Northern Plains Region

Pest Management Strategy

2003 - 2006

NSW NATIONAL PARKS AND WILDLIFE SERVICE

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Cover image: Spraying a Sweet Briar infestation in the central valley of the Warrumbungle National Park.

Photograph by NSW NPWS.

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Regional Pest Management Strategies

Foreword

Pest animals and weeds are the targets of the five regional pest management strategies for central and western NSW. The strategies are an initiative of the National Parks and Wildlife Service (NPWS) and have been released by the Western Directorate for public information. The release of the pest management strategies follows a two-month public exhibition of draft strategies during August and September 2002, which provided an opportunity for the community to have their say in how they were developed.

These strategies recognise that pest species are a problem across the landscape and they aim to maximise the effectiveness of pest control programs, particularly through cooperative programs with neighbours and others.

The NPWS is committed to a regional approach to pest management where the programs are developed and often undertaken in collaboration with neighbours, other government agencies, rural lands protection boards, local government councils, regional pest committees, CSIRO, universities and community groups such as Landcare, and Bushcare volunteers.

These documents identify the major pest populations within the regions, and establish priority control programs. The aim is to apply best practice, humane, cost effective methods, which will have minimal impacts on the environment. In general this requires careful planning, to ensure an integrated approach is adopted using a range of techniques at critical times of the year, and often, the targeting of more than one species.

The pest management strategies establish direction for pest management activities within the NPWS' western regions until 2006. The year to year focus of control activities will vary with climatic conditions and available funding. The annual work programs will be set out in Regional operation plans. For further information on these details I encourage you to contact the Regional Manager in your Region.

TERRY KORN
DIRECTOR WESTERN

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1 Background

1.1 Introduction

Introduced pest species can seriously impact upon the biodiversity of reserved areas by modifying species richness, abundance and ecosystem function. They can also have significant impacts on the economic and social values of neighbouring areas.

This Pest Management Strategy is a review of the 1995 Narrabri District strategy and establishes the strategic direction for pest management activities within lands managed by the National Parks and Wildlife Service (NPWS) in the Northern Plains Region over the period 2003 - 2006. Priorities and programs for recent additions to the NPWS estate are still being finalised and will be included in subsequent revisions of the strategies.

This strategy incorporates further information collated from Region-wide weed mapping, neighbour liaison, field survey work and information received from key stakeholders. The strategy also includes pest planning for the recent new additions to NPWS managed lands and the changes to the regional boundaries.

The aim of this strategy is to maximise the effectiveness of pest control programs. It identifies the major pest species populations within the Region, and establishes criteria for prioritising control programs. The strategy provides a brief summary of control programs to be undertaken. Specific details of individual programs are addressed in operational pest control plans.

It is envisaged that this review of the strategy will continue to improve the development, co-ordination and implementation of pest species management within Northern Plains Region.

This Pest Management Strategy outlines how the NPWS manages pest species. In this strategy, the term “pest species” refers to introduced species of weeds and pest animals.

1.2 Northern Plains Region

The Northern Plains Region covers an area of about 100,000 square kilometres. It coincides with 10 local government areas, including Coolah, Coonabarabran, Coonamble, Gilgandra, Gunnedah, Moree Plains, Narrabri, Walgett, Warren and Yalleroi.

The Region currently manages 17 conservation reserves, including two national parks and fifteen nature reserves. The total area managed is 180,106 hectares.

The Warrumbungle National Park and Mount Kaputar National Park annually attract over 90,000 visitors. These parks are an important focus for tourism in the Coonabarabran and Narrabri communities.

The largest reserve in the Region is the Pilliga Nature Reserve, with 85,000 hectares reserved. It presents the Service with significant challenges in fire and pest management.

Two nature reserves have been identified as wetlands of international significance. These are the Macquarie Marshes Nature Reserve and the Narran Lake Nature Reserve.

Regional programs are specifically aimed at protecting native species, such as ground-nesting birds in the Narran Lake and Macquarie Marshes Nature Reserves from pigs and foxes, reducing the impact of feral goats on a population of Brush-tailed Rock-wallabies in the Warrumbungle and Mt Kaputar National Parks, and the impact of feral animals on the Region’s reserves in general.

The Region's programs also aim at reducing the effect and spread of weeds in the national parks and nature reserves in general.

