



NSW **National Parks
and Wildlife Service**

Hunter Region

Pest Management Strategy

2008-2011



Department of **Environment & Climate Change** NSW



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The New South Wales National Parks and Wildlife Service (NPWS) is now part of the Department of Environment and Climate Change (DECC). Throughout this strategy, references to “NPWS” should be taken to mean the NPWS carrying out functions on behalf of the Director General and the Minister of DECC.

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Commonly used terms

Acronym	Term	Definition
CMA	Catchment Management Authority	CMAs are regional bodies that work in partnership with farmers, local groups, Aboriginal communities, local government, industry and State Government agencies to develop the best policies and programs for natural resource management at a catchment level.
DECC	Department of Environment and Climate Change	The State Government Department that brings together a range of conservation and natural resources science and programs, including native vegetation, biodiversity and environmental water recovery to provide an integrated approach to natural resource management. DECC includes the Parks and Wildlife Group, whose 'public' name is NPWS.
EEC	Endangered Ecological Community	As defined in the Threatened Species Conservation Act 1995.
KTP	Key Threatening Process	As defined in the Threatened Species Conservation Act 1995.
NPWS	National Parks and Wildlife Service	The 'public' name of Parks and Wildlife Group within DECC.
PaCS	Planning and Coordination Section	The section within each Parks and Wildlife Group Branch responsible for planning and coordinating activities and administration across the Branch. Includes Operations, Assets, Planning, Community Programs and Business Services Units.
PAS	Priority Action Statement	The PAS provides an overview of recovery actions for all NSW threatened species, populations and ecological communities. It establishes relative priorities and timetables for carrying out recovery actions, and will establish performance indicators to monitor the progress of each species' recovery.
PWG	Parks and Wildlife Group	The Group within the Department of Environment and Climate Change that manages NPWS parks.
RLPB	Rural Lands Protection Board	Statutory bodies under the <i>Rural Lands Protection Act 1998</i> that deliver essential services to ratepayers and others in each district as the frontline in the management of animal health, pest animal and insect control, travelling stock reserves, stock movement and identification, and drought relief. Currently 47 RLPBs cover NSW.
RPMS	Regional Pest Management Strategy	This document.
TAP	Threat Abatement Plan	Comprehensive plans to tackle the state's 'Key Threatening Processes' - from foxes and feral cats to land clearing and firewood collection. The plans outline actions to manage these threats, and explain how the actions can be put into effect.
WONS	Weed of National Significance	Species recognised nationally as having adverse impacts on biodiversity,

1 Introduction

Pest species are animals (including invertebrates) and plants that have negative environmental, economic and social impacts. In this document they are collectively referred to as pests. Pests are most commonly introduced species, though native species can become pests. In parks, pests may have impacts across the range of park values, including impacts on biodiversity, cultural heritage, catchment and scenic values.

Pests are among the greatest threats to biodiversity throughout Australia. In New South Wales, they have been identified as a threat to 657 of 945 (70%) species, populations and communities listed under the *Threatened Species Conservation Act 1995*; more than any other process except the destruction and disturbance of native vegetation. Minimising the impacts of pests on biodiversity is thus the main objective of NPWS pest management.

Pests can also have significant impacts on economic values of neighbouring lands. The NPWS seeks to address these impacts when setting management priorities and significant resources are committed towards landscape wide pest programs, including wild dogs.

The control of pests outside of parks is the responsibility of private landholders and other agencies such as rural lands protection boards, local councils, the Department of Primary Industries and the Department of Lands. The NSW Invasive Species Plan provides the framework for the coordinated management of weeds and pests that occur over varying land tenure. NPWS is a committed partner to the implementation of this plan.

Many pests are distributed widely across Australia and eradication is not possible in the foreseeable future. They occur in most environments and across all land tenures. Pests often spread quickly and have high reproductive rates, allowing them to re-establish rapidly following control. In recognising that eradication of widespread pests across large areas is an unrealistic goal, NPWS prioritises control effort to focus on areas where impacts are greatest. Resources can then be directed to ensure that the resultant control programs are effective in reducing these impacts. It is the responsibility of all land managers to work together to control pests where significant impacts have been identified.

In New South Wales, the main pest management priorities for the conservation of biodiversity are focussed on threatened species and endangered ecological communities, and are identified in the Threatened Species Priorities Action Statement (PAS), individual threat abatement plans (TAPs) and reserve plans of management. Pest programs are also integrated with other park management programs such as fire management.

2 Purpose of the Strategy

The development of Regional Pest Management Strategies (RPMS) provides NPWS with a strategic approach to pest management across NSW. The Strategy developed for each region provides a tool to broadly identify pest distribution and their associated impacts across the park system. It details priorities for each Region, including actions listed in the PAS and TAPs as well as other actions such as wild dog and feral pig control to protect neighbouring properties and site-based weed control and allows resources to be allocated to high priority programs. The RPMS

also identifies the requirement for other plans or strategies, such as Wild Dog Plans or Bush Regeneration Plans that provide a more detailed approach.

New pest species continue to establish in the environment either through the importation of new species into Australia or the escape of domestic plants and animals. Prevention and early detection followed by eradication is the most cost-effective way to minimise the impacts of new pests. The NPWS works with other agencies to prevent the introduction of new pests into the wild and to respond rapidly when new incursions occur. The response of NSW government agencies to new pests will be coordinated through the NSW Invasive Species Plan.

In this strategy, the generic term "parks" is used to refer to any lands managed by NPWS including national park, nature reserve, Aboriginal area, historic site, state conservation area and regional park amongst others. This strategy has a four year life span. In the final year of the strategy, it is intended that the strategy will be reviewed and updated.

3 Legislation and Policy

The NPWS has a number of statutory responsibilities in relation to pest management.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) vests the care, control and management of national parks, nature reserves, historic sites and Aboriginal areas with the Director-General of the NPWS. Key management objectives include conservation, provision of appropriate scientific and educational opportunities, and management of fire and pest species. These are achieved through the preparation and implementation of plans of management for each reserve, which identify pest species present, control strategies and priorities for that reserve.

Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) lists threatened species, endangered populations and endangered ecological communities. The *TSC Act* also lists Key Threatening Processes (KTPs), which are identified as having significant impacts on the conservation of native flora and fauna. As of August 2006, 18 pests have been listed as KTPs e.g. *Predation by the Red Fox*, *Invasion of Native Plant Communities by Bitou Bush and Boneseed*. The NSW Threatened Species Priorities Action Statement (PAS) outlines the strategies for ameliorating threats listed under the *TSC Act* including the preparation of TAPs. For each of these strategies the PAS lists one or more detailed actions which aim to protect threatened species by reducing the impact of listed threats.

Rural Lands Protection Act 1998

The pest animal provisions of the *Rural Lands Protection Act 1998* (RLP Act) outline the conditions under which animals, birds and insects are "declared" pests and provides for the control of such pest species. Gazettal of pest species occurs through Pest Control Orders that allow the Minister for Primary Industries to specify pest species on a state wide or local basis and the conditions or factors that apply to the control of each pest. Rabbits, wild dogs and feral pigs have been declared pest animals throughout NSW.

The *RLP Act* binds the Crown for the control of pest animals declared under the Act. Public land managers such as the NPWS are required to eradicate (continuously suppress and destroy) pest animals "...to the extent necessary to minimise the risk of the pest causing damage to any land" using any lawful method or, if the Order specifies a method to be used, by the method specified.

An approach to balance the conservation of dingoes with the need for wild dog control has been incorporated into the *RLP Act* through the Pest Control Order for

Wild Dogs. This order allows for the general destruction obligation for lands listed in Schedule 2 of the order to be satisfied through wild dog management plans with both control and conservation objectives.

Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* provides for the identification, classification and control of noxious weeds in New South Wales. The Act aims to identify noxious weeds and their respective control measures, as well as the roles and responsibilities for their control for both public and private land managers/owners.

Amendments to the *Noxious Weeds Act* in 2005 repealed the *NSW Seeds Act 1982* and introduced a new classification system of weed control classes based on the degree of threat and the distribution of the introduced plant within the state. These new control classes are:

- Control Class 1 – State Prohibited Weeds*
- Control Class 2 – Regionally Prohibited Weeds*
- Control Class 3 – Regionally Controlled Weeds*
- Control Class 4 – Locally Controlled Weeds*
- Control Class 5 – Restricted Plants.*

Under this new classification system, Control Classes 1, 2 and 5 noxious weeds are referred to as notifiable weeds.

Pesticides Act 1999

The *Pesticides Act 1999* and the *Pesticides Regulation 1995*, regulate the use of all pesticides in NSW, after point of sale, and includes specific provisions for record keeping, training and notification of use.

Specific requirements have been included under the Pesticides Regulation in relation to the following.

Pesticide Record Keeping: Records must be kept by all people who use pesticides for commercial or occupational purposes such as on farm or as part of their occupation or business. There are also specific record keeping provisions for persons who aurally apply pesticides under both the Act and regulations.

Pesticides Training: People who use pesticides in their business or as part of their occupation must be trained how to use these pesticides. Any person employed or engaged by NPWS to use pesticides must also be trained.

Pesticide Notification: Notification requirements apply to pesticide applications by public authorities in public places (including NPWS managed park lands). The NPWS Pesticide Use Notification Plan sets out how the Department will notify the community about pesticide applications it makes to public places. (The plan can be located on the NPWS web site).

Pesticide Control Orders are orders that prohibit or control the use of a pesticide or a class of pesticide, or authorise the use or possession of a restricted pesticide e.g. 1080.

Use of a pesticide must be in accordance with the Control Order where such exists. Current Control Orders can be found at:

www.environment.nsw.gov.au/pesticides/pco.htm.

Game and Feral Animal Control (Game) Act 2002

The major aim of the *Game and Feral Animal Control Act 2002* (Game Act) is to promote responsible and orderly hunting of game animals and certain pest animals. The public lands that are covered by this Act do not include any NPWS parks.

Other Relevant Legislation

- *Environment Protection and Biodiversity Conservation Act 2000* (Australian)
- *Catchment Management Authorities Act 2003*
- *Agricultural and Veterinary Chemicals Code Act 1994*
- *Environmental Planning and Assessment Act 1979*
- *Firearms Act 1996*
- *Heritage Act 1977*
- *Prevention of Cruelty to Animals Act 1979*
- *Occupational Health and Safety Act 2000*
- *Wilderness Act 1987*
- *Protection of the Environment Operations Act 1997*

Park Management Program and policies

The Park Management Program is a series of guides which are being developed to define the values and objectives for park management and to integrate park policy, planning, operations, monitoring, evaluation and reporting. The aims of the guides are to improve the way we go about park management by:

- providing clear and consistent management objectives and operational procedures, and
- introducing a system to achieve consistent standards in park management and reporting on performance.

The Park Management Program comprises a Policy Guide, a Planning Guide, an Operating Procedures Guide and a Monitoring and Evaluation Guide.

The Policy Guide describes the goals and objectives for park management and the key principles which are applied to guide the achievement of these objectives.

Some specific policies relating to the management of weeds and pest animals are mentioned below.

Policy 2.6 Wild Dogs acknowledges the complexities inherent in the need to conserve native dingoes (and their hybrids) together with the need to control wild dogs.

The NPWS Firearms Management Manual brings together the policy, procedural and technical information required for staff regarding the safety, security and legal procedures for keeping and using firearms. The manual replaced the *NPWS Firearms Policy* and provides policy and procedures for all aspects of firearms use and management including:

- possession and use of firearms by NPWS staff and other approved users,
- firearms administration and record keeping,
- location and storage of firearms,
- planning and risk management for firearms operations,
- maintenance and modification of firearms,
- animal welfare issues related to shooting pest animals and euthanasing native animals, and
- firearms training.

A statewide policy directive requires conservation risk assessments for the application of pesticides on park to ensure that an appropriate level of environmental assessment is carried out prior to application.

Other plans

Other plans that help direct pest management include the State Plan, Catchment Action Plans, regional weed plans, state and national strategies, and reserve Plans of Management.

This Regional Pest Management Strategy satisfies several State Plan targets:

E4 Better environmental outcomes for native vegetation, biodiversity, land, rivers and coastal waterway: This Strategy contains a number of actions to help achieve priority E4, through the implementation of feral animal and weed control programs to reduce impacts on biodiversity.

P6 Increased business investment in rural and regional NSW. This Strategy contains actions that will reduce potential and actual economic impacts of pests to neighbouring enterprises.

E1 A secure and sustainable water supply for all users. This Strategy includes actions that will enhance water catchment values through the control of weeds and feral animals in catchment areas.”

Catchment Action Plans are developed by Catchment Management Authorities (CMA's). These CMA's are regional bodies that work in partnership with farmers, local groups, Aboriginal communities, local government, industry and State Government agencies including NPWS to develop policies and programs for natural resource management at a catchment level.

4 Regional Overview

The Hunter Region of NPWS currently covers parts of the Hunter, Peel and Manning Valleys. The region extends from Merewether in the south to Tuncurry in the north and extends inland to Merriwa and Quirindi. The Hunter Region includes the city of Newcastle and surrounding suburbs. The total residential population of the region exceeds 400 000 and it is estimated two-thirds of park visitors come from this population.

The region is divided into five management areas - Hunter Coast, Newcastle, Barrington Tops, Great Lakes and Upper Hunter. Hunter Region manages 220 000 hectares of lands including 12 national parks, 11 state conservation reserves, 46 nature reserves and 2 regional parks (Figure 1).

The Hunter Region was one of the first areas in NSW cleared for agricultural purposes, thus a wide range of plants and animals have been introduced. In addition to landuse changes, the geology, the altitudinal range from the coast to sub-alpine, and the variation in landuse including rural, semi-rural, urban and natural areas, all contribute to a wide variety of pest management issues.

Pest issues in the rural areas of the upper Hunter and Barnard catchments are associated with impacts from vertebrate pests. Coordinated cooperative programs with neighbours and the Hunter, Maitland, Armidale and Gloucester Rural Lands Protection Boards are implemented to reduce populations of wild dog, fox and feral pigs in key areas including Barrington Tops, Curracabundi, Ben Halls Gap and Towarri National Parks and Tomalla, Back River, Woolooma and Wallabadah Nature Reserves.

The implementation of the NSW Fox TAP has lead to control programs to protect populations of the endangered broad-toothed rat in Barrington Tops NP and the brush-tailed rock wallaby in Woko and Curracabundi NPs. A component of these programs includes annual population monitoring of the species at risk.

An annual fox / wild dog program is coordinated on public lands across the Port Stephens Local Government Area to reduce predation on koala populations. Other cooperative fox control programs are undertaken in the Hunter Estuary to protect migratory wader habitat.

Biodiversity impacts from weeds such as bitou bush, scotch broom, lantana, exotic vines and alligator weed are being addressed by the implementation of weed control programs in locations where threatened species and / or endangered ecological communities occur.

Coordinated landscape programs have been implemented in coastal reserves with Great Lakes, Lake Macquarie, Newcastle and Port Stephens Local Government Areas for coastal weeds such as bitou bush. These programs have improved the long term success of weed control by removing weeds across land tenure.

Island recovery weed control programs have commenced at Snapper Island and John Gould NRs and Broughton Island in Myall Lakes NP to protect threatened ecological communities such as Littoral Rainforest and *Themeda* coastal clay grasslands.

The involvement of community bush regeneration groups in coastal reserves is integral to the success of weed control programs in Glenrock SCA, Shelly Beach in Booti Booti NP and Seal Rocks in Myall Lakes NP.

A number of research and monitoring programs for scotch broom, bitou bush, fox TAP projects and wild dogs are also being undertaken in coordination with various universities, other Government agencies and the Weeds and Pest Invasive Animals Cooperative Research Centres.

4.1 New Reserves and Additions

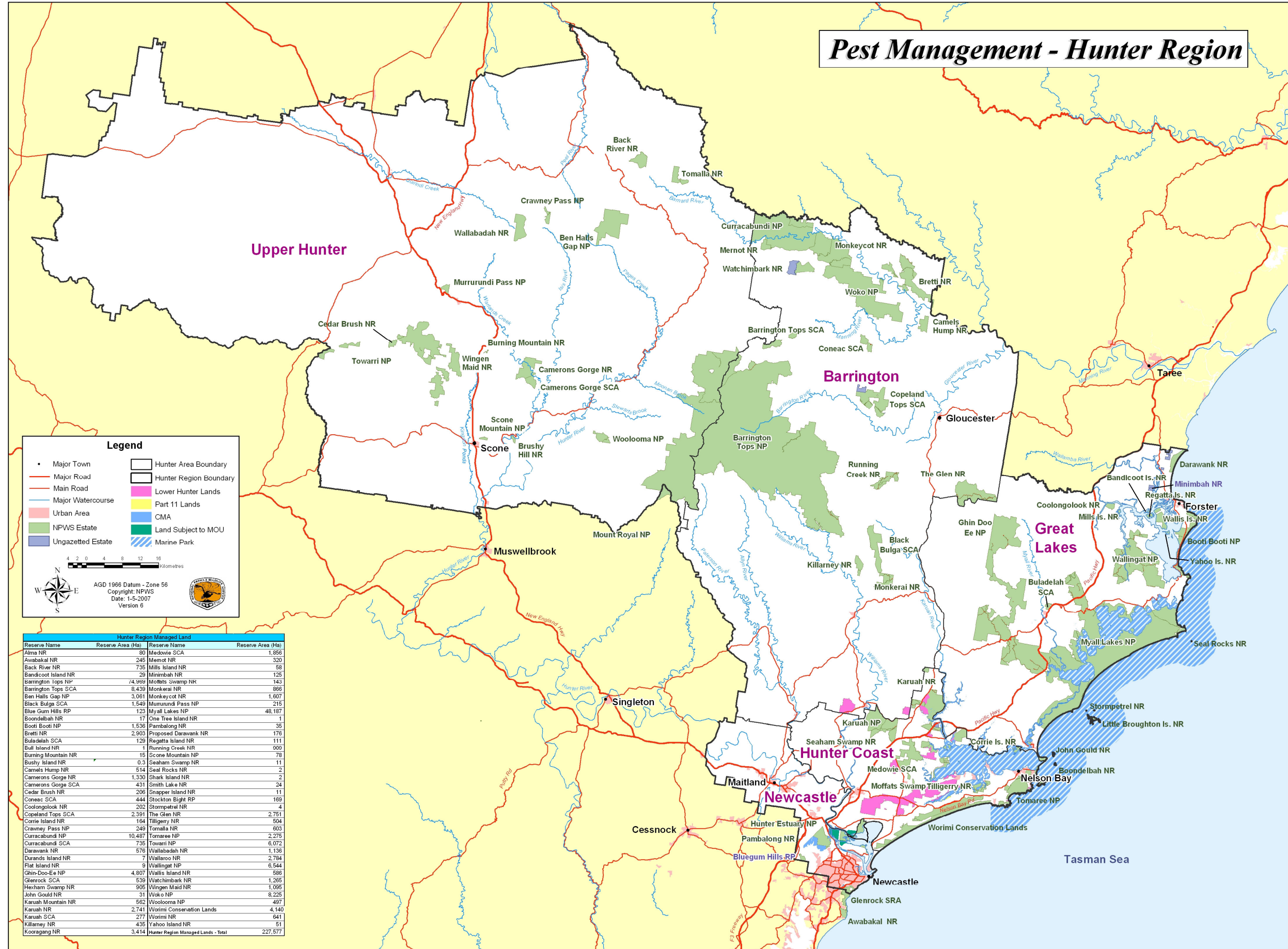
At the time of publication of this Regional Pest Management Strategy (RPMS), the land managed by Hunter Region NPWS has expanded by approximately 12 000 ha. Currently most of these areas have not been investigated for weed and vertebrate pest issues. During the life of the RPMS (2008-2011), surveys will be undertaken and pest management plans developed and implemented. Priorities for control will be considered within the context of existing pest programs in the region, as well as the available resources.

