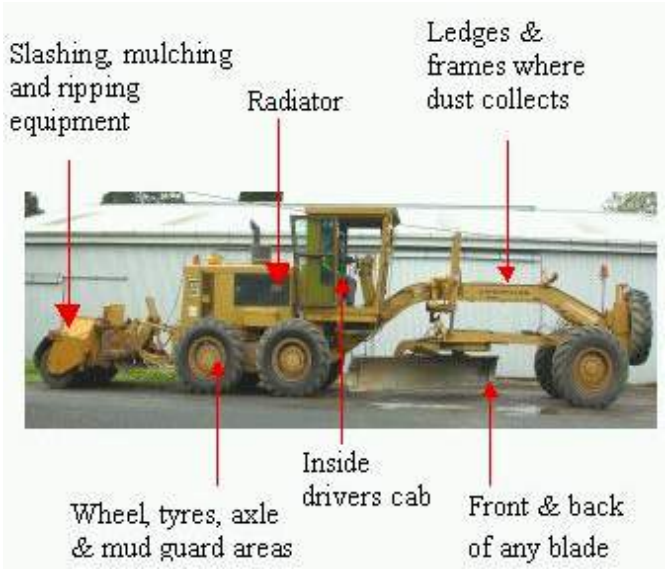

Figure 2. Critical contamination areas on machinery

Clean down options


Figure 3. Wash down with high-pressure hose


Figure 4. Clean down with compressed air

The level of risk of contamination will often determine clean-down options. The most effective options include:

- wash-down (Figure 3)
- air blast (Figure 4)

- vacuuming
- physical removal.

Wash-down can be achieved by applying water to the machinery at high pressure using a pressure cleaner or spray tank and pump. The critical areas on equipment must be rigorously targeted and thoroughly washed clean. The use of approved cleaning detergents should be considered when using water. These may aid in the removal of built up grease, dirt and mud that can contain weed seeds.

Air blast assists decontamination of machinery, especially for those hard-to-reach areas such as cavities and joints. A compressor with hose and suitable nozzles is required.

Vacuuming can help remove contaminants from the interior surfaces of machinery, for example, driver's cab carpet.

Physical removal with hand-held tools is an option that is most appropriate for contaminants that adhere to machinery such as spiny burr and other plant materials that can attach themselves to tyres and tines. Physical removal is often undertaken prior to or as a follow-up procedure to both water and air blast clean down. This may be labour intensive, but it will ensure that contaminants are removed and disposed of correctly. Brooms, brushes, shovels and scraping tools can help with clean-down procedures.