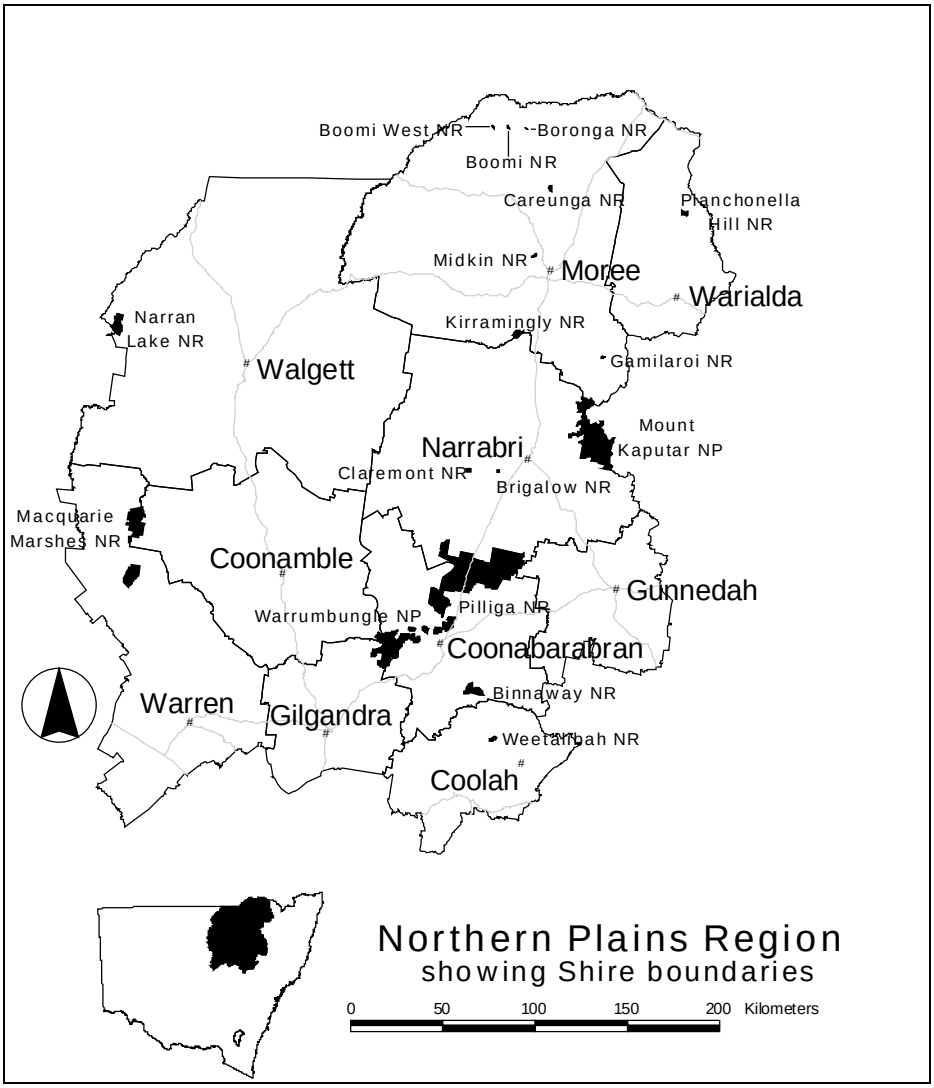
Control techniques employed in the Northern Plains Region are those promoted by NSW Agriculture, in particular the Vertebrate Pest Research Unit, and carried out under the Model Code of Practice for the Welfare of Animals. Extensive evaluation of control techniques has been carried out to ensure the most appropriate methods are being used in each area.

Where necessary, regional programs are carried out in conjunction with local Rural Lands Protection Boards and other Government agencies, such as NSW Agriculture, Local Councils and adjoining NPWS Regions. Neighbours are included in nearly all regional programs.

The Region cooperates and liases with NSW Agriculture, CSIRO Division of Wildlife and Ecology, the Co-operative Research Centre for Weed Management Systems and Research Centre for Biological Control of Vertebrate Pests, and the Zoological Parks Board of NSW.

The Region is serviced by two Pest Control Officers, one located in the Narrabri Area Office and the other at Coonabarabran.

Figure 1: Map of Northern Plains Region showing NPWS estate.



1.3 Legislation and Policy

The NPWS has a number of statutory responsibilities in relation to pest species management, and has also adopted a number of related policies.