Newly gazetted lands include lower Hunter lands in Hunter Coast Area (HCA), Newcastle Area (NCA) and Barrington Tops Area (BTA). They include:

- Worimi Conservation Lands (previously recognised as Stockton Bight / Beach), incorporating Worimi NP, SCA and RP. Gazetted February 2007.
- Tilligerry NP and SCA (HCA);
- Hunter Estuary NP (incorporating existing reserves Kooragang and Hexham NRs) (NCA); and
- Additions to Karuah NP, Medowie SCA and Tomaree NP (HCA); and Columbey NP (BTA).

The Port Stephens – Great Lakes Marine Park (PSGLMP) was declared in December 2005 and covers an area of 98 000 hectares, including offshore waters to the 3 nautical mile limit of state waters between Cape Hawke Surf Life Saving Club and Birubi Headland and all the estuarine waters and tributaries (to the tidal limit) of Port Stephens, Myall Lakes and Smith Lakes. The Marine Parks Authority became part of the Parks and Wildlife Group in April 2007. The PSGLMP is now part of the Hunter Region. Assessment of pest management issues in the Marine Park will be considered in the future as part of the RPMS.

Pest Management - Hunter Region



5 Pest Distribution Tables

Pest distribution tables give an overview of priority pest species for each reserve within the Region. The data is derived from a combination of systematic surveys, consultation with staff and other agencies and through planning processes. The tables are not comprehensive lists of all pest species but focus on new incursions or on pests which are having environmental, cultural, agriculture or social impacts in the Region. Due to the size of these lists they have been included as Appendix 1.

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

WEED DISTRIBUTION	Scotch Broom	Lantana	Blackberry	Black-eyed Susan	Asparagus spp.	GPG	Cape Ivy	Cats Claw Creeper	Honeysuckle	Croton Weed	Mistleflower	Xanthium spp.	Madeira Vine	Nodding Thistle	Leucantheum	Moth Vine	Smooth Senna	Opuntia spp.	Tree of Heaven	Cotoneaster	Inkweed	St Johns Wort	Thistles	Sweet Briar	Pepper Tree	Potato Vine	Pasture Grasses	Yorkshire Fog
BARRINGTON TOPS AREA																												
Barrington Tops National Park	●	●	●						⊙	⊙			⊙	⊙									○			○	○	
Barrington Tops State Conservation Area	●		○																							○	○	
Berrico Nature Reserve		●	⊙						●	●																○	○	
Black Bulga State Conservation Area		●							⊙	⊙																○	○	
Bretti Nature Reserve		●	⊙						⊙					⊙						○						○	○	
Camels Hump Nature Reserve		●	○			○			○								○									○	○	
Columbey National Park		○															○									○	○	
Coneac State Conservation Area		●	○						⊙	○					○					⊙						○	○	
Copeland Tops State Conservation Area		●		⊙		⊙		⊙	⊙	⊙		⊙		⊙	○								○			⊙	○	
Curracabundi National Park		○	○		⊙	⊙	○	⊙	⊙		○	○		○		○	○	○	○	○	⊙	○	○	●		○	○	
Curracabundi State Conservation Area		●	○								○	○					○									○	○	
Killarney Nature Reserve		●	○						○	○																○	○	
Mernot Nature Reserve																	○									○	○	
Monkerai Nature Reserve		●	○						○																	○	○	
Monkeycot Nature Reserve		○	○						○						○		○									○	○	
The Glen Nature Reserve		●	○		○				●	●					○											○	○	
Watchimbark Nature Reserve		⊙	⊙		⊙				●	○	○	○			●		○			○	○	○	○			○	○	
Woko National Park		●	○		⊙	●			○	○	○				○		○			○						○	○	

WEED DISTRIBUTION GREAT LAKES AREA	Bitou Bush	Lantana	Blackberry	Salvinia	Madeira Vine	Asparagus spp.	Morning Glory	GPG	Pampas Grass	Cape Ivy	Crofton Weed	Mistflower	Burrs	Moth Vine	Privet spp.	Wandering Jew	Eastern Cassia	Pear spp.	Coral Tree	Pine spp.	Camphor Laurel	Balloon Vine	Black Eyed Susan
Bandicoot Island Nature Reserve		○			⊙																		
Booti Booti National Park	●	●	○		●	⊙	●	○	⊙	○	●			○		○	●	○	⊙	○			
Buladelah State Conservation Area																							
Coolongolook Nature Reserve																							
Darawank Nature Reserve	○	○															○			○			
Ghin-Doo-Ee National Park		●	○								●												
Mills Island Nature Reserve																							
Myall Lakes National Park	●	●	○		⊙	⊙	●	○	○	⊙	●	●	⊙	●	○		⊙	○	○	●	⊙		⊙
Regatta Island Nature Reserve	⊙	○																					
Seal Rocks Nature Reserve																							
Wallingat National Park		●													○								
Wallis Island Nature Reserve	○	○							⊙		⊙												
Yahoo Island Nature Reserve	○	○			⊙		○															⊙	

WEED DISTRIBUTION UPPER HUNTER AREA	Scotch Broom	Lantana	Blackberry	Madeira Vine	Bridal Creeper	Xanthium spp.	Privet spp.	Pepper Tree	Opuntia spp.	Tree of Heaven	Smooth Senna	Sweet Briar	Nodding Thistle	Weeping Willow	Yorkshire Fog	Leucantheum	St Johns Wort	Box Thorn	Black Thistle	Yucca	Blue Heliotrope	
Back River Nature Reserve								⊙														
Barrington Tops National Park	●		○						⊙				⊙		○	○						
Barrington Tops State Conservation Area	●												○		○	○						
Ben Halls Gap National Park																			⊙			
Brushy Hill Nature Reserve				⊙				●									●		⊙			
Burning Mountain Nature Reserve								●								⊙					⊙	
Camerons Gorge SCA								●					⊙				⊙					
Camerons Gorge Nature Reserve			⊙	⊙				●		○			○			⊙	○	○	○	⊙	○	
Cedar Brush Nature Reserve																						
Crawney Pass CCAZ			⊙		⊙											⊙						
Murrurundi Pass CCAZ			⊙														●		○		○	
Scone Mountain NP				⊙			⊙	●			⊙							⊙	○		○	
Tomalla Nature Reserve																						
Towarri National Park		⊙	○	⊙	○	●	⊙		○	⊙	⊙	○		⊙		○	○	○	○	○		
Wallabadah Nature Reserve			⊙																	○		
Wingen Maid Nature Reserve			⊙	○				●	○								⊙					
Woolooma National Park																						

WEED DISTRIBUTION	Bitou Bush	Lantana	Blackberry	Water Hyacinth	Asparagus spp.	Bridal Creeper	Morning Glory	Pampas Grass	Crofton Weed/Mistflower	Polygala	Xanthium spp.	Moth Vine	Eastern Cassia	Formosa Lily	Opuntia spp.	Camphor Laurel	Coral Tree	Papyrus	Chinese Violet	Kikuyu	Garden escapes	Pine spp.	Turkey Rhubarb	Chrythmum maritimum
HUNTER COAST AREA																								
Boondelbah Nature Reserve	⊙													●										
Bushy Island Nature Reserve		○			○									○										
Broughton Island (MLNP)	⊙					●	○	○						●										
Corrie Island Nature Reserve	○																							
Gir-um-bit NR (Fame Cove)	●	○	○						●					○	○	○								
Gir-um-bit Nature Reserve																								
John Gould NR (Cabbage Tree Island)	○													●										
Karuah National Park (Wallaroo)		○	○				○	○																
Karuah Nature Reserve		○	○											○		●						○		
Karuah State Conservation Area		○	○											○										
Little Broughton Island Nature Reserve	○													●										
Medowie State Conservation Area		○	○																					
Moffats Swamp Nature Reserve																								
One Tree Island Nature Reserve	○	○			⊙																			
Seaham Swamp Nature Reserve		○	○	○		○		○		●				○	○		⊙		○					
Snapper Island Nature Reserve		●									⊙			○										
Stormpetrel Nature Reserve	○													○										
Tilligerry Nature Reserve	●	○	○			⊙		○																
Tilligerry National Park																								
Tomaree National Park	●	○	○	○	○	○	○	○	●	⊙		○	○	○	○	⊙		○		○		⊙	⊙	
Worimi National Park	○	○																						
Worimi State Conservation Area	○	○																						
Worimi Regional Park																								

WEED DISTRIBUTION	Bitou Bush	Lantana	Blackberry	Water Hyacinth	Alligator Weed	Parrots Feather	Madeira Vine	Asparagus spp.	Morning Glory	Pampas Grass	Cape Ivy	Crofton Weed/Mistflower	Balloon Vine	Moth Vine	Privet spp.	Wandering Jew	Eastern Cassia	Formosa Lily	Opuntia spp.	Camphor Laurel	Willow	Kikuyu	Garden escapes	Turkey Rhubarb
NEWCASTLE AREA																								
Awabakal Nature Reserve	●	○	○				⊙	⊙			○					●	●	○		●				
Blue Gum Hills Regional Park	○	●	○						●		⊙			⊙				○		○	○			
Glenrock State Conservation Area	●	●	○		○	⊙	●	●	●	○	●	●	●	●	●	●	●	○	●			○	○	
Hunter Estuary NP (Hexham Swamp)		○	○	●	●				○									○						
Hunter Estuary NP (Kooragang)	●	○	○		⊙				⊙		○							○		⊙		○		
Pambalong Nature Reserve		○	○	●	⊙				⊙													○		

VERTEBRATE PEST DISTRIBUTION	Wild dog	Fox	Feral pig	Rabbit	Horse	Goat	Deer	Cat
BARRINGTON TOPS AREA								
Barrington Tops National Park	●	●	●	○	⊙			○
Barrington Tops State Conservation Area	●	●	●		⊙		⊙	○
Berrico Nature Reserve	○	○	⊙					○
Black Bulga State Conservation Area	○	○						○
Bretti Nature Reserve	●	○	○					○
Camels Hump Nature Reserve	○	○	○					○
Columbey National Park	○	○						○
Coneac State Conservation Area	○	○						○
Copeland Tops State Conservation Area	○	○	○	⊙				○
Curracabundi National Park	○	○	○	○	⊙	⊙		○
Curracabundi State Conservation Area	○	○	○					○
Killarney Nature Reserve	○	○				○		○
Mernot Nature Reserve	○	○	○			○		○
Monkerai Nature Reserve	○	○		○				○
Monkeycot Nature Reserve	○	○	○			○		○
The Glen Nature Reserve	○	○	⊙					○
Watchimbark Nature Reserve	●	○	○	○				○
Woko National Park	●	○	○	○				○

VERTEBRATE PEST DISTRIBUTION	Wild dog	Fox	Feral pig	Rabbit	Horse	Goat	Deer	Cat
GREAT LAKES AREA								
Bandicoot Island Nature Reserve								
Booti Booti National Park	○	●						○
Buladelah State Conservation Area	○	●						○
Coolongolook Nature Reserve	○	○						○
Darawank Nature Reserve	○	○						○
Ghin-Doo-Ee National Park	○							○
Mills Island Nature Reserve								
Myall Lakes National Park	●	○	○	○	⊙	⊙		○
Regatta Island Nature Reserve								
Seal Rocks Nature Reserve								
Wallingat National Park	○	○					⊙	○
Wallis Island Nature Reserve		○						○
Yahoo Island Nature Reserve								

VERTEBRATE PEST DISTRIBUTION	Wild dog	Fox	Feral pig	Rabbit	Cat	Black Rat
NEWCASTLE AREA						
Awabakal Nature Reserve		○		⊙	○	
Blue Gum Hills Regional Park		○		○	○	○
Glenrock State Conservation Area	○	●		●	●	●
Hunter Estuary NP (Hexham Swamp)		○	○	○	○	○
Hunter Estuary NP (Kooragang)		●			○	○
Pambalong Nature Reserve		○				○

VERTEBRATE PEST DISTRIBUTION	Wild dog	Fox	Feral pig	Rabbit	Horse	Deer	Cat	Black Rat	Carp
HUNTER COAST AREA									
Boondelbah Nature Reserve									
Bushy Island Nature Reserve		○							
Broughton Island (MLNP)			●				●		
Corrie Island Nature Reserve		●					○		
Gir-um-bit NR (Fame Cove)	○	○				⊙	○		
Gir-um-bit Nature Reserve									
John Gould NR (Cabbage Tree Island)									
Karuah National Park (Wallaroo)	●	●			⊙	○	○		
Karuah Nature Reserve	●	○	○	●	○	○	○		
Karuah State Conservation Area	●	●	○		○	○	○		
Little Broughton Island Nature Reserve				○			⊙		
Medowie State Conservation Area	●	○	○				○		
Moffats Swamp Nature Reserve	○	○					○		
One Tree Island Nature Reserve									
Seaham Swamp Nature Reserve		○					○	○	○
Snapper Island Nature Reserve							○		
Worimi Regional Park	○	○		⊙		○	○		
Stormpetrel Nature Reserve									
Tilligerry Nature Reserve		○					○		
Tilligerry National Park									
Tomaree National Park		○		⊙			○		
Worimi National Park									
Worimi State Conservation Area									

VERTEBRATE PEST DISTRIBUTION	Wild dog	Fox	Feral pig	Rabbit	Horse	Goat	Deer	Cat
UPPER HUNTER AREA								
Back River Nature Reserve	●	●	○					
Barrington Tops National Park	●	●	●	○	○		○	○
Barrington Tops State Conservation Area	●	●	●	○	⊙		⊙	○
Ben Halls Gap National Park	●	●	●			○	○	○
Brushy Hill Nature Reserve	●	●		○			○	○
Burning Mountain Nature Reserve		●		○				○
Cameron's Gorge Nature Reserve	○	⊙	⊙	○		⊙		○
Cedar Brush Nature Reserve	○	○	○				○	○
Crawney Pass CCAZ	●	○	○			○	○	○
Murrurundi Pass CCAZ	○	○	⊙	●			●	○
Scone Mountain NP		○	⊙	○				●
Tomalla Nature Reserve	●	○	○					
Towarri National Park	⊙	●	●		○		●	○
Wallabadah Nature Reserve	●	●	⊙		○		○	○
Wingen Maid Nature Reserve		○	⊙				⊙	○
Woolooma National Park	●	○	○					○

6 Pest Management Objectives

The overriding objective of NPWS's pest management programs is to minimise adverse impacts of pests on biodiversity and other park values whilst complying with legislative responsibilities.

Programs also aim to:

- manage pest populations to minimise their impact on neighbours,
- increase community understanding of the adverse impacts of pests on biodiversity and Aboriginal and historic cultural heritage, and
- support cooperative approaches and participation in pest management programs with the community and other agencies.

7 Pest Management Principles

Wherever possible, NPWS adopts an integrated approach to pest management, where more than one control technique is used across the landscape. Integrated pest management is likely to be more effective because it avoids selecting for herbicide resistant weed biotypes or bait-shy animals. Targeting more than one pest species is important as the control of one species may benefit another e.g. control of foxes may benefit rabbits; control of bitou bush often leads to an increase in other weeds. Also, control is usually undertaken at particular times of the year when pests are most vulnerable (e.g. translocation of herbicides to growing points is usually greater when weeds are flowering).

So that pest management undertaken by the NPWS is carried out effectively and efficiently, the following principles are generally applied.

- Pest control is targeted to species/locations where benefits will be greatest.
- Development of control priorities are set by clearly defining the problem to be addressed i.e. specific impacts are identified so that the purpose of control is clear.
- Where relevant, pest control is collaborative and across tenure, that is, undertaken on a landscape approach.
- Early detection of new incursions and rapid response is considered a high priority as this is the most cost-effective form of pest control.
- Priority is given to mitigating the impacts on biodiversity of a pest that has cultural significance, whilst minimising impacts on cultural values.
- The aim of most pest control programs is to minimise the adverse impacts of pests, as many exotic pests are already widespread (e.g. foxes, blackberries) and for these species eradication is not possible.
- The focus of control programs is directed towards the values to be protected, because killing pests, by itself, does not necessarily minimise their impacts due to the fact that ecological processes are complex and can be affected by a range of factors.
- Risk assessments are undertaken prior to pest control, where required.
- Pest management strives to strike a balance between cost efficiency, target specificity and animal welfare.
- Where appropriate, pest control employs a combination of control methods and strategies (integrated pest management).

- Pest control programs take a holistic approach, given that the control of one pest may benefit other pests, in that they attempt to control all significant pest threats at a site.
- Pesticide use complies with relevant legislation and is employed in a manner that minimises impacts on the environment.
- Pest management programs are often integrated with other land management activities such as fire management and recreation management.
- Monitoring is being implemented, at varying levels, to demonstrate and improve the ongoing effectiveness of control programs.

8 Pest Program Priorities

NPWS prioritises its pest control programs to focus on those areas where the impacts of pests are likely to be greatest. Resources can then be directed to ensure that the resultant control programs are effective in reducing these impacts. The availability of suitable control techniques and resources (both financial and physical), as well as the practicality and cost effectiveness of control, also influence which programs can be implemented.

Where new pest incursions occur, early detection and eradication is the most cost-effective way to minimise the impacts. The NPWS will work with other agencies to prevent the introduction of new pests and to respond rapidly when new incursions occur.

The following key factors are considered when determining priorities for pest management within the Region.

Critical Priority

1. Programs targeting pests which are, or are likely to be, significantly impacting on biodiversity, as largely identified in the NSW Threatened Species Priorities Action Statement e.g. undertake fox control on the Barrington Tops plateau to protect endangered population of the broad-toothed rat.
2. Programs that target pests which impact significantly on human health or are part of a declared national emergency e.g. outbreak of foot and mouth disease.
3. Programs targeting pests that impact significantly on agricultural production e.g. wild dog control where there is potential for significant stock losses as identified in Wild Dog Management Plans; programs to control State Prohibited or Regionally Prohibited Noxious Weeds (Control Class 1 and 2 weeds).
4. Programs addressing new occurrences of highly invasive pest species with potential for significant impacts on park values (subject to risk/feasibility assessment) e.g. control of *Leucantheum* in Barrington Tops NP or gloriosa lily in coastal reserves.

High Priority

5. Programs that target pests (other than those covered in priorities above) that impact significantly on World Heritage or international heritage values, e.g. control of crofton weed / mistflower in Jerusalem Creek / Williams River Barrington Tops NP.
6. Programs targeting pests that impact significantly on important cultural heritage values e.g. control of weeds in old colliery sites in Glenrock SCA.

Medium Priority

7. Programs that target pests (other than those covered in priorities above) that impact significantly on Wilderness, Wild Rivers, national heritage values or other important listed values e.g. control of willows along a declared Wild River or within a Wilderness Area.
8. Programs that target pests that impact significantly on recreation, landscape or aesthetic values, e.g. control of blackberry on the margins of camping areas.
9. Community or cooperative programs targeting pests that impact significantly on park values or agricultural production and that have ongoing, proven effectiveness and participation, e.g. control of bitou bush / lantana in coastal reserves.
10. Community or cooperative programs that are implemented as part of an endorsed state or regional plan (and not covered above in higher priorities), e.g. control of bitou bush across boundaries as part of a Regional Control Plan prepared by a Regional Weeds Advisory Committee and supported by NPWS.

Lower Priority

11. Community programs targeting pests that have localised impacts on natural ecosystems or agricultural lands and that promote community education and involvement with parks, e.g. participation in a new bush regeneration project with a local community group; control of Locally Controlled and Restricted Noxious Weeds (Control Class 4 and 5 weeds).
12. Previous programs targeting pests that have localised impacts on native species and ecosystems, and that can be efficiently implemented to maintain program benefits, e.g. the maintenance of areas treated previously for lantana.

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

Future priorities for pest control will need to reflect changes in the distribution, abundance or impacts of pests that may occur in response to environmental changes including climate change. This is consistent with the key objectives for invasive species in the NSW Biodiversity and Climate Change Adaptive Framework. NPWS is supporting research to understand the interaction between climate change, pests and biodiversity.

Climate Change

Climate change has been listed as a KTP under the *Threatened Species Conservation Act 1995*. Projections of future changes in climate for NSW include higher temperatures, rising sea levels and water temperatures, elevated CO₂, more intense but possibly reduced annual average rainfall, increased temperature extremes and higher evaporative demand.

These changes are likely to lead to greater intensity and frequency of fires, more severe droughts, reduced river runoff and water availability, regional flooding, increased erosion and ocean acidification.

The direct impacts of climate change on species and ecosystems may include:

- Range shifts and species movement towards cooler latitudes or higher elevations or in response to changed rainfall frequencies and/or distributions;
- Extinctions of local populations along range boundaries;

- Changes in productivity and nutrient cycling within ecosystems due to a combination of climate change and increasing CO₂ levels;
- Increasing invasion by opportunistic, weedy or highly mobile species, especially into sites where local populations of existing species are declining;
- Increasing threat to freshwater ecosystems through decreasing water flows and changes in water temperature and chemistry; and
- Progressive decoupling of species interactions (e.g. plants and pollinators).

Ross Bradstock of the University of Wollongong believes the greatest detrimental impact will be on the cover and diversity of woody species. Warm to cool temperate sclerophyll forest and woodlands will see an increased fire risk resulting from more droughts, with a decline in shrub species and potentially as increase in invasive grasses.

Adjusting NPWS management of the environment, through programs to reduce the pressures arising from other threats such as habitat fragmentation, invasive pest species, bushfires, pollution and urban expansion, will help reduce the severity of the effects of climate change.

For this reason NPWS will continue with existing pest and weed management programs to increase the ability of native flora and fauna to cope with future climatic disturbances.

9 Pest Program Recording and Monitoring

9.1 Recording

Records are kept when control programs are undertaken and pesticides are used. Records are kept to satisfy legal requirements under the *Pesticides Act 1999* and the *Pesticides Regulation 1995* for programs such as weed spraying and 1080 baiting. Standard recording sheets for the use of pesticides have been implemented in the region. In addition, all Hunter Region pest management programs are recorded and regularly updated on GIS, including:

- weed spraying and bush regeneration control areas,
- ground baiting (1080) programs for wild dogs and foxes,
- aerial baiting (1080) programs for wild dogs, and
- release sites for biocontrol agents.

Records are used in conjunction with monitoring data to evaluate the effectiveness of control programs.

9.2 Monitoring

Monitoring of pest species depends on observing and measuring distribution and abundance of species. Monitoring the effectiveness of all pest programs through pest species and biodiversity response can be both expensive and difficult to implement in a way that is able to effectively demonstrate results. Therefore monitoring of a few select projects where the effectiveness of programs can be extrapolated to other similar pest programs is the preferred option. In the Hunter Region native species regeneration is monitored using quadrat and transect surveys, for example on Snapper Island NR following lantana control and Barrington Tops NP with and without scotch broom control.

Measuring the response of biodiversity can be difficult because populations of native species can vary in space and time for many reasons so that differentiating the effects of pest control from other sources of impact is often complex. Measuring the response of biodiversity (or other values) to pest control is necessary in order to:

- demonstrate the degree of impacts and hence justify priorities for management, and
- measure the effectiveness of ongoing control and direct resources to those programs with the greatest effect.

Where native populations are rare, cryptic or dispersed, or where a suite of species is predicted to be affected, indicator species, or other indices of relative abundance, can be used to provide an indirect measure of effectiveness. For example, while fox control may benefit a broad range of ground dwelling mammals, monitoring may focus on a particular “indicator” species. Populations of these indicator species are monitored. Indicator species in Hunter Region include threatened species such as broad-toothed rat and brush-tailed rock wallaby.

Where pest incursions have occurred recently, or where their distribution is otherwise limited, the objective of control is usually to eradicate the incursion completely or to contain its spread. In these situations, monitoring is required to confirm eradication or containment and should focus on the pest species rather than the response of native species. Such an approach may require methods that are capable of detecting populations at very low densities and prolonged monitoring will be required to ensure that containment or eradication has been achieved.

NPWS standard systems and databases are being developed for the consistent and systematic collection, collation, storage and analysis of data as part of the Monitoring and Evaluation component of the Park Management Program.

A statewide strategy for monitoring NSW natural resources has been adopted by the State Government. The NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy seeks to measure long-term trends in natural resources in NSW and the effectiveness of specific management actions to sustain them. It is based on 13 statewide targets which define broadly the natural resources of interest including a specific target for invasive species (weeds and pest animals) viz. By 2015 there is a reduction in the impact of invasive species (New South Wales State Plan: Priority E4 – Better environmental outcomes for native vegetation, biodiversity, land, rivers and coastal waterways).

To assess progress towards this target, three indicators have been developed for invasive species:

- Number of new invasive species established (all new species whose impacts are likely to be significant);
- Distribution and abundance of emerging invasive species (selected species only); and
- Success of control programs for widespread invasive species (selected species only) as measured by a reduction in impacts (e.g. a reduction in the impacts of foxes on biodiversity).

DECC has committed to providing information for the third indicator. This commitment is currently limited to biodiversity responses to fox control and bitou bush control at priority sites identified in the respective TAPs. Monitoring protocols for both TAPs have been developed and these will be used to guide the collection and analysis of data for these species. In the future, reporting on other pests may be provided if additional resources become available.

10 Regional Coordination and Support of Pest Control Programs

Pest control programs are coordinated by the Pest Management Officer with support from the Pest Technical Officer and relevant Area staff in order to ensure that resources are utilised to achieve the best possible outcomes. The Region puts emphasis on the implementation of landscape programs which require a cooperative approach with neighbours, community groups and other agencies, including the Hunter Central Rivers CMA. Education of staff and the broader community are essential requirements in integrated pest management

The Pest Management Officer also represents the NPWS on external committees including the Northern Feral Animal Committee, Port Stephens Feral Animal Committee, Lower Hunter and Central Coast Weed Management Committee, and Mid-North Coast Weed Committee.

11 Pest Program Overviews

Although individual pests are discussed as part of this section most pest management programs encompass the control of a number of pest species simultaneously. Meeting the objectives of pest control programs is reliant on this approach. Appendix 1 identifies pest management programs undertaken by each Area, the priority for each program, control strategy summary and key performance indicators.

11.1 Weed Species

11.1.1 Aquatic Weeds

Alligator Weed (*Alternanthera philoxeroides*), Parrots Feather (*Myriophyllum aquaticum*), Salvinia (*Salvinia molesta*), Sharp Rush (*Juncus acutus*) and Water Hyacinth (*Eichhornia crassipes*)

Distribution and Abundance

Alligator weed - isolated scattered infestations in Pambalong NR. Scattered infestations throughout Hunter Estuary NP (Hexham) with heavy infestations adjacent to Iron Bark and Mosquito Creeks.

Parrots feather - scattered populations occur along Flaggy Creek in Glenrock SCA. Heavy populations occur in the upper catchment outside the boundaries of Hunter Estuary NP (Hexham). It is also in the upper Myall River growing in freshwater wetlands of Myall Lakes NP. It is likely that salt water intrusion will assist in controlling the spread of this weed in Hunter Estuary NP (Hexham).

Salvinia - has been controlled in Myall Lakes NP however monitoring for all aquatic weeds will be continued.

Sharp rush - isolated infestations occurring in Hunter Estuary NP starting to impact on saltmarsh communities.

Water hyacinth - successfully treated in Seaham Swamp and Awabakal NRs although monitoring to continue during peak growing periods. Heavy infestations in Pambalong NR. Scattered infestations in Hunter Estuary NP (Hexham) however heavy infestations occur on neighbouring lands.

Impacts

Alligator weed produces masses of creeping and layering stems over land and water. It is an aggressive invader that responds to high nutrient levels and is a major threat to wetlands, rivers and irrigation systems (ARMC 2000). New plants regenerate readily from plant fragments which facilitate rapid spread and increase the difficulty of control. Alligator weed is a Weed of National Significance (WONS).

Parrots feather is a stoloniferous perennial. It grows in static or moving water up to 2 metres in depth, rooting in mud or gravel. Spreads by stem fragments.

Salvinia is a free-floating aquatic fern which can form dense mats. Plants have central stems that lie beneath the water surface, pairs of hairy floating leaves along the stems and submerged trailing root-like filaments. Plants float together over the water surface and have three distinct growth stages. Reproduction is asexual (NSW DPI 2006). Salvinia infestations rapidly grow in high nutrient slow-moving water bodies. Salvinia is a Weed of National Significance (WONS). Salvinia previously infested part of Myall Lakes NP which is listed as a RAMSAR wetland (NPWS 1999).

Sharp rush is a terrestrial and aquatic weed which colonises disturbed wet areas and can tolerate high salinity. This weed is starting to invade endangered ecological salt marsh communities in Hunter Estuary NP (Kooragang).

Water hyacinth is a free-floating stoloniferous perennial up to 1metre in height. Floating plants completely obstruct water movement and reduce oxygen levels in water (Lamp and Collet 1999).

Alligator weed and water hyacinth are both impacting on freshwater wetlands at Pambalong NR which is listed as an Endangered Ecological Community. This reserve also provides habitat for Latham Snipe (*Gallinago hardwickii*).

Management Objectives

Implement co-operative programs with all landholders. Focus control efforts on the upper catchment as a priority.

Record and map all aquatic weed infestations and treat any newly identified isolated infestations.

Control Priorities

- Alligator weed - isolated infestations at Pambalong NR
- Parrots feather - isolated infestations in Glenrock SCA
- Salvinia - *ad hoc* monitoring of Boolambayte Creek / Lake - Myall Lakes NP
- Sharp rush - evaluate the impact of infestations affecting saltmarsh communities in Hunter Estuary NP (Kooragang).
- Water hyacinth - infestations west of Cedar Hill Drive at Pambalong NR - quarterly monitoring at Seaham Swamp NR.

Control Techniques

Aquatic weed control is problematic due to the rapid growth of aquatic weeds and the impact dead and decaying material can have on the water quality of waterways. The Hunter Region has an environmental protection licence for the use of herbicides in waterways to treat aquatic weeds.

- Alligator weed - physical removal of plant biomass followed by treatment with metsulfuron-methyl (terrestrial growing plants) and glyphosate (aquatic growing plants).
- Parrots feather - physical removal of isolated plants, removing all plant material.
- Salvinia - physical removal of isolated plants and herbicide control of dense mats.
- Sharp rush - Mechanical removal in areas already disturbed or invaded with weeds. Physical removal of isolated infestations. Treatment with glyphosate as per permit 5206.
- Water hyacinth - mechanical removal, herbicide (diquat or glyphosate), physical removal of isolated seedlings/plants.

Monitoring

- NPWS will map, record and store on the agency Geographic Information System (GIS) all occurrences of aquatic weeds on its lands and will monitor its distribution in response to control.
- Monitoring of Seaham Swamp NR and Redhead Lagoon in Awabakal NR for any water Hyacinth seedlings.

NPWS will liaise regularly with the local control authorities, Great Lakes, Port Stephens, Newcastle and Cessnock LGAs to identify any new incursions in the upper catchments.

11.1.2 Asparagus Species

Bridal Creeper (*Asparagus asparagoides*), Ground Asparagus (*A. densiflorus*) and Climbing Asparagus (*A. plumosus*)

Distribution and Abundance

Bridal creeper - Isolated infestations in Tomaree NP, Bandicoot Island NR and Wingen Maid NR. This weed has the ability to increase its current range.

Ground asparagus - Glenrock SCA, Tomaree Head - Tomaree NP, Cape Hawke - Booti Booti NP, Seal Rocks - Myall Lakes NP.

Climbing asparagus - Old Homestead sites - Curracabundi NP and Korsmans Landing; Seal Rocks - Myall Lakes NP; The Ruins area and Booti Island - Booti Booti NP.

Impacts

Bridal creeper is listed as a WONS largely due to its invasiveness, potential for spread and economic and environmental impacts. It invades undisturbed environments where its climbing stems and foliage smother native plants and form thick dense mats (ARMC 2001).

Ground asparagus occurs in coastal reserves, in close proximity to urban areas. The plant quickly establishes in both disturbed and undisturbed sites and competes with native ground cover species.

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

All of these asparagus species produce fleshy fruit which are distributed by birds.

Management Objectives

Priority will be given to new incursions of asparagus weeds, sites which have known threatened species/endangered ecological communities which are being degraded from the invasion or at sites which have been identified as part of a Threat Abatement Plan for example the Bitou Bush TAP.

Priorities for control

- Bridal creeper - isolated infestations in Tomaree NP, Bandicoot Island NR, Wingen Maid NR, Bushy & One Tree Island NRs.
- Ground asparagus - control in Bitou Bush TAP sites in Glenrock SCA, Myall Lakes NP, Tomaree NP and rainforest regeneration sites in Booti Booti NP.
- Climbing asparagus - isolated infestations in Myall Lakes NP (Korsmans Landing and Seal Rocks), Booti Booti NP and Curracabundi NP.

Control

Isolated infestations can be controlled by physical removal or the cut-and-paint or cut-and-scrape technique. Heavier infestations controlled using herbicide applied by backpack sprayers or vehicle-based spray. On Booti Island control of bridal creeper may be achieved by the release of a biocontrol agent. All treatment of asparagus species will be recorded and information maintained on GIS.

Monitoring

- All control will be recorded and mapped.
- Monitoring at some of these sites will be undertaken as part of the Bitou Bush TAP project.

11.1.3 Bitou Bush (*Chrysanthemoides monilifera ssp. rotundata*)

Distribution and abundance

Bitou bush mapping has been undertaken in all coastal reserves in the Hunter Region. Bitou bush invasion is mostly confined to the first 500 metres of the coastline, although in Myall Lakes NP isolated infestations are starting to invade the forests on the lake foreshore and in Glenrock SCA bitou bush infestations are scattered throughout the reserve. Tomaree and Booti Booti NPs have dense infestations largely confined to 100 m from the coastline. Isolated infestations occur in Gir-um-bit NR, Hunter Estuary NP (Hexham) and the offshore islands Broughton

and John Gould NR. The islands of Kooragang and Corrie have extensive infestations.

Impacts

Bitou bush is a highly competitive weed that smothers native plant communities and destroys natural habitat and food sources for native animals. It threatens over 180 native plant species, populations and ecological communities in NSW. Bitou bush invades dunes, coastal heathlands, grasslands, woodlands and forests (DEC 2006a). It infests almost the entire coastline in the Hunter Region (NPWS 2002). Bitou bush can also disturb cultural heritage sites by destroying the structure of the site.

Bitou bush is a WONS and is declared Control Class 4 under the *Noxious Weeds Act 1993* in the three coastal councils in the Hunter Region (Great Lakes, Port Stephens and Newcastle). The invasion of native plant communities by bitou bush is listed as a KTP under the *TSC Act* and a TAP (DEC 2006b) has been prepared and is being implemented.

Management Objectives

Bitou bush programs focus on the treatment of isolated infestations (to reduce the weeds distribution), cultural heritage sites and in areas which have threatened species or endangered ecological communities (Bitou Bush TAP).