1.3.1 *National Parks and Wildlife (NPW) Act 1974*

This 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. This pest management strategy incorporates actions identified in plans of management that have been completed within the Northern Plains Region.

1.3.2 *Threatened Species Conservation (TSC) Act 1995*

The main objective of the *TSC Act* is to conserve biological diversity. The Act provides for the listing of threatened species, populations and ecological communities. The Act also provides for the preparation and implementation of recovery plans for threatened species, populations and ecological communities and the designation of areas as habitat critical to the survival of those listed as endangered. The Act provides for the identification of key threatening processes, and the amelioration of these through the preparation and implementation of threat abatement plans.

One of the major features of the Act is the integration of the conservation of threatened species into the development control processes under the *Environmental Planning and Assessment Act 1979.* Thus, proponents are required to assess the likely impact of a development or activity on threatened species, populations or ecological communities or their habitats.

1.3.3 *Rural Lands Protection (RLP) Act 1998*

The pest animal provisions of the *RLP Act* commenced on 28 September 2001. The *RLP Act* sets out the conditions under which “animals, birds and insects” can become "declared" pests and provides for the control of such pest species.

Gazettal of pest species occurs through Pest Control Orders [s.143] which allow the Minister for Agriculture to specify which species are pests, either on a statewide 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 [s.142]. 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 [s.156(1)]. The Minister for Agriculture must consult with the Service before making a Pest Control Order that applies to lands managed by the NPWS [s.147].

Fauna listed under Schedule 1 or 2 of the *Threatened Species Conservation Act 1995* cannot be declared as pests [s.143(5)]. The Minister for the Environment must be consulted before any native fauna is declared a pest [s.144(2)].

The Pest Control Order for wild Dogs, gazetted on 2 October 2001, provides for the general destruction obligation for lands listed in Schedule 2 of the Order

will be satisfied through a wild dog management plan [s.156(4)] that addresses both control and conservation objectives and has been approved by the relevant RLP Board for that District. Schedule 2 lists 254 reserves considered to contain high quality Dingo habitat on lands managed by the NPWS, State Forests of NSW, Sydney Catchment Authority and unoccupied Crown land managed by the Department of Land and Water Conservation.

1.3.4 *Noxious Weeds Act 1993*

Under this Act the Minister for Agriculture has the power to make Orders declaring plants as "noxious weeds" (listed in Schedule 1 of the Act). Weeds can be declared "noxious" if they pose a threat to agriculture, the environment or community health, and there is a public benefit from such declaration. A number of environmental weeds have now been declared under this Act, for example, bitou bush in all coastal councils and gorse in a number of tablelands and coastal councils. Noxious weeds are classified into four categories with different control requirements.

1.3.5 Wild Dog Destruction (WDD) Act 1921

The WWD Act requires landholders and occupiers in the Western Division to destroy all wild dogs upon such land and for the maintenance of the wild dog fence along the north-western parts of the NSW/Queensland and NSW/South Australian borders. The WDD Act does not bind the Crown.

1.3.6 Other Relevant Legislation

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Agricultural and Veterinary Chemicals Code Act 1994*
- *Occupational Health and Safety Act 2000*
- *Environmental Planning and Assessment Act 1979*
- *Firearms Act 1996* and the *Firearms (General Regulation) 1997*
- *Heritage Act 1977*
- *Prevention of Cruelty to Animals Act 1979*
- *Pesticides Act 1999*
- *Occupational Health and Safety Act 1998*
- *Wilderness Act 1987*
- *Native Vegetation Conservation Act 1997*

1.3.7 NPWS Field Management Policies

A number of field management policies are relevant to this strategy.

Policy 1.9 *Exotic Plant Species* gives priority for control programs to exotic plants that are increasing in abundance and distribution, or displacing native flora and fauna, or where NPWS reserves adjoin land not infested or agricultural land. Programs that are practical and involve techniques with little harmful or residual environmental impact have preference.

Policy 2.3 states that *Introduced Animals* (with limited exceptions) shall not be allowed to remain on NPWS reserves as they may prey on native fauna or have other adverse impacts on vegetation, soils and water quality.

Policy 2.6 *Wild Dogs* acknowledges the complexities inherent in the need to conserve dingoes together with the need to control wild dogs. Baiting programs are only undertaken on NPWS reserves where there is adequate evidence of wild dogs

coming from those reserves and killing or maiming stock.