A bitou bush plan was developed for Hunter Region in 1998 and has been implemented in coordination with the Local Government Areas of Lake Macquarie, Newcastle, Port Stephens and Great Lakes.

Priorities for Control

The Bitou Bush TAP (DEC 2006b) identifies 26 priority sites for control in the Hunter Region. Site management plans have been prepared for these sites and also include the treatment of a number of other weed species. Bitou bush control programs have commenced in many of these sites including:

- Glenrock SCA - Scenic Drive, Burwood Beach and Flaggy Creek
- Tomaree NP - Tomaree Headland, Fishermans Bay, Anna Bay Headland, Wreck and Box Beaches
- Myall Lakes NP - Yacaaba Headland, Mungo Brush, Big Gibber Beach, Lighthouse Beach, Seal Rocks, Treachery Headland
- Booti Booti NP - Shelly Beach, Janies Corner, The Ruins
- Darawank NR - Seven Mile Beach:

Other control priorities include the treatment of isolated infestations:

- John Gould NR (Cabbage Tree Island), Broughton Island in Myall Lakes NP and Boondelbah Island
- Gir-um-bit NR - riparian forest at Swan Bay
- Broadwater foreshore in Myall Lakes NP to protect EEC-listed Swamp Sclerophyll Forest
- Sea cliffs in Awabakal NR

Control Techniques

Bitou bush is controlled using an integrated approach. A number of different techniques are utilised including physical removal, cut-and-paint technique and herbicide treatment from backpack, vehicle and helicopter. Two biocontrol agents, Tip Moth (*Comostolopsis germana*) and Seed Fly (*Mesoclanis polana*) have also effectively established in all coastal reserves.

Monitoring

Bitou bush density and distribution mapping was undertaken in Myall Lakes, Booti Booti and Tomaree NP coastal reserves in 1997/1998. Mapping will be replicated in 2008 as an indicator of the changes in distribution over the ten year period. This

mapping data will also provide information regarding the success of long term control programs.

The region will also monitor the success of the bitou bush control programs at sites in Glenrock SCA, Tomaree and Myall Lakes NPs using methods outlined in the Bitou Bush TAP monitoring guidelines. Information will be collected annually from permanent transects, including density and abundance of bitou bush and native species present. All treatment of bitou bush will be recorded and information maintained on GIS.

A permanent monitoring site has been established in Tomaree NP with the Pest Management Unit (Head Office) to further understand the demography of bitou bush invasion and native plant rehabilitation following control.

11.1.4 Blackberry (*Rubus fruticosus* agg.)

Distribution and Abundance

Blackberry occurs throughout the region. In coastal reserves such as Glenrock SCA, Tomaree NP, Kooragang NR and Myall Lakes NP isolated plants occur but are less invasive than other coastal weeds. Inland reserves such as Barrington Tops, Curracabundi and Tomalla NPs have more widespread blackberry infestations. Other inland reserves such as Camerons Gorge, Murrurundi Pass, Wallabadah, The Glen and Watchimbark NRs have isolated infestations.

Impacts

Blackberry can thrive in a range of habitat and invades the banks of watercourses, roadsides, open forest and sub-alpine areas. Blackberries can impede access, provide habitat suitable for introduced species and treated plants provide increased fine fuels, increasing fire intensity. Blackberries spread from the stems which can root into the ground and through the dispersal of seed from fruit which is spread by animals (Parsons and Cuthbertson 1992).

Blackberry is listed as a WONS and a Control Class 4 noxious weed in the Hunter Region (Appendix 2).

Management Objectives

Blackberry infestations which impact on threatened species, or directly impact on neighbours and are part of a collaborative program will be a priority.

Control Priorities

- Blackberries in Towarri and Barrington Tops NPs directly impact on threatened species and endangered ecological communities. Blackberry control in these reserves is a priority. Further mapping is required in Barrington Tops to fully establish the distribution of the weed in the sub-alpine area.
- Isolated blackberry infestations located in the upper catchment of Curracabundi NP are a priority for control.
- Isolated plants in the Glenn NR
- In coastal reserves, blackberries are being controlled only as part of other coastal weed programs which are considered a critical priority such as Bitou Bush TAP sites.

Control programs in other reserves are not a critical priority and should only be undertaken as part of a long-term cooperative projects with surrounding neighbours or as part of other critical priority weed control programs.

Blackberry infestations in a number of newly gazetted reserves in the Upper Hunter area will only be treated once resources are available.

Control Techniques

Integrated control techniques are utilised and include treatment of blackberry using herbicide applied from backpack sprayers, gas guns and vehicle-mounted spray units. A spot-spraying helicopter applicator has been developed to reach blackberries for inaccessible areas. Fire can also be used as a primary tool for initial blackberry control.

The blackberry leaf rust fungus (*Phragmidium violaceum*) biocontrol has established in the Barrington Tops NP which reduces fruit and seed on the plant (CRC 2003).

Monitoring

Mapping of treatment areas is undertaken throughout the Region and information maintained on GIS.

Before and after photopoints, and mapping have been undertaken for Towarri NP where spot-spraying from helicopter has been used.

Establishment of the blackberry rust fungus is monitored as a part of a long-term vegetation community monitoring project undertaken in the Barrington Tops NP plateau.

11.1.5 Coastal Environmental Weeds

Camphor Laurel (*Cinnamomum camphora*), Cassia (*Senna pendula*), Formosan Lily (*Lilium formosanum*), Groundsel Bush (*Baccharis halimifolia*), Mickey Mouse Plant (*Ochna serrulata*), Pine Tree (*Pinus species*), Polygala (*Polygala myrtifolia*), Umbrella Tree (*Schefflera actinophylla*) and Wild Tobacco Tree (*Solanum mauritianum*).

Distribution and Abundance

A number of coastal weeds are establishing in urban reserves in addition to the more common weeds of lantana and bitou bush. In Glenrock SCA, Awabakal NR and Tomaree NP there is an increasing number of exotic tree species including camphor laurel, mickey mouse plant and umbrella tree. In Booti Booti NP, Myall Lakes NP and Glenrock SCA infestations of cassia are increasing following bitou bush control. A new weed incursion of groundsel bush has been identified in the Tomago area of Hunter Estuary NP. In Glenrock SCA and Awabakal NR there has been an increase in Formosan lily. Polygala infestations remain restricted to Tomaree NP. Pine species are an issue in the southern area of Myall Lakes NP on lands adjoining plantations.

Impacts

Coastal environmental weeds invade native plant communities often in association with other weeds already widely distributed such as bitou bush or lantana. Many of these species are grown in urban gardens and seed is distributed into bushland reserves by birds or through refuse dumping. At some sites these weed species are secondary invaders, such as Formosan lily and cassia, following the removal of the primary weed invasion. Many of these secondary weed invaders are more difficult, and thus more expensive, to control than the primary weeds. They also reduce the ability of native vegetation communities to recover (Buchanan 1994).

Management Objectives

Secondary weed incursions are recorded and treated as part of critical priority existing weed control programs for bitou bush and lantana. New weed incursions

which have not been previously recorded and are known to be a problem in other areas are treated as a priority.

Develop community awareness regarding urban escapes through the Hunter Central Coast and Mid North Coast Weeds Committees Bushland Friendly Nursery Schemes.

Priority Control

- Treatment of polygala in Tomaree NP as part of Bitou Bush TAP sites.
- Treatment of Formosan lily in Glenrock SCA at sites where the endangered orchid *Diurus venosa* is known to occur.
- Treatment of cassia at Glenrock SCA, Booti Booti NP and Myall Lakes NP as part of Bitou Bush TAP sites or where it occurs near threatened plant species or within Littoral Rainforest Endangered Ecological Community.
- Treatment of Groundsel Bush at Hunter Estuary NP (Tomago area).
- Mapping of pine infestation in Myall Lakes, development of priorities and implementation of program.

Monitoring

All treatment of coastal environmental weeds will be recorded and information maintained on GIS.

All new weed incursions will be mapped.

Monitoring of these species will be undertaken as part of existing Bitou Bush TAP monitoring sites.

11.1.6 Crofton Weed (*Ageratina adenophora*) and Mistflower (*A. riparia*)

Distribution and Abundance

Crofton weed (*Ageratina adenophora*) and mistflower (*Ageratina riparia*) occur in isolated infestations throughout the region, generally east of the range. These weeds are common along road edges and gullies in wetter areas such as eastern Barrington Tops NP, Glenrock SCA, The Glen NR, Ghin Doo Ee NP and central Myall Lakes NP.

Impacts

Both weeds spread rapidly in disturbed areas along roadside verges, out-competing native colonisers. Plants produce vast numbers of seed which are spread by wind and water, resulting in the establishment of plants along creeks where no disturbance has occurred. Crofton weed is poisonous to horses and is listed as a Control Class 4 noxious weed.

Management Objective and Control Priorities

- Priority for control will include the World Heritage listed Williams River and Jerusalem Creeks in Barrington Tops NP.
- Crofton weed and mistflower control will be undertaken as part of other multi-weed control including rainforest rehabilitation projects at Mungo Brush and Seal Rocks in Myall Lakes NP and Flaggy Creek in Glenrock SCA.
- Crofton weed control will also continue to be undertaken as part of the removal of an isolated weed incursion at Whoota Lookout in Wallingat NP.
- Crofton weed control in Watchimbark NR.

Monitoring

All treatment will be recorded and information maintained on GIS.

Mapping of crofton weed and mistflower will continue in the Williams River and Jerusalem Creek.

11.1.7 Exotic Grasses

Buffalo Grass (*Stenotaphrum secundatum*), Chilean Needlegrass (*Nassella nemesia*), Coolatai Grass (*Hyparrhenia hirta*), Giant Parramatta Grass (*Sporobolus fertilis*), Panic Veldtgrass (*Ehrharta erecta*), Pampas Grass (*Cortaderia jubata*), Paspalum Grass (*Paspalum dilatatum*), Spiny Burr Grass (*Cenchrus echinatus*), Whiskey Grass (*Andropogon virginicus*) and Yorkshire Fog (*Holcus lanatus*)

Distribution and Abundance

Exotic perennial grasses occur in all reserves throughout the region. The above list is not comprehensive; however it identifies those grasses that are likely to have the greatest impact or are already widely established. Buffalo grass, kikuyu and panic veldtgrass infestations are problems in many of the coastal Bitou Bush TAP and Littoral Rainforest sites in Booti Booti NP, Glenrock SCA, Snapper Island NR and Tomaree NP. These grasses are also widely established on parts of Broughton Island and in the Hunter Estuary NP. Pampas grass infestations are scattered throughout Glenrock SCA and Hunter Estuary NP with heavy infestations on Kooragang Island. There is an isolated infestation of pampas grass in an old dredge site on Wallis Island NR. Yorkshire fog is increasing across the sub-alpine plateau displacing native species along roadsides and along the creek lines at Polblue and Nolans Swamp in Barrington Tops NP/SCA. Isolated spiny burr grass infestations are located at Anna Bay Headland in Tomaree NP and heavy infestations occur throughout Curracabundi NP. Whiskey grass occurs throughout most coastal reserves but is confined to roadside edges or disturbed areas. This grass could have impacts if it establishes in more inland reserves with open forest.

Other grasses, such as coolatai grass and Chilean needlegrass, have not yet established however they have the potential to invade reserves in the Barrington Tops and Upper Hunter Areas.

Impacts

Exotic perennial grasses are characterised by vigorous growth and prolific seed production which in some places displace native vegetation. They may also change the fuel loads in plant communities. The changed structure and fire regimes of the habitat impact on both native vertebrate and invertebrate fauna (DECC 2007a). Invasion of native plant communities by exotic perennial grasses have been listed as a KTP as part of the *TSC Act*.

In the Barrington Tops plateau, Yorkshire fog threatens the Endangered Ecological Community listed Montane Peatlands, habitat for the endangered broad-toothed rat and a number of other threatened plant species.

Management Objectives

Develop strategies to treat exotic perennial grasses where they impact on threatened species or endangered ecological communities.

Identify, locate and treat any new weed incursions. Provide information to all officers. Ensure hygiene protocols especially cleaning of vehicles for road plant is enforced.

Control Priorities

- Treat buffalo grass, kikuyu and spiny burr grass at Bitou Bush TAP sites or in other locations where threatened species or EECs are impacted.
- Treat isolated pampas grass infestations on Broughton Island and Wallis Island NR.
- Prevent the establishment of Yorkshire Fog in the Edwards Swamp catchment on the sub-alpine plateau of Barrington Tops NP.
- Prevent the invasion of exotic grasses at Watchimbark NR.
- Treat isolated infestations of giant Parramatta grass in Barrington Tops area.

Control Techniques

A variety of control techniques can be utilised for controlling grasses, including physical removal of isolated clumps or herbicide spot-spraying, from a vehicle-mounted spray unit or rope wick applicators. The risk of using herbicides is the potential impact to native grasses. The creation of bare patches following herbicide application allows exotic grasses to rapidly re-establish. Follow-up is critical in the control of exotic grasses.

Monitoring

All treatment of exotic grasses will be recorded and information maintained on GIS. The distribution of Yorkshire fog will be mapped for Barrington Tops NP and SCA. This will be used to compare the changes in distribution over time.

11.1.8 Exotic Herbs

Blue Heliotrope (*Heliotropium amplexicaule*), Chinese Violet (*Asystasia gangetica* ssp. *micrantha*), Mother-of-Millions (*Bryophyllum delagoense*), Noogoora Burr (*Xanthium occidentale*), Nodding Thistle (*Carduus nutans*), Ox-eye Daisy (*Leucanthemum vulgare*), Spear Thistle (*Cirsium vulgare*) and St Johns Wort (*Hypericum perforatum*).

Distribution and Abundance

- Blue heliotrope occurs along the waterways in Cameron Gorge NR and is present on neighbouring lands in the upper catchment. Scattered populations also occur in Murrurundi Pass NP, Crawney Pass NP and Burning Mountain NR.
- Chinese violet is listed on the National Weed Alert list. This species is located adjacent to Tomaree NP at Boat Harbour and One Mile Beach.
- Mother-of-millions occurs at a number of locations primarily adjacent to urban areas.
- Noogoora burr occurs in a number of reserves throughout the region including Curracabundi, Towarri and Myall Lakes NPs, and is most common adjoining recently disturbed tracks and trails.
- Nodding thistle and ox-eye daisy are recent weed incursions occurring in Barrington Tops SCA.
- St Johns Wort occurs as an isolated infestation in Curracabundi NP where it does not occur on neighbouring lands. There are also infestations at Burning Mountain NR, Camerons Gorge NR, Crawney Pass NR and Murrurundi Pass NP. These reserves all adjoin lands which have infestations.

Impacts

- Chinese violet is a herbaceous scrambling perennial plant that competes strongly for space, water and nutrients. It has rapidly colonised coastal areas in the Port Stephens areas following the control of bitou bush.
- Mother-of-millions is confined to isolated minor infestations on urban park boundaries and has minimal impact on native plant communities however it is poisonous to stock.
- Noogoora burr, spear thistle, blue heliotrope and St Johns wort are largely a result of the past agricultural landuse of many of the Upper Hunter Area reserves. All of these species compete with native species during regeneration and can impact on agriculture production. St Johns wort causes photosensitivity in cattle and the fruit from noogoora burr can affect wool production.
- Nodding thistle and ox-eye daisy have the potential to establish in open forests of the Barrington Tops plateau.

Management Objectives

Target and treat isolated infestations of weeds which are known to be problematic in similar environments. Focus control programs on infestations in the upper catchments as a priority. Work with neighbours to implement a landscape approach to the management of agriculture weeds.

Control Priorities

- Identify and treat Chinese violet in Tomaree NP in coordination with Port Stephens LGA.
- Treat mother-of-millions where it occurs in Bitou Bush TAP sites.
- Treat isolated incursions of nodding thistle and ox-eye daisy in the Barrington Tops plateau.
- Treat isolated noogoora burr infestations at Nerong in Myall Lakes NP and in Towarri NP to prevent spread to neighbouring sheep properties.
- Treat isolated infestations of St Johns wort in Curracabundi NP.

Other weed control programs for exotic herbs should only be undertaken across the landscape as part of cooperative programs with all neighbours.

Monitoring

All treatment of exotic herbs will be recorded and information maintained on GIS.

St Johns wort infestation in Curracabundi will be remapped annually to measure the effectiveness of the program over time.

Annual monitoring of roadsides on the Barrington Tops plateau specifically to identify establishment of nodding thistle and ox-eye daisy.

11.1.9 Exotic Vines and Scramblers

Cape Ivy (*Delairea odorata*), **Madeira Vine** (*Anredera cordifolia*), **Moth Plant** (*Araujia sericifera*), **Glory Lily** (*Gloriosa superba*), **Blue Morning Glory** (*Ipomoea indica*), **Coastal Morning Glory** (*Ipomoea cairica*), **Dipogon** (*Dipogon lignosus*), **Trad** (*Tradescantia fluminensis*) and **Turkey Rhubarb** (*Acetosa sagittata*).

Distribution and Abundance

Cape ivy and **moth plant** occur along riparian zones in the catchments of Little Manning River in Woko NP, Watchimbark Creek in Watchimbark NR and in Curracabundi NP. These two weeds also occur in and around Cape Hawke in Booti Booti NP. Moth plant infestations also occur in Glenrock SCA and Snapper Island NR.

Madeira vine infestations occur along park boundaries at the northern end of Awabakal NR and east of Seacourt Avenue (adjacent to Glenrock SCA). It has also been recorded on Earps and Booti Islands in Booti Booti NP and Yahoo Island NR. A minor infestation occurs in Copeland Tops SCA.

Both species of **morning glory** occur in scattered locations throughout Booti Booti NP, Tomaree NP, Glenrock SCA and Broughton Island in Myall Lakes NP.

Minor infestations of **dipogon** occur on Broughton Island, Anna Bay Headland in Tomaree NP and Scenic Drive (adjacent to Glenrock SCA).

Trad infestations are limited to Glenrock SCA where the weed dominates the understorey of Littoral Rainforest along Flaggy Creek.

Glory lily has not been located within NPWS reserves in Hunter Region however it is known from two locations near reserve boundaries in Tomaree NP and Worimi NP.

Turkey rhubarb occurs on Anna Bay Headland in Tomaree NP.

Impacts

Exotic vines and scramblers have been identified as a KTP as part of the *TSC Act*.

Cape ivy, madeira vine, moth plant and morning glory are all vines that smother the ground and canopy of riparian and rainforest vegetation, altering light availability and

suppressing the growth and regeneration of native species. The weight of these vines may also cause breakages and canopy collapse (DECC 2007b).

Turkey rhubarb and Dipogon impact on coastal vegetation communities where they smother vegetation following bitou bush control.

Glory lily is a scrambler or climber up to 2metres in height which predominantly invades coastal dune and headland vegetation communities, including rainforests and open forest. The plant smothers vegetation and has become an invader following the control of bitou bush at sites on the North Coast. Once established, it is difficult to control due to its perennial growth.

Management Objectives

Identify and locate the occurrence of exotic vines and scramblers where they impact on threatened species or endangered ecological communities. Implement programs as part of TAPs or to protect threatened species. Develop community awareness regarding urban escapes through the Lower Hunter and Mid North Coast Weeds Committees Bushland Friendly Nursery Schemes.

Control Priorities

- Control cape ivy and moth plant in Cape Hawke, Booti Booti NP, Snapper Is NR to protect Littoral Rainforest, and in Woko NP to protect threatened species.
- Treat turkey rhubarb and dipogon in Tomaree NP as part of Bitou Bush TAP programs.
- Control trad and morning glory along Flagggy Creek in Glenrock SCA.
- Treat isolated infestation of madeira vine in Copeland Tops SCA.
- Control isolated infestations of morning glory and dipogon on Broughton Island & Cabbage Tree Island NR
- Treat all exotic vines and scramblers occurring at Bitou Bush TAP sites.

Control Techniques

A variety of techniques can be utilised to treat exotic vines depending on the extent and location of infestations and the type of vegetation community in which the vines are growing. Small infestations and seedlings can be removed physically ensuring removal of all below and above ground tubers for some species, particularly madeira vine, morning glory and turkey rhubarb. Herbicide treatment and application concentration varies for each species. The DECC has an off-label permit for the treatment of these weeds and others with herbicide.

Monitoring

All treatment will be recorded and information maintained on GIS.

Assess the extent of madeira vine on Yahoo Island.

Monitor for and prevent the establishment of glory lily in Hunter Region reserves by communicating with Local Government Weeds Control Officers and through visual inspections of high risk sites.

11.1.10 Lantana (*Lantana camara*)

Distribution and Abundance

Lantana is a common widespread weed growing east of the Barrington Tops. Lantana occurs in a variety of vegetation communities such as sand dunes, heath and open forest, and it proliferates in wet forest and rainforest.

Lantana is common in the tall wet forests and rainforest communities of Booti Booti NP, Brettli NR, Myall Lakes NP, Running Creek NR, Killarney NR, The Glen NR, Woko NP, Wallingat NP, Black Bulga and Copeland Tops SCAs. Lantana infestations are also common in dry open forest communities in Curracabundi NP, Camels Hump NR, Wallaroo NR, Blue Gums Hills RP and Columbey NP. In coastal

reserves lantana grows in association with bitou bush at Glenrock SCA and Tomaree NP.

Impacts

Lantana infests a wide variety of natural ecosystems. Its dense thickets exclude native species through smothering and allelopathic effects, dominating understoreys and reducing biodiversity (DNRME 2004).

Lantana is a WONS and a Control Class 5 noxious weed. Lantana has been listed as a KTP under the *TSC Act*. In Hunter Region lantana infestations impact on Endangered Ecological Communities such Littoral Rainforest, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest and a number of threatened species.

Management Objectives

A Lantana TAP for NSW is currently being prepared 26 sites from the Hunter Region has been included in this process. Control programs are currently focussed on isolated infestations and sites which have threatened species or endangered ecological communities.

Control Priorities

- Littoral Rainforest projects at Flaggy Creek – Glenrock SCA, Seal Rocks, Lighthouse Beach, Yacaaba Headland and Mungo Bush in Myall Lakes NP, Cape Hawke, Elizabeth Beach, Shelly Beach, Sth Burgess Beach, Workshop area, Wallis Lake Eastern Foreshore in Booti Booti NP, Snapper Island NR.
- Foreshore areas in EEC listed Fringe Forest s in Myall Lakes NP
- Dry Rainforest project at Woko NP.
- Targeting an isolated new weed incursion at Towarri NP.
- Isolated infestations along roadways in Wallingat NP, Ghin-doo-ee NP, Berrico

Control Techniques

Physical removal of seedlings and cut-and-paint technique for isolated infestations in sensitive environments. Herbicide treatment using the splatter gun, backpack spraying, vehicle-mounted spray units for heavy infestations.

A number of lantana biocontrol agents have been released across the Hunter Region, however none of these agents have successfully established.

Monitoring

Records of lantana control programs are maintained on GIS.

An annual monitoring program (5 x 10sq metre quadrats) has been established on Snapper Island NR to identify the effectiveness of lantana control and success of native species regeneration.

11.1.11 Prickly Pear (*Opuntia stricta*) and Tiger Pear (*O. aurantiaca*)

Distribution and Abundance

Prickly pear infestations are scattered throughout the region and in most cases controlled effectively by the presence of the Cactoblastis (*Cactoblastis cactorum*) and Cochineal (*Dactylopius opuntiae*) insects. In exposed coastal landscapes these two biological controls have difficulty establishing and therefore prickly pear has become a major weed on Broughton and Boondelbah Islands. Tiger pear occurs in Camerons Gorge and Burning Mountain NRs and biocontrol activity alone is not controlling these infestations.

Impacts

Dense patches of pears form an impenetrable barrier and provide harbour for introduced species. On Boondelbah Island a dense infestation threatens suitable breeding habitat for the endangered Goulds Petrel (*Pterodroma leucoptera*). The large sharp spines and barbed bristles readily penetrate human skin causing severe irritation and are difficult to remove (Parsons and Cuthbertson 1992).

Management Objectives

Treat pears in recreation areas to minimise impact on human health.
Continue to strategically release biocontrol agents.
Develop a control strategy for prickly pear on Boondelbah Island.

Control Priorities

- Prickly pear infestations on Boondelbah Island to protect breeding habitat for endangered population of Goulds Petrel.
- Tiger pear infestations adjoining recreation areas in Burning Mountain NR.

Control Techniques

Biological control agents including the Cactoblastis and Cochineal insect are the preferred methods of control for scattered populations. Herbicide application at priority locations.

Monitoring

All treatment will be recorded and information maintained on GIS.
The effectiveness of treatment on Boondelbah Island will be reflected as part of the annual Gould Petrel monitoring program.

11.1.12 Scotch Broom (*Cytisus scoparius*)

Distribution and Abundance

Scotch broom infests in excess of 10 000 hectares of the sub-alpine plateau in Barrington Tops NP and SCA.

Impacts

Scotch broom is an aggressive invader in areas of high fertile soils and open canopy. It is competitive with native species inhibiting regeneration and growth. The weed has become established in woodlands and open forest (Hosking 1998). Scotch broom is also starting to invade the wetlands and open grasslands of the Barrington Tops plateau (NPWS 2001).

Scotch broom is a KTP under the *TSC Act*. The Barrington Tops plateau has a large number of endemic plant species including six threatened species and the sub-alpine wetlands have been listed as an endangered ecological community. Scotch broom also provides unsuitable habitat for a number of threatened mammal populations including the endangered population of the broad-toothed rat.

Management Objectives

A Scotch Broom Containment Strategy has been prepared and implemented since 1998 (NPWS 2001). The containment strategy aims to:

- treat isolated infestations outside the containment boundaries,
- prevent the infestation of unaffected catchments,
- minimise the spread along trails, and
- treat scotch broom within the main infestation in areas identified as high ecological priority.

Control Priorities

- Removal of all plants within the sub-alpine wetlands including Polblue, Little Murray and Edwards Swamps.

- Biannual treatment of isolated infestations in the Moppy Catchment.
- Expansion of the containment strategy to include biannual treatment of the areas east of the Barrington Trail (North).
- Annual monitoring of Gloucester Tops and biannual monitoring of the Link Trail.
- Biannual treatment of various trails within the infestation as outlined in the Scotch Broom Containment Strategy.

Control Techniques

A combination of physical removal of seedlings and cut-and-paint technique are utilised for isolated infestations around sub-alpine wetlands. Other areas are treated with herbicide from vehicle-mounted spray units.

Three biological control agents have been released including a Twig Mining Moth (*Leucoptera spartifoliella*), Plant Louse (*Arytainilla spartiophila*) and Seed Feeding Beetle (*Bruchidius vilosus*). A rust fungus (*Uromyces genistae*) has established.

Monitoring

All treatment will be recorded and information maintained on GIS.

Mapping of the distribution and abundance was undertaken in 1989 and 1999 and is due for re-mapping in 2008. This information indicates the effectiveness of containment over a ten year period (Odom *et al.*, 2003).

Other monitoring includes:

- Annual monitoring of permanent quadrats (established in 1986) around Polblue Swamp has provided information of the biology and ecology of the weed at Barrington Tops
- 20 transects established across 10km of the plateau (established in 2001). These sites are recording the long-term changes in native vegetation in association with scotch broom infestations. They also collect information on the presence of other weed species, biocontrol activity and pest animals such as pigs.

11.1.13 Woody Weeds

Cotoneaster (*Cotoneaster* species.), Gorse (*Ulex europaeus*), Pepper Tree (*Schinus areira*), Large-leaved Privet (*Ligustrum lucidum*), Small-leaved Privet (*Ligustrum sinense*), Tree of Heaven (*Ailanthus altissima*), Sweet Briar (*Rosa rubiginosa*) and Willow species (*Salix* species)

Distribution and Abundance

Isolated infestations of cotoneaster occur in the eastern area of the Curracabundi NP.

Pepper tree occurs in Scone Mountain NR and is widely distributed along the Barnard River in Curracabundi NP with scattered isolated plants of tree of heaven.

Large- and small-leaved privet infestations occur along creeklines in Glenrock SCA (Flaggy and Little Flaggy Creeks) and Towarri NP (Middlebrook, Branch, Kellys and Dry Creeks).

Isolated willows and sweet briar are located in Towarri NP and Camerons Gorge NR. Isolated sweet briar infestations occur in western extent of Curracabundi NP.

Impacts

Many of these weeds have largely established along creeklines following the removal of native vegetation during clearing for agriculture. In Towarri and Curracabundi NPs many of these weeds were planted. These weeds now prevent the reestablishment of other native species and impact on existing remnants. Control programs must consider the impact of removal on stream bank stability.

In Glenrock SCA privet infestations are a major issue along creeklines and gardens in the upper urban catchment.

Management Objectives

Establish programs with neighbours and Catchment Management Authorities to implement priority programs on isolated infestations such as tree of heaven in Curracabundi NP and willow in Towarri NP.

Implementation of stormwater management plans with Newcastle and Lake Macquarie LGAs for the Glenrock Lagoon catchment.

Control Priorities

- Control of riparian weeds along Flaggy Creek in Glenrock SCA to protect Littoral Rainforest.
- Treatment of isolated privet, pepper tree and willow in Towarri NP.
- Treatment of isolated tree of heaven, sweet briar and cotoneaster in Curracabundi NP.
- Identify and treat infestations of pepper tree impacting of Slaty Red Gum in Curracabundi NP working from the upper catchment.
- Continue control of pepper tree in Scone Mountain NR.

Control Techniques

All species can be removed applying glyphosate herbicide using the cut-and-paint technique or foliage spraying. Tree of heaven can also be treated using basal bark picloram / triclopyr. Stem injection is also a useful control technique for plants such as willows where stems must be kept off the ground to avoid re-rooting.

Monitoring

Information from control programs will be recorded on GIS.

Monitoring of tree of heaven infestation in Barrington Tops NP (Stewarts Brook area). Identification of the occurrence of Slaty Red Gum community adjacent to the Barnard River and any associated impacts following control of tree of heaven and pepper tree.

11.2 Pest Animal Species

11.2.1 European Rabbit (*Oryctolagus cuniculus*)

Distribution and abundance

Rabbit populations are disjunct throughout the Hunter Region. In the urban coastal reserves rabbits persist on the edges utilising resources in neighbouring properties in Tomaree NP, Glenrock SCA, Awabakal NR and Blue Gum Hills RP. Isolated populations also occur in the Barrington Tops plateau, Curracabundi NP and Broughton Island in Myall Lakes NP.

Impacts

Feral rabbits occupy a wide range of habitats, including native and modified grasslands, woodland, heath and forest. Rabbits impact on native species due to competition for resources, alteration to the structure and composition of vegetation, and land degradation.

Rabbits are associated with minimal environmental impacts in Hunter Region; however populations in the Barrington Tops plateau have the potential to compete for habitat with the endangered population of broad-toothed rat. Additional populations in Glenrock SCA may impact on native fauna populations of northern brown bandicoot which is a disjunct population due to the reserves urban boundaries. Competition and grazing by the feral European rabbit are listed as a KTP under Commonwealth *EPBC Act* and NSW *TSC Act*.

Management Objectives

Control programs will be implemented as part of threatened species habitat protection or as part of cooperative programs with neighbours.

Control Priorities

- Control programs in urban areas will only be undertaken as part of a cooperative program with LGAs along the boundaries of a reserve using biocontrol.
- Control programs will be implemented in areas where rabbit burrowing is causing damage to recreational facility infrastructure, such as Burning Mountain NR.
- Control programs for Broughton Island will be undertaken as part of a federally funded Island Recovery program.

Control Techniques

Rabbit control uses a combination of techniques including baiting, fencing, fumigations, trapping, shooting, warren ripping and biological controls. The release of biocontrol agents is the preferred option for reducing rabbit populations on reserve boundaries with urban interfaces.

Monitoring

Rabbit distribution on the Barrington Tops plateau will be monitored annually as part of the broad-toothed rat population monitoring.

11.2.2 European Red Fox (*Vulpes vulpes*)

Distribution and Abundance

Foxes occur 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 den sites. In contrast, foxes appear to be rare in closed forest distant from cleared land.

Foxes occur throughout the Hunter Region, excluding the offshore islands.

Impacts

The introduction of foxes into Australia has had a devastating impact on native fauna, particularly among small to medium-sized (450-5000g) 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 is listed as a KTP under the *TSC Act*. Foxes are also significant predators of domestic stock including lambs and poultry; predation by foxes has the potential to reduce lambing rates significantly.

The native species most likely to be impacted at the population level in Hunter Region include the endangered population of broad-toothed rat in Barrington Tops NP and SCA and brush-tailed rock wallaby in Curracabundi NP, Monkerai NR and Mernot NR.

Fox populations also occur in the Hunter Estuary NP and Corrie Island NR. The impacts on shorebird roosting and migratory waders (foraging behaviour) has not been assessed.

Impacts from foxes on lambing have been identified in the Upper Hunter adjoining Towarri NP.

Management Objectives

Implement programs identified in the NSW Fox TAP or as part of cooperative programs with neighbours where fox predation on domestic stock is identified.

Control Priorities

- The broad-toothed rat and brush-tailed rock wallaby populations have been identified as priority sites in the NSW Fox TAP.
- Annual cooperative fox control projects in the Hunter Estuary NP.
- Other fox control programs include cooperative programs undertaken in the upper Hunter prior to lambing season.
- Evaluate the need to implement programs on Corrie Is NR.

Control Techniques

Biannual baiting is implemented in the Barrington Tops plateau for the protection of the broad-toothed rat populations. In the Curracabundi area baiting is undertaken if required after sandpad monitoring.

Monitoring

All treatment will be recorded and information maintained on GIS.

The impact of fox predation on the broad-toothed rat and brush-tailed rock wallaby populations and conversely, the effectiveness of the control program are being assessed through long-term monitoring. Broad-toothed rat populations are being monitored annually to understand distribution and age class structure. Brush-tailed rock wallaby are being monitored by pellet counts at fixed locations. Fox and other medium-sized mammal populations in the Monkerai area are being measured biannually via track counts on sandpads. Data is analysed by the Pest Management Unit and published periodically as part of the review of the Fox TAP.

The effectiveness of programs in Towarri NP is indicated through stock loss reports and in the Hunter Estuary fox sightings are recorded by the Hunter Bird Observers Club.

11.2.3 Feral Cat (*Felis catus*)

Distribution and abundance

Feral cats are known to occur throughout most reserves (excluding the islands) in the Hunter Region. Due to their shy and elusive nature their abundance and impacts are largely unknown.

Impacts

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

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

Management Objectives

Develop a database of cat sightings in areas where they are likely to have the greatest threat to native fauna such as the Endangered Broad-toothed Rat population in the Barrington Tops plateau.

Encourage NPWS staff and the community to contribute to the database.

Increase community awareness of responsible cat ownership in conjunction with local government, NPWS newsletters etc.

Control Priorities

Undertake targeted cat trapping/ shooting when required for areas where cat populations are likely to be directly impacting on a threatened species.

Control Techniques

Control of feral cats is difficult as they are often shy of traps and will not take baits. No pesticides are currently available for use on cats in NSW. Other control methods include shooting and predator proof fencing.

Monitoring

Increased community awareness as indicated by community contribution to the cat sightings database.

Removal of identified problem cats using available techniques.

All control will be recorded and information maintained on GIS

11.2.4 Feral Deer (Various species)

Distribution and Abundance

Feral rusa (*Cervus timorensis*), fallow (*Dama dama*) and red deer (*Cervus elaphus*) are known to occur within Hunter Region, including Gir-um-bit, Karuah, Wallabadah, Cedar Brush NR and Myall Lakes, Towarri and Wallingat NPs and Barrington Tops SCA. In the past 4-5 years there has been an observable increase in the number of feral deer in Upper Hunter Area (UHA), particularly in Towarri NP. Recent additions to the UHA reserves, Murrurundi Pass NP and Scone Mountain NR, have established feral deer populations.

Impacts

Feral deer impact on parks and reserves by destroying native plants through trampling, grazing and ring barking small trees, fouling watercourses, causing soil erosion, spreading weeds and their potential ability to transmit diseases such as foot-and-mouth. The herbivory and environmental degradation caused by feral deer has been listed as a KTP (NPWS 2005) under the NSW TSC Act. They are known to impact on rural properties by browsing on agricultural crops and garden plants. Within Hunter Region feral deer pose threats to public safety when they stray onto roadways.