The *Firearms Policy* sets out procedures to ensure firearms are safely managed and used by NPWS staff in accordance with the relevant legislation.

2 Management Strategy

The National Parks & Wildlife Service is committed to a regional/catchment approach to pest management where the programs are developed and often undertaken in collaboration with neighbours, other government agencies, rural lands protection boards, local government councils, regional pest committees, CSIRO, universities and community groups such as Landcare, Bushcare and Green Corp volunteers, and local Aboriginal Land Councils.

The Service aims to manage populations of pest animals and weeds to minimise their adverse impacts. Many of the Service's weed control programs focus on environmental weeds because of the need to reduce the adverse impacts of these species on biodiversity conservation. However, to protect neighbouring properties, the NPWS also undertakes numerous programs targeting noxious agricultural weeds e.g. Serrated Tussock, Bathurst Burr, Noogoora Burr, Johnson Grass, Giant Parramatta Grass and Scotch Thistle. There is a clear recognition that the eradication of introduced pests over large areas is rarely, if ever, possible and resources must be directed to those species/localities where the benefits of control are likely to be greatest.

Wherever possible a strategic approach to pest management is adopted and the reader is referred to the pest management publications by the Bureau of Resource Sciences for greater detail on pest animals (see Further Reading list) or to various references for weeds (see Further Reading list).

The Service employs a large number of specialist staff to develop and implement effective pest management programs. The aim is to apply best practice, cost-effective methods that will have minimal impacts on the environment. In general, this requires careful planning to ensure an integrated approach is adopted using a range of techniques at critical times of the year, and often, the targeting of more than one species (e.g. foxes and wild dogs).

Integrated pest management is likely to result in the most effective long-term reduction in pest populations and avoid selection for bait shy pest animals, or herbicide resistant weeds. Biological control is incorporated into programs where effective agents are available, but in most cases biocontrol must be supplemented with conventional control techniques. The pest management approach adopted by the Service reflects a balance between the desire to use the most effective control technique (such as 1080 baiting for many animal pests) with a requirement to minimise non-target impacts and animal suffering.

As the lead conservation agency in NSW the Service has a duty to ensure its own activities comply with the law and are environmentally sound. All pest control activities proposed on NPWS land require an appropriate level of assessment of their environmental impacts. The level of assessment undertaken relates to the probable degree of impact and can range from an initial analysis, to a Review of Environmental Factors, to an Environmental Impact Statement.

3 Objectives of Pest Control Programs

The overriding objective of NPWS pest control programs is to conserve biodiversity and cultural heritage.

Programs also have the following specific goals:

- Increase community understanding of the adverse impacts of pests on biodiversity and Aboriginal and historic cultural heritage

- Manage pest populations to minimise their movement into NPWS estate, or onto adjoining properties where they impact on agricultural production

- Satisfy legislative responsibilities e.g. *Rural Lands Protection Act 1998, Noxious Weeds Act 1993* and *Threatened Species Conservation Act 1995*

- Support cooperative approaches to pest management with other agencies and the community

- Foster community support.

4 Pest Programs and Threatened Species

4.1 Past Pest Management

Prior to 1995, pest programs in Northern Plains Region were restricted to control programs carried out in an ad hoc manner. Many of these programs were reactive in nature. These included:

- Aerial shooting throughout the Region was carried primarily in response to neighbour complaints or when money was available;

- Weed control was carried out on an ad hoc basis depending on the availability of funds;

- Fox control was carried out occasionally, but in an uncoordinated manner; and

- Joint control programs with outside agencies were not carried out to their full potential, and little planning went into many of the programs.

Since that time, Northern Plains Region has adopted a more strategic approach to pest control management incorporating programs that were identified as high priorities in the 1995 Pest Strategy. This includes weed mapping, integrated control techniques, the development of short/long term coordinated strategies, environmental assessment, and monitoring and evaluation. The Northern Plains Region has also increased the number of cooperative neighbour pest programs.

Pest management priorities and programs for recent additions to the NPWS estate are still being finalised and will be included in subsequent revisions of this strategy.

4.1.1 Pest Animals

Pest animal programs are undertaken throughout the Region and cover a number of species (Table 1).

Major control programs have been carried out for feral pigs throughout the Region, particularly aerial control programs in the Macquarie Marshes, Narran Lake, Planchonella, and Brigalow Park Nature Reserves. Aerial control programs undertaken primarily for goats in Mount Kaputar NP and the Warrumbungle NP also accounted for a number of pigs.