Management Objectives

Identify suitable techniques for removal of feral deer in urban and rural areas.

Develop and implement feral deer control programs in coordination with neighbours where required.

Control Priorities

Assist neighbours, stakeholders and other government agencies in cooperative feral deer control programs as required.

Control Techniques

Control programs can include trapping or shooting. Trapping has very limited success in areas with high deer densities.

Monitoring

Improve knowledge of the distribution and abundance of feral deer populations and their impacts on reserves, particularly in Upper Hunter Area.

Management of feral deer populations in coordination with other stakeholders.

11.2.5 Feral Goat (*Capra hircus*)

Distribution and abundance

Within the Hunter Region, feral goat populations are largely restricted to small disjunct populations which occur on both reserve and private land. Scattered populations occur in Ben Halls Gap NP, Brushy Hill NR, Burning Mountain NR, Camerons Gorge NR, Curracabundi NP, Killarney NR, Mernot NR, Monkerai NR, Murrurundi Pass NP and Scone Mountain NR.

Impacts

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

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

Competition and habitat degradation by feral goats has been listed as a KTP under the *TSC Act* and a KTP under the Commonwealth *EPBC Act*. In Hunter Region, they compete with brush-tailed rock wallaby habitat in Curracabundi NP and graze on threatened plant species in Towarri NP.

Control Priorities

Biannual aerial shooting programs in Towarri and Curracabundi NPs to reduce the impact of goats on threatened species.

Control Techniques

Effective control of feral goats requires an integrated approach using several complementary control techniques. In Hunter Region the main control technique is aerial shooting. In addition, landholders adjacent to reserve boundaries are being encouraged to reduce feral goat numbers through mustering and trapping, however the main source of reinvasion is from adjoining properties that do little or no control. Therefore, for areas such as Towarri NP where migration is constant, aerial shooting programs will be conducted at least biannually to maintain or reduce the current goat density.

Monitoring

Changes in the relative abundance of feral goats are assessed during successive aerial shoots and trapping and mustering programs by comparing kills (cull rate compared from shoot to shoot) or captures per unit effort (time).

11.2.6 Feral Horse (*Equus caballus*)

Distribution and Abundance

Feral horses occur on the plateau area of Barrington Tops NP. In late 2006, six distinct mobs were identified, each mob consisting of approximately 3-15 horses. In the Nerong area of Myall Lakes NP 10-15 feral horses have been observed. In the Tuggalo area of Curracabundi NP feral horses have been observed to be increasing in numbers of the past few years.

Impacts

Feral horses cause significant damage to the natural environment. They create frequently used paths which increase erosion and disturb and compact the soil. Feral horses destroy native plants by grazing, trampling and collapsing edges of swamps and wildlife burrows. They spread weeds in their dung and hair. On the

Barrington Tops plateau feral horses are impacting on threatened species, both flora and fauna, and endangered ecological communities.

Feral horses also threaten public safety as the animals are known to stray on major roads including the Scone-Gloucester Road through Barrington Tops NP and the Pacific Highway at Nerong.

Management Objectives

Prepare and implement a feral horse management strategy for Barrington Tops NP. Continue implementation of Nerong Horse Management Strategy (DEC 2006c) in cooperation with Forests NSW and neighbours.

Control Priorities

Feral horse removal in Barrington Tops NP to reduce damage to threatened species and endangered ecological communities. Removal of feral horses in the Nerong area and Barrington Tops NP to reduce risk to vehicular traffic.

Control Techniques

Current control programs utilise low stress stock handling techniques which are passive, humane and effective.

Monitoring

Management of feral horse populations where it is determined it is required.

Monitor the number and movements of mobs in the Tuggalo area of Curracabundi NP.

11.2.7 Feral Pig (*Sus scrofa*)

Distribution and abundance

Higher densities of feral pigs occur in the plateau area of Barrington Tops NP and SCA, Hunter Estuary NP (Hexham) and Towarri NP. Pig populations at lower densities occur in Curracabundi, Ben Halls Gap and Woko NPs, Back River, Tomalla and Woolooma, NRs. Isolated individuals have been observed in Myall Lakes and Murrurundi Pass NPs, and Karuah, The Glen, Wallabadah and Wingen Maid NRs.

Impacts

Feral pigs use a wide range of habitats. They can cause environmental damage by selective feeding on plant communities, creation of drainage channels in swamps, soil erosion, fouling of watering points by their habit of wallowing and rooting (Hone 2002) and are an agent in the spread of weeds such as scotch broom (Parsons and Cuthbertson 1989).

In the sub-alpine wetlands of Barrington Tops and Ben Halls Gap NPs pigs cause damage to a number of threatened species and an endangered ecological community, Montane Peatland and Swamps by their behaviour and feeding habits (Heinrich and Dowling 2000).

Feral pigs are listed as a KTP under the Commonwealth *EPBC Act* and NSW *TSC Act*.

Management Objectives

Implementation of programs in areas where threatened species are impacted upon and improve cooperative programs with neighbours where feral pigs impact on agriculture.

Control Priorities

- Feral pig programs to protect threatened species and endangered ecological communities in Barrington Tops NP and SCA and Ben Halls Gap NP.
- Cooperative feral pig control in Towarri NP and Curracabundi NP.

Control Techniques

Current control programs utilise annual trapping and shooting programs supplemented by biennial aerial shooting which is undertaken in coordination with neighbours. Other methods available include baiting, Judas collaring and exclusion fencing.

Aerial shooting programs also target goats.

Monitoring

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

Establish population monitoring protocols for pig populations in Barrington Tops NP and Hunter Estuary NP (Hexham).

Feral pig activity is monitored in permanent transects which have been established as part of recording long-term changes in native vegetation in the Barrington Tops NP.

11.2.8 Wild Dog (*Canis lupus familiaris*)

Distribution and abundance

Wild dog are distributed throughout the Hunter Region excluding the coastal islands. Wild dog issues associated with stock predation are more prevalent in the Upper Hunter and west of Barrington Tops and Curracabundi NPs. Other wild dog issues occur in Myall Lakes NP, Medowie SCA and Wallaroo and Karuah NRs.

Impacts

Wild dogs can cause substantial losses to livestock enterprises, especially sheep and grazing operations. These impacts occur in the north western areas of the region where forested areas interface with sheep country.

The impacts of wild dogs on native species appear to be greatest on large mammals, such as kangaroos and swamp wallabies and large ground-dwelling birds. Wild dogs also suppress populations of feral goats, pigs and foxes, although quantitative evidence of this is limited.

In contrast, predation by wild dogs may have negative impacts on some threatened species. In the Port Stephens area wild dogs have been associated with impacts on the koala population.

Management Objectives

All wild dog control programs require cooperation with neighbours and a landscape approach in the implementation of programs. Wild dog control programs will be consistent with Wild Dog Plans which have been developed for the Great Lakes, Barnard River, Ellerston, Mt Hungerford and Murrurundi districts.

Control Priorities

- Cooperative annual and reactive baiting programs will continue to be implemented in Ben Halls Gap NP, Curracabundi NP, Barrington Tops NP and SCA (north west section), and Woolooma, Crawney Pass, Murrurundi Pass, Back River and Tomalla NRs.
- Annual baiting programs will be undertaken as part of the Port Stephens Feral Animal Committee in Karuah NR, Wallaroo NR and Medowie SCA to protect koala populations.
- Reactive programs will be undertaken as required in Myall Lakes NP, The Glen NR, Woko NP and Barrington Tops NP (east).

Control Techniques

Integrated control programs will be used to manage wild dog issues in Hunter Region.

Strategic control programs will include:

- Aerial baiting in the more rugged inaccessible areas where other control techniques may not be cost-effective.
- Ground baiting and trapping in accessible areas.

Reactive control in response to reports of livestock predation or dog activity will include ground baiting, trapping, and howling up and shooting

Control methods include the delivery of 1080 (sodium monofluoroacetate) baits, either through aerial application or buried, trapping, shooting and exclusion fencing.

Monitoring

All ground baiting control is recorded on data sheets and this information is maintained on GIS.

Effectiveness of programs in areas which receive monthly stock loss reports (Hunter and Armidale RLPB) for adjoining lands will be gauged by assessing stock loss records.

Sandpad monitoring will be undertaken following aerial baiting in Curracabundi NP.

A monitoring project is being established in Curracabundi NP by the Vertebrate Pest CRC. A number of wild dogs will be collared with GPS satellite linked data loggers. This will provide information of the home range of animals using the Barnard River valley.

11.3 Other Pest Related Issues

11.3.1 Community Bush Regeneration Programs

Location

Community groups undertake bush regeneration programs throughout a number of coastal reserves in Hunter Region. They include

- Glenrock SCA - Dudley Progress Association, Leggy Point Boardriders, Bahai Group, Trees In Newcastle and Merewether Bush and Landcare Group,
- Myall Lakes NP - The Bush Ticks at Seal Rocks,
- Booti Booti NP - Friends of Booti Booti NP at Shelly and Elizabeth Beach, and
- Darawank NR - Tuncurry Dune Care Group.

Impacts

These groups have a positive impact on coastal vegetation communities through the removal of coastal weed infestations including bitou bush, lantana and cassia. All of the groups work in areas which have been identified as high priority in the Bitou Bush TAP.

Management Objectives

Support and management of groups in accordance with the DECC Volunteer Policy.

Develop work plans in partnership with groups to ensure priorities are consistent with Reserve Plans of Management and the Regional Pest Management Strategy.

Support groups through the provision:

- Training - including OH&S, safe herbicide use, weed and native plant identification,
- Equipment – including bush regeneration tools, personal protective equipment, identification manuals, etc, and
- Supervision – an appropriate level of supervision for new member or new groups.

Encourage and support new community groups at sites identified as critical priority as part of the Regional Pest Management Strategy.

Monitoring

All works undertaken by community groups will be recorded and entered onto GIS.

11.3.2 Dingo Risk Management (*Canis lupus dingo*)

Distribution and Abundance

Dingo issues associated with visitor areas occur in Myall Lakes NP. Pure bred dingoes and their hybrids occur throughout the park. The majority of dingo human interactions occur in the Mungo Brush camping areas and to a lesser extent the Seal Rocks area. Myall Lakes NP is listed as a Dingo Management Area on Schedule 2 of the Pest Control Order No.2 for wild dogs under the Rural Lands Protection Act 1998.

Impacts

Dingoes primarily frequent camping and picnic areas in search of food. The scavenging for food and direct feeding of dingoes by humans has resulted in their loss of fear and subsequent habituation. Habituated dingoes in camping areas can lead to negative interactions with humans through stealing food and belongings, and the threat to human safety. Dingoes may also spread disease such as hydatid tapeworms which are transferred to humans through scats or direct contact.

Management Objectives

Management of dingoes in visitor areas promotes visitor safety and the conservation of dingoes. Dingo management has adopted a risk management approach, whereby the likelihood and consequence of dingo-human interactions are evaluated. Control strategies to lessen the risk are then implemented. It is acknowledged that not all dingo-human risks can be controlled and visitors must be informed of the risks. A Risk Treatment Plan will be developed for Myall Lakes NP detailing risk assessments and control strategies.

Monitoring

Monitoring involves three levels - preventative, reactive and research.

Preventative monitoring consists of:

- Colour ear-tagging dingoes frequenting camping areas,
- Recording negative dingo-human interactions,
- Sand plot monitoring of the relative abundance of dingoes,
- Development of a Risk Treatment Plan, and
- Dingo aware signage and pamphlets for visitors.

Reactive monitoring includes:

- Evaluating individual dingo risk and
- Hazing.

Research includes:

- Home range and movement patterns,
- Social relationships within the pack,
- DNA collection and analysis, and
- Aversion collar project

11.3.3 Plant Pathogen (*Phytophthora cinnamomi*)

Distribution and Abundance

Phytophthora occurs in the sub-alpine Barrington Tops plateau. An area of the plateau has been quarantined to prevent the spread to non-affected catchments. It is

likely that dieback along Flaggy Creek in Glenrock SCA may also be a result of *Phytophthora*.

Impacts

Phytophthora is a soil-borne pathogen belonging to the water mould group. The pathogen spreads through the movement of spores through water or transmission from infested plant roots. The pathogen can also be distributed by machinery or animals. *Phytophthora* infects a large number of species however they display varying effects - some are killed, damaged or show no apparent symptoms. The threatened species *Tasmannia purpurascens* is impacted by the pathogen on the Barrington Tops plateau (DECC 2007c).

Infections of native plants by *Phytophthora cinnamomi* has been listed as a KTP in Schedule 3 of the *TSC Act* and dieback caused by the root-rot fungus (*Phytophthora cinnamomi*) as a KTP under the *EPBC Act*.

Management Objectives

Prevent the spread of *Phytophthora* from current known locations to non-infected areas. Verify the occurrence of *Phytophthora* in Glenrock SCA and other reserves in the region.

Control Priorities

Implementation of a containment strategy for the Barrington Tops plateau increases public awareness and understanding, and reduces public access to infected catchments. Provisions of wash down facilities for equipment have been installed and must be used in the infected areas.

Control Techniques

No widespread current control options are available for the Barrington Tops. Commercial phosphite is to be trialled to treat individual eucalypts through stem injection.

Monitoring

Soil sampling in areas adjoining containment boundaries to monitor any movement. Opportunistic checking of dieback in known areas.

Monitoring of trees treated with phosphite.

11.3.4 Bell Miner Associated Dieback (BMAD)

Distribution and Abundance

Dieback has been recorded in eucalypt forest communities of Copeland Tops and Wallingat NP, and along Flaggy Creek in Glenrock SCA. In each of these situations an abundance of bell miners (*Manorina melanophrys*) is considered to be associated with the dieback.

Impacts

Bell miners (bellbirds) are a natural part of eucalypt forests, however in some reserves their populations have increased in size and the birds have become more widely distributed. Changes in bell miner populations have increased the populations of sap-feeding insects called psyllids, insects strongly associated with dieback. Dieback is a condition in which trees progressively die, from the top downward.

Management Objectives

A BMAD Working Group has been established to investigate strategies to deal with BMAD. When strategies are developed, NPWS will implement these to reduce dieback in current locations and prevent further dieback occurring.

Control Priorities

When methods are available undertake control of BMAD in Copeland Tops and Glenrock SCAs and Wallingat NP.

Control Techniques

Currently there are no methods of control identified.

Monitoring

Continue to observe and record changes in vegetation structure in eucalypt forest communities in Wallingat NP and Glenrock and Copeland Tops SCAs. Monitor bell miner populations in other eucalypt forests in reserves across the region.

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Appendix 1 – Pest Control Priorities for each Area

Pest Programs Hunter Coast Area	CRITICAL		HIGH		MEDIUM		LOW		Control Strategy Summary	Key Performance Indicators				
	1.Threatened species/communities	2.Human Health	3.Impacts on agriculture	4.New Incursions	5.World Heritage	6.Cultural Heritage	7.Wilderness/Wild Rivers	8.Recreation/Aesthetic			9.Community Co-operative program	10.Regional Plan	11.Community programs/local impacts	12.Exiting programs
Vertebrate Pest Control														
Currawong / Raven - Cabbage Tree Is NR	●										●		Monitor prior to nesting season	Remove birds from island
Fox Control - Tomaree NP								●			●		Implement an annual ground baiting coordinated control program	Increased community awareness
Fox Control - CINR	●												Investigate the impact of foxes on breeding bird	Identification of the need to implement a program
Rabbit Control - Tomaree NP								●			●		Implement cooperative programs with Port Stephens LGA	Reduction in rabbit activity in urban areas (monitoring by PSC)
Wild dog - MSCA, KNR, KNP, TNR	●										●		Implement an annual ground baiting program as part of the Port Stephens Feral animal Committee to protect Koala populations	Reduced impacts on Koala populations demonstrated through NATF figures
Weed Control														
Blackberry/ Lantana/Morning Glory Control - SSNR								●			●		Treat weeds as part of a community cooperative program	Reduction in weed distribution
Blackberry/ Bitou Bush Control - Point Stephens - TNP								●					Treat weeds as part of a community cooperative program	
Bitou Bush TAP site - Anna Bay Headland - GSCA	●							●			●		Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Kingsley Beach/Boat Harbour	●										●		Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Fingal Beach	●												Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush Tap site - Wreck / Stephens Peak	●										●		Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush Control - Gir-um-bit NR (isolated plants)				●							●		Treat all isolated infestations/ reduce the spread of bitou bush	Reduce distribution of bitou bush demonstrated through mapping
Bitou Bush/Polygala/Asparagus - Tomaree Headland				●		●		●			●		Control all weeds	Prevent the establishment of new weed incursions
Bitou Bush/ Lantana - Tilligerry NR				●							●		Treat isolated weed incursions	Reduce distribution demonstrated through mapping
Cabbage Tree Is - Morning Glory/ Bitou Bush	●												Control isolated weeds using a combination of ground/ helicopter control	Protect Goulds Petrel
Cultural Heritage - Point Stephens						●					●		Control weeds in the vicinity of the heritage precinct	Protect the fabric of site from weed invasion
Crithimum - Tomaree NP				●									Map and treat all new incursions	Reduce the distribution, demonstrated through mapping
Lantana/ Crofton Weed/Pampas Grass - Karuah NP(Wallaroo)								●					Control isolated infestations in the upper catchments	Reduce the distribution, demonstrated through mapping
Mother of Millions - Seaham Swamp NR								●						
Prickley Pear - Boondelbah Is	●												Targeted weed control in gullies where Gould Petrel nesting habitat is located	Reduced weed densities in key breeding areas
Rainforest Rehabilitation Project - Snapper Is	●										●		Implement rainforest rehabilitation program	Reduce the distribution, implementation of annual monitoring program
Turkey Rhubarb - Tomaree				●									Map and treat isolated infestations	Reduce the distribution

Pest Programs Newcastle Area	CRITICAL		HIGH		MEDIUM		LOW		Control Strategy Summary	Key Performance Indicators				
	1. Threatened species/communities	2. Human Health	3. Impacts on agriculture	4. New Incursions	5. World Heritage	6. Cultural Heritage	7. Wilderness/Wild Rivers	8. Recreation/Aesthetic			9. Community Co-operative program	10. Regional Plan	11. Community programs/local impacts	12. Existing programs
Vertebrate Pest Control														
Feral Pig - Hunter Estuary NP (Hexham)				●									Liase with RLPB/neighbours regarding population density	Annual monitoring for pig activity
Fox Control - Hunter Estuary NP					●				●			●	Implement an annual ground baiting coordinated control program	Increased community awareness /feedback from bird observers
Fox Control - GSCA / ANR									●				Identify the need to implement a program	
Fox Control - BGHRP									●				Only undertaken as part of a cooperative neighbour program	
Rabbit Control - Awabakal NR / Glenrock SCA									●				Implement cooperative programs with Lake Macquarie LGA	Reduction in rabbit activity in urban areas
Rabbit Control - Blue Gum Hills RP									●				Implement cooperative programs with Newcastle LGA	Reduction in rabbit activity in revegetation areas
Weed Control														
Alligator weed control - PNR	●								●			●	Treat isolated incursions in the upper catchment using a combination of physical removal/ spot spraying	Prevent the establishment of new weed incursions in upper catchments
Alligator weed control - Hunter Estuary NP									●			●	Implement control programs in areas where salt water inundation will not occur	Prevent the spread of the weed demonstrated through mapping
Blackberry / Small Leaved Privet - BGRP									●				Implement program in upper catchment	Reduce distribution in upper catchment
Bitou Bush TAP site - Flaggy Creek - GSCA	●											●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Burwood Beach Sth - GSCA	●								●			●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Scout Camp Rd	●								●			●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Sth Dudley Beach - GSCA	●											●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush TAP site - Scenic Drive - GSCA	●											●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush - Dudley Beach - GSCA	●											●	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Bush - Awabakal NR (sea cliffs)				●									Treat isolated weed incursions	Reduce distribution demonstrated through mapping
Cultural Heritage - Glenrock SCA						●						●	Control weeds in the vicinity of the heritage precinct	Protect the fabric of site from weed invasion
Groundsel Bush - Tomago - Kooragang NR				●									Map and treat all new incursions	Reduce the distribution, demonstrated through mapping
Juncus acutus - Kooragang NR	●								●				Map and identify incursions in EEC (salt marsh)	
Lantana/ Morning Glory/Blackberry - Awabakal NR Nth									●			●	Control isolated weeds as a priority	Reduce the distribution, demonstrated through mapping
Lantana/ Crofton Weed/Privet - Blue Gum HRP									●			●	Control isolated infestations in the upper catchments	Reduce the distribution, demonstrated through mapping
Lantana / Privet - Glenrock SCA									●			●	Control infestations in the Upper catchment in coordination with Newcastle / Lake Macquarie LGAs	Reduce the distribution, demonstrated through mapping
Pampas Grass - Glenrock SCA									●			●	Control isolated infestations	Reduce the distribution, demonstrated through weed mapping
Pampas Grass - Kooragang NR									●			●	Target isolated weeds in freshwater wetlands	Reduce the distribution,
Parrots Feather - GSCA				●									Control isolated infestation working from the upper-lower catchment	Reduce distribution of the weed
Water Hyacinth - PNR									●			●	Treat the weed in the area west of Cedar Hill Drv	Maintain current distribution, demonstrated through mapping

Pest Programs Great Lakes Area	CRITICAL		HIGH		MEDIUM		LOW		Window of opportunity	Control Strategy Summary	Key Performance Indicators			
	1.Threatened species/communities	2.Human Health	3.Impacts on agriculture	4.New Incursions	5.World Heritage	6.Cultural Heritage	7.Wilderness/Wild Rivers	8.Recreation/Aesthetic				9.Community Co-operative program	10.Regional Plan	11.Community programs/local impacts
Vertebrate Pest Control														
Deer - WNP									•				Develop a coordinated approach to deer management with landowners	Reduction in Deer Density
Feral Pig - MLNP										•			Monitor pig activity in the eastern side of MLNP	Understanding of feral pig distribution
Fox Control - BBNP									•				Monitor fox populations implement program as required	Increased community awareness
Fox Control - WNP									•				Monitor fox populations implement cooperative program as required	Increased community awareness
Horse Management - Nerong		•											Implement horse removal program as part of approved Strategy	Reduction in horse populations /movement onto roadways
Wild dog - MLNP			•										Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - WNP			•										Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - GDNR			•										Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Weed Control														
Climbing Asparagus - Korsmans			•								•		Control isolated infestation	Reduce distribution, demonstrated through mapping / record any new incursions
Crofton Weed - WNP							•			•		•	Control isolated infestation in upper catchment - Whoota lookout	Reduce distribution, demonstrated through mapping / record any new incursions
Blackberry Control - MLNP - Corrigans Lane									•	•		•	Reduce density of current infestation	Improve neighbour relations
Bitou TAP site - Yaccaaba	•				•							•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Banksia Green - MLNP	•				•							•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Mungo - Big Gibber - MLNP	•				•							•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Seal Rocks - MLNP	•								•		•	•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Treachery/Lighthouse - MLNP	•											•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Yagon - MLNP	•											•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Janie's Corner - BBNP	•											•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Elizabeth/Shelly Beach - BBNP	•								•		•	•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - The Ruins Rainforest - BBNP	•											•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou TAP site - Hindunes - DNR	•											•	Control weeds and encourage natural regeneration to protect EECs/Threatened plant species	Reduce distribution of bitou bush / Establish monitoring of native plant recovery
Bitou Control - Beach access - MLNP							•					•	Control weeds to maintain access	Reduce distribution, demonstrated through mapping / record any new incursions

Pest Programs Great Lakes Area cont.	CRITICAL		HIGH		MEDIUM		LOW		Window of opportunity	Control Strategy Summary	Key Performance Indicators			
	1. Threatened species/communities	2. Human Health	3. Impacts on agriculture	4. New Incursions	5. World Heritage	6. Cultural Heritage	7. Wilderness/Wild Rivers	8. Recreation/Aesthetic				9. Community Co-operative program	10. Regional Plan	11. Community programs/local impacts
Bitou Control - Boolambayte Foreshore - MLNP				•									Control weeds to reduce the distribution of Bitou Bush around the Myall Lakes foreshore	
Bitou Control - Beach Access/Roadsides - BBNP							•					•	Control weeds to maintain access	Reduce distribution, demonstrated through mapping / record any new incursions
Giant Parramatta Grass - MLNP										•			Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MLNP - Eastern camping areas							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MLNP - Nerannie					•		•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MLNP - Nth Western							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MLNP - Sth Western							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - GDNR							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MNR							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - WNP							•					•	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Noogoora Burr - Nerong - MLNP							•					•	Treat isolated infestation	Reduction in distribution demonstrated through mapping
Mother of Millions - Seal Rocks Lighthouse					•								Assess the need to implement control	
Pine Plantation	•				•			•					Map and develop priorities for control	Reduction in distribution demonstrated through mapping
Rainforest Rehabilitation - Cape Hawke	•											•	Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Rainforest Rehabilitation - Lobster Pot Beach	•											•	Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Rainforest Rehabilitation - Mungo Brush	•											•	Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Rainforest Rehabilitation - Tamboy	•											•	Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Rainforest Rehabilitation - Seal Rocks	•											•	Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Whiskey Grass - road sides - MLNP										•				

Pest Programs Barrington Tops Area	CRITICAL		HIGH		MEDIUM		LOW		Control Strategy Summary	Key Performance Indicators					
	1. Threatened species/communities	2. Human Health	3. Impacts on agriculture	4. New Incursions	5. World Heritage	6. Cultural Heritage	7. Wilderness/Wild Rivers	8. Recreation/Aesthetic			9. Community Co-operative program	10. Regional Plan	11. Community programs/local impacts	12. Existing programs	Window of opportunity
Vertebrate Pest Control															
Cats - BTNP													●	Maintain access to new technologies	
Feral Pig - BTNP	●				●		●						●	Reduce populations of feral pig using annual ground trapping /aerial shooting/ Encourage cooperative programs on neighbouring lands	Reduced activity in sub-alpine area /monitored through Scotch Broom monitoring program
Feral Pig - CNP			●										●	Reduce populations of feral pig using annual ground trapping /aerial shooting	Reduce the movement of pigs onto neighbouring lands
Fox Control - BT Plateau	●				●								●	Reduce population of fox through the implementation of biannual baiting programs	Monitoring of Broad-toothed Rat population as an indicator species
Fox Control - CNP	●												●	Reduce populations of fox through implementation of ground baiting programs	Monitoring as part of the Fox TAP
Goat Control - CNP	●			●										Reduce populations in areas identified as important habitat for Brush-tailed Rock Wallabies	Monitor goat activity in key habitat areas
Horse Management - BTNP - plateau	●	●					●							Reduce populations of feral horse on the Barrington plateau	Reduction in visual damage around EEC wetlands / reduction in dung
Horse Management - CNP - Tuggalo													●	Monitor populations	Work towards development of a plan for this area
Rabbit Control - BTNP - plateau							●						●	Monitor populations	Visual monitoring as part of fox /Btrat programs
Rabbit Control - CNP									●				●	Monitor populations	
Wild dog - WNP			●						●				●	Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - BTNP			●						●				●	Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - CTSCA			●						●				●	Reduce populations through coordinated wild dog program	Minimise predation through RLPB stock loss reports
Weed Control															
Bamboo - Gloucester River							●							Treat as part camp ground management	Removal of infestation
Blackberry Containment - BTNP	●												●	Identify and treat isolated infestations as a priority	Reduction in the distribution of blackberries
Blackberry Containment - CNP			●										●	Treat infestation in the upper catchment as a priority	Reduction in distribution demonstrated through mapping
Climbing Asparagus - CNP				●									●	Identify and treated isolated infestations	Reduce distribution /prevent reestablishment of new infestations
Crofton Weed/Mistflower - Gloucester Tops							●		●				●	Treat infestation in the upper catchment as a priority	Reduction in distribution demonstrated through mapping
Crofton Weed/Mistflower - Williams/Jerusalem							●		●				●	Treat infestation in the upper catchment as a priority	Reduction in distribution demonstrated through mapping
Crofton Weed/Mistflower - CNP									●				●	Treat infestation in the upper catchment as a priority	Reduction in distribution demonstrated through mapping
Crofton Weed/Mistflower - Burruga Swamp									●				●	Map current known infestations	
Crofton Weed/Mistflower/Lantana - WNR	●												●	Treat weeds to protect threatened plant species	Reduction in distribution demonstrated through mapping
Giant Parramatta Grass - TGNR									●				●	Map and Control isolated infestations in coordination with LGA	Reduction in distribution
Lantana - BerricoNR									●				●	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - BNR									●				●	Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - TGNR									●					Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping

Pest Programs Barrington Tops Area cont.	CRITICAL		HIGH		MEDIUM		LOW		10.Regional Plan	11.Community programs/local impacts	12.Existing programs	Window of opportunity	Control Strategy Summary	Key Performance Indicators
	1.Threatened species/communities	2.Human Health	3.Impacts on agriculture	4.New Incursions	5.World Heritage	6.Cultural Heritage	7.Wilderness/Wild Rivers	8.Recreation/Aesthetic						
Lantana - CNP									●				Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - MNR									●		●		Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Lantana - CTSCA									●		●		Treat isolated infestations in the upper catchment	Reduction in distribution demonstrated through mapping
Leucanthemum - BTNP				●									Monitor/remove new weed incursions	Reduce the distribution of this weed
Madeira Vine/Potato Vine - CTSCA				●									Treat isolated infestations in the upper catchment/prevent new incursions	Reduce the distribution of this weed
Pepper Tree /Large Leaved Privet/Tree of Heaven- CNP											●		Treat from the upper catchment/liase with neighbours in upper catchment/target areas where threatened species occur	Reduce the distribution of this weed
Rainforest Rehabilitation - WNP	●												Implement bush regeneration program to protect threatened species	Reduce the distribution of weeds demonstrated through mapping
Roadside weeds - CNP								●			●		Monitor and treat weeds following road works	
St Johns Wort - CNP				●									Map and treat entire infestation	Prevent seed set/ reduce the distribution of the weed
Scotch Broom Containment	●				●		●				●		Implement the Scotch Broom Containment strategy	10 year mapping of distribution/abundance /annual transect monitoring
Sweet Briar/ Cotoneaster/Hawthorn - CNP				●									Treat isolated infestations working from the upper catchment	Reduce the distribution demonstrated through weed mapping
Yorkshire Fog - BTNP	●			●									Identify / Implement control priorities	Prevent infestation in unaffected catchments - Edwards Swamp complex

Pest Programs Upper Hunter Area	CRITICAL		HIGH		MEDIUM		LOW		Other		Control Strategy Summary	Key Performance Indicators		
	1. Threatened species/communities	2. Human Health	3. Impacts on agriculture	4. New Incursions	5. World Heritage	6. Cultural Heritage	7. Wilderness/Wild Rivers	8. Recreation/Aesthetic	9. Community Co-operative program	10. Regional Plan			11. Community programs/local impacts	12. Existing programs
Vertebrate Pest Control														
Aerial Shooting Program - WNR, BHGNP, TNP			●								●	●	Biannual program to reduce populations	Support ground based programs by reducing populations
Cats - Poleblue/Btops Plateau												●	Implement strategic cage trapping programs	
Deer - Murrurundi/ Crawney Pass			●	●								●	Monitor populations through biannual aerial surveys	Compare population changes
Feral Pig - BTSCA	●						●	●				●	Reduce populations of feral pig using annual ground trapping /aerial shooting	Reduced activity in sub-alpine area /monitored through Scotch Broom monitoring program
Feral Pig - BHG	●		●										Reduce populations of feral pig using annual ground trapping /aerial shooting	
Feral Pig - TNP			●									●	Reduce populations of feral pig using annual ground trapping /aerial shooting	
Fox Control - BT Plateau	●											●	Reduce population of fox through the implementation of biannual baiting programs	Monitoring of Broad-toothed Rat population as an indicator species
Fox Control - TNP			●					●				●	Reduce populations of fox prior to lambing season	Reduced activity on neighbouring lands
Fox Control - CGNR								●				●	Reduce fox population through annual baiting	Reduced activity on neighbouring lands
Goat Control - TNP	●											●	Reduce goat populations in EEC /threatened species	Reduced populations in EECs/threatened species
Horse Management - BTNP - plateau		●					●	●					Reduce populations of feral horse on the Barrington platea	Reduction in visual damage around EEC wetlands / reduction in dung
Rabbit Control - BTNP - plateau							●					●	Monitor populations	Visual monitoring as part of fox /Btrat programs
Rabbit Control - BMNR							●			●	●		Reduce populations	Visual monitoring
Wild dog - BTSCA/NP			●		●			●		●	●		Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - BHGNP			●					●		●	●		Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - TNR			●					●		●	●		Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - BRNR			●					●		●	●		Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - WNR			●					●		●			Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - Woolooma (aerial baiting)			●					●		●			Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild Dog - Crawney Pass (aerial baiting)			●					●		●			Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Wild dog - Murrurundi (aerial baiting)			●							●			Reduce populations through coordinated wild dog program (ground baiting/aerial baiting)	Minimise predation through RLPB stock loss reports
Weed Control														
Blackberry Containment - BTNP			●									●	Treat isolated infestations as a priority	Reduction in the distribution of blackberries
Blackberry Control - TNP			●					●					Control blackberries in the upper catchment	Reduction in the upper catchment
Blackberry/ St Johns Wort - Murrundi Pass			●					●				●		

Pest Programs Upper Hunter Area cont.	CRITICAL		HIGH		MEDIUM			LOW		Other		Control Strategy Summary	Key Performance Indicators	
	1. Threatened species/communities	2. Human Health	3. Impacts on agriculture	4. New Incursions	5. World Heritage	6. Cultural Heritage	7. Wilderness/Wild Rivers	8. Recreation/Aesthetic	9. Community Co-operative program	10. Regional Plan	11. Community programs/local impacts			12. Existing programs
Bridal Creeper - Scone Mountain NP													Grassy Box Woodland	
Lantana - Towarri NP				●									Eradicate isolated infestation	
Leucanthemum - BTSCA				●									Monitor/remove new weed incursions	Reduce the distribution of this weed
Pear sp.- CGNR											●		Encourage biocontrol activity	Annual identification of biocontrol activity
Privet , Bridal Creeper - TNP				●									Implement control programs targeting upper catchment	Reduction in the upper catchment
Tiger Pear - BMNR		●											Treat all pear in the vicinity of recreational access	A reduction in pear in recreation areas
Scotch Broom Containment - BTNP/BTSCA	●											●	Implement the Scotch Broom Containment strategy	10 year mapping of distribution/abundance /annual transect monitoring
Thistles Control - BHGNP												●	Maintain machinery/vehicles does not spread thistle seed in	
Tree of Heaven - TNP				●								●	Annual monitoring of treated area	Prevent reestablishment
Tree of Heaven - BTNP				●									Annual monitoring of treated area	Prevent reestablishment
Yorkshire Fog - BTNP /BTSCA	●			●									Identify / Implement control priorities	
Xanthium - Towarri NP			●										Implement cooperative program with neighbours	Impact on neighbours domestic stock