A Judas Pig project was commenced in 2001 to aid in locating mobile pig populations within and around Mt Kaputar NP. The project involves placing radio collars on captured feral pigs within and adjoining Mt Kaputar NP. The pigs are then periodically tracked via a radio receiver attached to a helicopter to determine actual locations. When done over a period of time, this tracking will give clues as to where and when are the most appropriate locations and times to implement trapping programs.

During 2001/2002 extensive operations were conducted to remove goats from Mt Kaputar and Warrumbungle NPs. Mustering is not a control option in these

parks as the terrain is very steep and access is limited. Aerial shooting operations accounted for large numbers of goats and these programs have been assessed as very effective following monitoring programs. In Mt Kaputar NP a Judas Goat program has continued successfully since its establishment in 1996. Program evaluation, involving analysis of results gathered to date, and planning of future strategies is currently underway. Observations indicate that the Judas Goats aid in the detection of goats that would have otherwise been overlooked.

Foxes have been listed as a key threatening process under the *Threatened Species Conservation Act 1995* and the NPWS has prepared a threat abatement plan (TAP) for foxes (NSW NPWS 2001a). This plan has direct implications for fox control programs in the Northern Plains Region, in that additional funds have been provided to protect Brush-tailed Rock-wallabies in the Warrumbungle NP, Black-striped Wallabies in the Brigalow Park Nature Reserve, and ground-nesting birds in the Macquarie Marshes and the Narran Lake Nature Reserves. For example, a co-operative fox baiting program between the NPWS, Warrumbungle Landcare and Warrumbungle NP neighbours has been carried out to provide a 5km buffer of reduced fox densities around Brush-tailed Rock-wallaby colonies in and around the Warrumbungle National Park.

Not all fox control programs undertaken NPWS are funded by the Fox TAP. For example, co-operative fox baiting has also been occurring in the Pilliga since 1996 with the establishment of the Pilliga Fox Control Committee. The committee is made up of representatives from NPWS, SFNSW, RLPBs and private landholders and aims to protect threatened species, such as the Pilliga Mouse, from fox predation and to increase lambing rates on adjacent grazing lands.

Cats are a major threat to wildlife in the Region's National Parks and Nature Reserves. The NPWS undertakes cat control programs, however the success of these programs is limited because cats are extremely difficult to control. No poison baits are registered for control of cats (although 1080 may be possible under strict permit conditions). Cats are instinctively wary of traps, and trapping programs therefore have limited success. Dumping of cats is a problem that may be effectively addressed by extensive education campaigns.

Wild dogs are a relatively minor problem within the Northern Plains Region, with very few reports received in recent years. All reports are followed up, and baiting programs implemented in conjunction with neighbours and RLPBs. For example, a cooperative baiting program is being conducted with neighbours on the northern side of Warrumbungle NP who have lost sheep to attacks by wild dogs. The trapping of a wild dog within the Warrumbungle NP seems to have ameliorated the problem for the time being, however the situation is continuing to be monitored.

4.1.2 Weeds

Weed species targeted vary according to the location of the reserve. Key weed control programs for the financial year 2001/2002 are summarised below:

Mt Kaputar NP – Monitoring of previous control works on Sweet Briar, Mother-of-Millions, Prickly Pear, Golden Dodder and Green Cestrum are being undertaken on relevant reserves by NPWS staff. Monitoring of weeds on Park boundaries by the local council has noted good results of previous works undertaken by NPWS. Planning for the next spring weed control period is currently being undertaken, and a weeds spraying contractor has been appointed for weed control over the next two years. A new spray-rig has recently been purchased.

Warrumbungle NP – Control works were carried out on St John's Wort, involving

spraying and hand removal, and on Blackberry along creek systems. Cooperative work with a neighbour removed Willows from a common boundary. A similar program for Green Cestrum was carried out. Spraying for Spiny Burr Grass and Noogoora Burr also took place. Prickly Pear bio-controls have also been distributed throughout the Park.

Narran Lake NR – Large-scale control of Golden Dodder was undertaken throughout 2000 and 2001. The dry conditions experienced throughout most of 2002 has negated the need for control in recent times. The are will be monitored to determine the level of germination when the season improves.