Appendix 2 – Declared Weeds

Common name (Scientific name)	Dungog	Gloucester	Great Lakes	Liverpool Plains	Maitland	Newcastle	Port Stephens	Tainworth	Upper Hunter
African boxthorn (<i>Lycium ferocissimum</i>)	4	4	4	4	4	4	4	4	4
African feather grass (<i>Pennisetum macrourum</i>)	5	5	5	5	5	5	5	5	5
African turnipweed (<i>Sisymbrium runcinatum</i>)	5	5	5	5	5	5	5	5	5
African turnipweed (<i>Sisymbrium thellungii</i>)	5	5	5	5	5	5	5	5	5
Alligator weed (<i>Alternanthera philoxeroides</i>)	2	2	2	2	3	3	3	2	2
Anchored water hyacinth (<i>Eichhornia azuerea</i>)	1	1	1	1	1	1	1	1	1
Annual ragweed (<i>Ambrosia artemisiifolia</i>)	5	5	5	5	5	5	5	5	5
Arrowhead (<i>Sagittaria montevidensis</i>)	5	5	5	5	5	5	5	5	5
Artichoke thistle (<i>Cynara cardunculus</i>)	5	5	5	5	5	5	5	5	5
Athel tree (<i>Tamarix aphylla</i>)	5	5	5	5	5	5	5	5	5
Bathurst burr (<i>Xanthium</i> spp.)	4	4	4	4	4	4	4	4	4
Bear-skin fescue (<i>Festuca gautieri</i>)	5	5	5	5	5	5	5	5	5
Black knapweed (<i>Centaurea nigra</i>)	1	1		1	1	1	1	1	1
Blackberry (<i>Rubus</i> spp.)	4	4		4	4	4	4	4	4
Blue heliotrope (<i>Heliotropium amplexicaule</i>)									
Bitou bush (<i>Chrysanthemoides monilifera</i>)			4			4	4		
Bridal creeper (<i>Asparagus asparagoides</i>)	5	5	5	5	4	5	5	5	5
Broad-leaf pepper tree (<i>Schinus terebinthifolius</i>)		3	3						
Broomrapes (<i>Orobanche</i> sp.)	1	1	1	1	1	1	1	1	1
Burr ragweed (<i>Ambrosia confertiflora</i>)	5	5		5	5	5	5	5	5
Cabomba (<i>Cabomba caroliniana</i>)	5	5	5	5	5	5	5	5	5
Cape tulips (<i>Homeria</i> spp.)	4				4	4	4		4
Cayenne snakeweed (<i>Stachytarpheta cayennensis</i>)	5		5	5	5	5	5	5	5
Chilean needle grass (<i>Nassella neesiana</i>)	4	4	4	4	4	4	4	4	4
Chinese celtis (<i>Celtis sinensis</i>)		3	3						
Chinese violet (<i>Asystasia gangetica</i> ssp. <i>micrantha</i>)	1	1	1	1	1	1	1	1	1
Clockweed (<i>Gaura lindheimeri</i>)	5	5	5	5	5	5	5	5	5
Clockweed (<i>Gaura parviflora</i>)	5	5	5	5	5	5	5	5	5
Columbus grass (<i>Sorghum alnum</i>)	4	4	4		4	4	4	4	4
Corn sowthistle (<i>Sonchus arvensis</i>)	5	5	5	5	5	5	5	5	5
Crofton weed (<i>Ageratina adenophora</i>)		4	4		4	4	4		
Dodder (<i>Cuscuta</i> spp.)	5	5	5	5	5	5	5	5	5
Espartillo (<i>Achnatherum brachychaetum</i>)		5	5	5	5	5	5	5	5
East Indian hygrophila (<i>Hygrophila polysperma</i>)	1	1	1	1	1	1	1	1	1
Eurasian water milfoil (<i>Myriophyllum spicatum</i>)	1	1	1	1	1	1	1	1	1
Fine-bristled burr grass (<i>Cenchrus biflorus</i>)	5	5	5	5	5	5	5	5	5
Fountain grass (<i>Pennisetum setaceum</i>)	5	5		5	5	5	5	5	5
Gallon's curse (<i>Cenchrus biflorus</i>)	5	5	5	5	5	5	5	5	5
Galvanised burr (<i>Sclerolaena birchii</i>)				4				4	4
Giant reed / elephant grass (<i>Arundo donax</i>)						4			
Giant Parramatta grass (<i>Sporobolus fertilis</i>)	3	3	4	3	3	3	3	3	3
Giant rattail grass (<i>Sporobolus pyramidalis</i>)		3	3						
Glaucous starthistle (<i>Carthamus glaucus</i>)		5	5	5	5	5	5	5	5
Golden dodder (<i>Cuscuta campestris</i>)	4	4	4	4	4	4	4	4	4
Golden thistle (<i>Scolymus hispanicus</i>)	5	5	5	5	5	5		5	5
Green cestrum (<i>Cestrum parqui</i>)	3	3	3	3	3	3	3	3	3
Groundsel bush (<i>Baccharis halimifolia</i>)	3	3	3		3	3	3		
Harrisia cactus (<i>Harrisia</i> sp.)	4	4	4	4	4	4	4	4	4
Hawkweeds (<i>Hieracium</i> spp.)	1	1	1	1	1	1	1	1	1
Hemlock (<i>Conium maculatum</i>)									4
Horsetail (<i>Equisetum</i> spp.)	1	1	1	1	1	1	1	1	1
Hygrophila (<i>Hygrophila costata</i>)					2	2	2		2
Hymenachne (<i>Hymenachne amplexicaulis</i>)	1	1	1	1	1	1	1	1	1
Johnsons grass (<i>Sorghum halepense</i>)	4	4	4	4	4	4	4	4	4
Karoo thorn (<i>Acacia karroo</i>)	1	1	1		1	1	1	1	1
Kochia (<i>Kochia scoparia</i>)	1	1	1	1	1	1	1	1	1
Lagarosiphon (<i>Lagarosiphon major</i>)	1	1	1	1	1	1	1	1	1
Lantana (<i>Lantana</i> spp.)	5	4,5	4,5	5	5	5	5		5

Long-leaf willow primrose (<i>Ludwigia longifolia</i>)	5	5	4,5	5	4,5	4,5	4,5	5	5
Mexican feather grass (<i>Nassella tenuissima</i>)	1	1	1	4	1	1	1	1	1
Mexican poppy (<i>Argemone mexicana</i>)	5	5	5	5	5	5	5	5	5
Miconia (<i>Miconia</i> spp.)	1	1	1	1	1	1	1	1	1
Mimosa (<i>Mimosa pigra</i>)	1	1	1	1	1	1	1	1	1
Mistflower (<i>Ageratina riparia</i>)		4	4		4		4		
Mintweed (<i>Salvia reflexa</i>)			4						4
Mossman river grass (<i>Cenchrus echinatus</i>)	5	5	5		5	5	5	5	5
Mother-of-millions (<i>Bryophyllum delagoense</i>)	3	3	3	4	3	4	4	4	3
Nodding thistle (<i>Carduus nutans</i>)	4	4		4			5	4	4
Onion grass (<i>Romulea</i> spp.)	5	5	5	5	5	5	5	5	5
Oxalis (<i>Oxalis</i> spp. and varieties)	5	5	5	5	5	5	5	5	5
Parthenium weed (<i>Parthenium hysterophorus</i>)	1	1	1	1	4	1	1	1	1
Parkinsonia (<i>Parkinsonia aculeata</i>)				2					
Pampas grass (<i>Cortaderia selloana</i>)	4	4	4	4	4	4	4	4	4
Patersons curse (<i>Echium</i> spp.)	4	4	4	4	4	4	4	4	4
Prickly acacia (<i>Acacia nilotica</i>)	1	1	1	1	1	1	1	1	1
Prickly pear (<i>Cylindropuntia</i> spp.)	1	4	4	4	4	4	4	4	4
Prickly Pear (<i>Opuntia</i> spp.)	4	4	4	4	4	4	4	4	4
Privet – broad-leaved (<i>Ligustrum lucidum</i>)						4			
Privet – narrow-leaved (<i>Ligustrum sinense</i>)						4			
Pond apple (<i>Annona glabra</i>)	1	1	1	1	1	1	1	1	1
Red rice (<i>Oryza rufipogon</i>)	5	5	5	5	5	5		5	5
Rhus tree (<i>Toxicodendron succedaneum</i>)	4	4	4	4	4	4	4	4	4
Rubbervine (<i>Cryptostegia grandiflora</i>)	1	1	1	1	1	1	1	1	1
Rhizomatous bamboo (<i>Phyllostachys</i> spp.)						4			
Sagittaria (<i>Sagittaria platyphylla</i>)		5	5	5	5	5	5	5	5
Salvinia (<i>Salvinia molesta</i>)		3	3	2	3	3	3	2	2
Sand oat (<i>Avena strigosa</i>)	5		5	5	5	5	5	5	5
Scotch broom (<i>Cytisus scoparius</i>)	4	4		4				4	4
Senegal tea plant (<i>Gymnocoronis spilanthoides</i>)	1	1	1	1	1	1	1	1	1
Serrated tussock (<i>Nassella trichotoma</i>)	4	4	4	3	4	4	4	3	3
Soldier thistle (<i>Picnomon acarna</i>)				5	5	5	5	5	
Siam weed (<i>Chromolaena odorata</i>)	1	1	1	1	1	1	1	1	1
Silk forage sorghum (<i>Sorghum</i> sp. hybrid cultivar)				4				4	
Silver leaf nightshade (<i>Solanum elaeagnifolium</i>)				3				3	4
Smooth-stemmed turnip (<i>Brassica barrelleri</i> ssp. <i>oxyrrhina</i>)	5	5	5	5	5			5	5
Spiny burrgrass (<i>Cenchrus incertus</i>)	4	4	4	4	4	4	4	4	4
Spiny burrgrass (<i>Cenchrus longispinus</i>)	4	4	4	4	4	4	4	4	4
Spiny emex (<i>Emex australis</i>)	4				4	4	4		
Spotted knapweed (<i>Centaurea maculosa</i>)	1	1	1	1	1	1	1	1	1
St Johns wort (<i>Hypericum perforatum</i>)	3	3	3	4	4	4	4	4	4
Star thistle (<i>Centaurea calcitrapa</i>)				4				4	4
Texas blueweed (<i>Helianthus ciliaris</i>)	5	4	5		5	5	5	5	5
Sweet briar (<i>Rosa rubiginosa</i>)				4					4
Tree of heaven (<i>Ailanthus altissima</i>)									4
Water caltrop (<i>Trapa</i> spp.)	1	1	1	1	1	1	1	1	1
Water hyacinth (<i>Eichhornia crassipes</i>)	4	3	3	2	4	4	4	2	2
Water lettuce (<i>Pistia stratiotes</i>)	1	1	1	1	1	1	1	1	1
Water soldier (<i>Stratiotes aloides</i>)	1	1	1	1	1	1		1	
Willows (<i>Salix</i> spp. except <i>S. babylonica</i> , <i>S. reichardtii</i> , <i>S. calodendron</i>)	5	5	5	5	5	5	5	5	5
Witchweed (<i>Striga</i> spp.)	1	1	1	1	1	1	1	1	1
Yellow burrhead (<i>Limnocharis flava</i>)	1	1	1	1	1	1	1	5	1
Yellow nutgrass (<i>Cyperus esculentus</i>)	5	5	5	5	5	5	5	5	5

Control Class 1 – State Prohibited Weeds

Control Class 2 – Regionally Prohibited weeds

Control Class 3 – Regionally Controlled Weeds

Control Class 4 – Locally Controlled Weeds

Control Class 5 – Restricted Plants

Control Classes 1, 2 and 5 noxious weeds are referred to as notifiable weeds.

Appendix 3 – Threatened Species / Endangered Ecological Communities

The following table lists known threatened species and endangered ecological communities that are impacted on by pest species on Hunter Region NPWS lands.

s1 – endangered

s2 – vulnerable

Threatened species	Pest	Program	Reserve
Flora			
<i>Allocasuarina defungens</i> (s2)	bitou bush, lantana, asparagus fern	Y	Booti Booti NP
<i>Allocasuarina simulans</i> (s2)	bitou bush		Booti Booti NP
<i>Chamaesyce psammogeton</i> (s1)	bitou bush, Eryngium	Y	Myall Lakes NP, Booti Booti NP
<i>Chiloglottis platyptera</i> (s2)	scotch broom, blackberry, Yorkshire fog, horse, pig	Y	Barrington Tops NP and SCA, Ben Halls Gap NP
<i>Cynanchum elegans</i> (s1)	bitou bush, lantana, cape ivy, moth vine, morning glory	Y	Berrico NR, Booti Booti NP, Bretti NR, Myall Lakes, NP, Glenrock SCA, Woko NP
<i>Diurus arenaria</i> (s1)	bitou bush		Tomaree NP
<i>Diurus praecox</i> (s2)	bitou bush, lantana, urban weeds	Y	Glenrock SCA, Tomaree NP
<i>Diurus venosa</i> (s2)	scotch broom, horse	Y	Barrington Tops NP & SCA
<i>Eucalyptus camfieldii</i> (s2)	bitou bush	Y	Awabakal NR
<i>Eucalyptus glaucina</i> (s2)	tree of heaven, pepper tree	N	Curracabundi NP
<i>Eucalyptus parramattensis</i> ssp. <i>decadens</i> (s2)	bitou bush	Y	Worimi NP
<i>Euphrasia ciliolate</i> (s2)	scotch broom, horse, pig	Y	Barrington Tops NP & SCA
<i>Melaleuca groveana</i> (s2)	bitou bush	Y	Tomaree NP
<i>Prasophyllum fuscum</i> (s2)	scotch broom, horse, pig	Y	Barrington Tops NP & SCA
<i>Prostanthera densa</i> (s2)			Tomaree NP
<i>Pterostylis elegans</i> (s2)	scotch broom, horse	Y	Barrington Tops NP & SCA
<i>Pultanea maritima</i> (s2)	bitou bush, lantana, cassia	Y	Awabakal NR, Tomaree NP, Glenrock SCA
<i>Senecio spathulatus</i> (s1)	bitou bush, penny wort	Y	Booti Booti NP, Myall Lakes NP, Tomaree NP
<i>Senna acclinis</i> (s1)	bitou bush, lantana, cassia, cape ivy	Y	Booti Booti NP, Monkerai NR, Myall Lakes NP
<i>Syzygium paniculatum</i> (s2)	bitou bush, lantana, cassia, exotic vines, wandering jew	Y	Booti Booti NP, Glenrock SCA, Myall Lakes NP
<i>Tasmannia glaucifolia</i> (s2)	scotch broom	Y	Barrington Tops NP
<i>Tasmannia purpurascens</i> (s2)	scotch broom	Y	Barrington Tops NP & SCA
<i>Tetradlea juncea</i> (s2)	bitou bush, urban weeds, lantana	Y	Awabakal NR, Glenrock SRA, Karuah NR, Wallaroo NR
<i>Thesium australe</i> (s2)	moth vine	N	Watchimbark NR
<i>Zannichellia palustris</i> (s1)	sharp rush, alligator weed	N	Hunter Estuary NP (Kooragang, Hexham)

Fauna	Pest	Program	Reserve
<i>Botaurus poiciloptilus</i> Australasian Bittern (s2)	fox, sharp rush	Y	Hunter Estuary NP
<i>Calidris alba</i> Sanderling (s2)	fox, sharp rush	Y	Hunter Estuary NP
<i>Charadrius mongolus</i> (s2) Greater Sand Plover	fox, sharp rush	Y	Hunter Estuary NP
<i>Charadrius asiaticus</i> (s2) Lesser Sand Plover	fox, sharp rush	Y	Hunter Estuary NP
<i>Haematopus fuliginosus</i> (s2) Sooty Oystercatcher	prickly pear	N	John Gould NR
<i>Haematopus longirostris</i> (s2) Pied Oystercatcher	fox	N	Corrie Island NR
<i>Limicola falcinellus</i> (s2) Broad-billed Sandpiper	fox, sharp rush	Y	Hunter Estuary NP

Fauna	Pest	Program	Reserve
<i>Litoria aurea</i> (s1) Green and Golden Bell Frog	fox, sharp rush, crofton weed, morning glory	Y	Hunter Estuary NP (Kooragang), Myall Lakes NP
<i>Mastacomys fuscus</i> (endangered population) Broad-toothed Rat	fox, scotch broom	Y	Barrington Tops NP & SCA
<i>Petrogale penicillata</i> (s2) Brush-tailed Rock Wallaby	fox, goat, lantana	N	Woko NP, Curracabundi NP
<i>Pterodroma leucoptera leucoptera</i> (s1) Gould's Petrel	bitou bush, prickly pear	Y	Boondelbah Is NR, John Gould Is NR
<i>Phascolarctos cinereus</i> (s2) Koala	dog	Y	Moffats Swamp NR, Tilligerry NP, Tomaree NP, Myall Lakes NP, Medowie SCA, Karuah NP
<i>Rostratula benghalensis</i> (s1) Painted Snipe	fox, sharp rush	Y	Hunter Estuary NP
<i>Sterna albifrons</i> (s1) Little Tern	dog / fox	Y	Myall Lakes NP
<i>Tyto novaehollandiae</i> (s2) Masked Owl	scotch broom	N	Barrington Tops SCA
<i>Xenus cinereus</i> (s2) Terek Sandpiper	fox	Y	Hunter Estuary NP

Endangered Ecological Community	Pest	Program	Reserve
Coastal Saltmarsh	sharp rush, bitou bush, pine	Y	Hunter Estuary NP (Kooragang), Myall Lakes NP
Freshwater Wetlands on Coastal Floodplains	alligator weed, water hyacinth, parrots feather, bitou bush, pine	Y	Myall Lakes NP, Tomaree NP, Pambalong NR, Booti Booti NP, Myall Lakes NP
Littoral Rainforest	bitou bush, lantana, exotic vines, asparagus ferns, cassia, blackberry	Y	Booti Booti NP, Glenrock SCA, Myall Lakes NP, Snapper Is NR, Worimi NP, Cabbage Tree Is NR
Lower Hunter Spotted Gum – Ironbark Forest	lantana, moth vine	Y	Karuah NP, Wallaroo NR, Columbey NP
Lowland Rainforest on Floodplain	lantana, moth vine, crofton weed, cape ivy	Y	Barrington Tops NP, Woko NP
Montane Peatlands and Swamps	scotch broom, blackberry, Yorkshire fog, horse, pig	Y	Barrington Tops NP & SCA
River-flat Eucalypt Forest on Coastal Floodplains	lantana	Y	Barrington Tops NP, Myall Lakes NP, Tomaree NP
Sub-tropical Coastal Floodplain Forest	lantana, crofton weed, mistflower	N	Berrico NR, Ghin-doo-ee NR, Killarney NR
Swamp Oak Floodplain Forest	bitou bush, lantana, morning glory, pine	Y	Booti Booti NP, Myall Lakes NP, Wallingat NP
Swamp Sclerophyll Forest on Coastal Floodplains	alligator weed, water hyacinth, morning glory, blackberry, cassia, white passionfruit, bitou bush, pine	Y	Pambalong NR, Seaham Swamp NR, Booti Booti NP, Myall Lakes NP, Tomaree NP
Themeda Grassland on Seacliffs and Coastal Headlands	bitou bush, lantana, crofton weed, cassia, turkey rhubarb, exotic grasses	Y	Booti Booti NP, Glenrock SCA, Myall Lakes NP, Tomaree NP, Broughton Is
White Box Yellow Box Blakely's Red Gum Woodland	blackberry, goat	Y	Towarri NP