Monitoring and control of previous weed spraying activities took place on the following reserves during 2001/2002: Boomi, Boomi West, Boronga and Kirramingley NRs. Results have been factored into budgets for weed control in the Region.

The list of weeds in this strategy (Table 1) is not an exhaustive list of species occurring within Northern Plains Region. A number of other weeds occur on NPWS managed lands but are of less importance in natural areas and, therefore, have not been included in this pest strategy. Noxious weeds recorded in Northern Plains Region are listed in Appendix 2.

Species	Location
PEST ANIMALS	
Feral Pig	All reserves.
Feral Goat	Mt Kaputar NP, Warrumbungle NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Planchonella NR, Pilliga NR, Weetalibah NR.
Fox	All reserves.
Rabbit	Scattered populations in Midkin & Narran Lake NRs and Mt Kaputar NP, Warrumbungle NP, Pilliga NR
Wild Dog	Isolated reports throughout the Region.
Feral Cat	Scattered populations in all areas
Feral Horse	Pilliga NR
Feral Cattle	Pilliga NR
WEEDS	
Sweet Briar	Mt Kaputar NP, Warrumbungle NP
Green Cestrum	Mt Kaputar NP, Warrumbungle NP
Lippia	Macquarie Marshes, Midkin & Boomi West NRs
Golden Dodder	Macquarie Marshes NR, Narran Lake NR, Mt Kaputar NP
Spiny Burr Grass	Warrumbungles NP, Boomi, Boomi West, Boronga and Pilliga NRs
St John's Wort	Warrumbungles NP
African Boxthorn	Kirramingly & Careunga NRs, Midkin NR
Blackberry	Warrumbungle NP, Mt Kaputar NP
Bathurst Burr & Noogoora Burr	Mt Kaputar NP, Warrumbungles NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Boomi, Boomi West & Boronga NRs, Midkin & Careunga NRs, Planchonella & Gamilaroi NRs, Pilliga NR
Khaki Weed	Warrumbungles NP
Castor Oil Plant	Kirramingly & Boomi West NRs
Prickly Pear	Mt Kaputar NP, Warrumbungles NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Boomi, Boomi West & Boronga NRs, Midkin & Careunga NRs, Planchonella & Gamilaroi NRs, Pilliga NR.
Mother-of-Millions	Mt Kaputar NP
Blue Heliotrope	Warrumbungle NP.
Paterson's Curse	Warrumbungle NP.

Table 1: Distribution of weeds and pest animals on NPWS estate in Northern Plains Region.

4.2 Threatened Species

The conservation of threatened species is of the upmost importance when considering pest management programs. Every effort is made to minimise any impacts to species, populations and communities when planning pest management programs within the Northern Plains Region, on and off park.

Pest control programs are undertaken in the Northern Plains Region by NPWS to protect those threatened species listed in Table 2.

In NSW, the threat abatement planning process is an excellent mechanism for delivering strategic statewide initiatives to protect threatened species. To date, a threat abatement plan has been finalised for foxes, with others in preparation, e.g. feral cats, bitou bush and plague minnow

.

Threatened species	Pest	Program	Reserve
Brush-tailed Rock-wallaby *Petrogale penicillata*	Fox Goat	Y	Warrumbungle NP
Black-striped Wallaby *Macropus dorsalis*	Fox	Y	Brigalow Park & Claremont NRs
Brolga *Grus rubicundus*	Fox Pig	Y	Narran Lake & Macquarie Marshes NRs
Australasian Bittern *Botaurus poiciloptilus*	Fox Pig	Y	Narran Lake & Macquarie Marshes NRs
Pilliga Mouse *Pseudomys pilligaensis*	Fox	Y	Pilliga NR
Malleefowl *Leipoa ocellata*	Fox	Y	Pilliga NR

Table 2: Threatened species protection programs in Northern Plains Region.

5 Regional Priorities

5.1 Criteria for Prioritising Pests

The following criteria reflect the key responsibilities and impacts that are considered by the NPWS when setting regional priorities for pest management. The availability of suitable technology and resources (financial, human and physical) also influences which programs are implemented.

A. A pest for which a national or state emergency control program has been developed (e.g. feral animals implicated in any exotic disease outbreak).

B. Any relevant action specified in a threat abatement plan developed for a pest species which has been listed as a key threatening process under the *Threatened Species Conservation Act 1995*.

C. Actions identified in recovery plans for threatened species.

D. A pest that the community has identified as a high priority for action (this includes, but is not restricted to, pests declared under the *Noxious Weeds Act 1993* or the *Rural Lands Protection Act 1998*). Priority will generally be given to those pests for which state or regional management strategies have been developed, or where there is support for a collaborative program.

E. A pest which threatens the conservation, cultural heritage or recreational values of an area.

F. A pest population of limited distribution but known to be an important problem in other parks, or in other states or overseas.

G. A pest for which continued management is necessary to maintain benefits gained from previous control programs.

H. A pest for which a window of opportunity occurs to undertake control activities (e.g. where an effective biocontrol agent is available, or feral pig control during floods or droughts).

I. A pest which must be controlled/contained to allow another high priority management program to be effective.

J. Other factors: For weeds, location of the infestation (i.e. within a water catchment or ease of access) and the potential of an area to regenerate naturally, will influence the priority given to a program (natural regeneration is more cost effective, reduces maintenance and maintains the genetic integrity of plant communities).

The pest species in Northern Plains Region are prioritised for control based on the extent to which they satisfy the above criteria, and on the probability of practical success of a control operation. The latter is determined by:

- the existence of an effective means of controlling the pest species;
- the availability of resources to undertake effective control;
- the likely availability of resources in the medium to long-term to maintain control efforts.

5.2 Regional Assessment

Table 3 illustrates how the criteria and probability of success are cross-referenced in order to group pest species into three priority classes.

Probability of success	Extent to which criteria satisfied		
	High	Med	Low
High	**1**	**1**	2
Med	**1**	2	3
Low	2	3	3

Table 3: Priority classes for pest species.

Table 4 shows the application of the criteria to reserves and pest species in Northern Plains Region, and the resultant priority classes.

The appropriate timing for pest control activities is given in Appendix 1.

Although the focus of NPWS pest management is the priority pest species, monitoring for emerging pest problems is undertaken on an ongoing basis. NPWS will continue to work with the Pest Animal Council, NSW Agriculture, RLPBs and local councils to address problems as they arise (e.g. outbreaks of Category W1 weeds). Appendix 3 lists emerging pest species for the Northern Plains Region.

Table 4: Pest species priority classes for Northern Plains Region.

Pest Species	Criteria										Reserve	Prob. of success	Priority
Pest Animals	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**			
Feral Pig				*	*		*		*	*	Mt Kaputar NP, Warrumbungles NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Boomi, Boomi West & Boronga NRs, Midkin & Careunga NRs, Planchonella & Gamilaroi NRs, Pilliga NR, Binnaway NR, Weetalibah NR.	M	1
Wild Dog				*			*			*	Warrumbungle NP, Mt Kaputar	H	1
Fox		*	*	*	*		*		*	*	All reserves.	M	1
Rabbit				*	*		*				Scattered populations in Midkin, Narran Lake & Pilliga NRs and Mt Kaputar and Warrumbungle NP.	M	2
Feral Cat		*		*							All reserves	L	2
Feral Goat				*			*				Mt Kaputar NP, Warrumbungles NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Planchonella NR, Pilliga NR, Weetalibah NR.	M	2
Feral Cattle					*			*			Pilliga NR	M/H	1
Feral Horse					*						Pilliga NR	M	3
Weed Species													
Sweet Briar				*	*	*	*				Mt Kaputar NP, Warrumbungle NP.	H	1
Green Cestrum				*	*	*	*			*	Mt Kaputar & Warrumbungle NPs	H	1
Lippia				*	*	*				*	Macquarie Marshes, Midkin & Boomi West NRs	L	1
Golden Dodder				*	*	*	*	*		*	Macquarie Marshes NR, Narran Lake NR, Mt Kaputar NP.	M	2
Spiny Burr Grass				*	*	*	*			*	Warrumbungle NP, Boomi, Boomi West & Boronga NRs Pilliga NR.	H H	1 2
St John's Wort				*	*	*				*	Warrumbungle NP.	M	1
African Boxthorn				*	*	*	*				Kirramingly & Careunga NRs, Midkin NR.	M	2
Blackberry				*	*		*		*	*	Mt Kaputar & Warrumbungle NPs	M	1

Pest Species	Criteria										Reserve	Prob. of success	Priority
Pest Animals	A	B	C	D	E	F	G	H	I	J			
Bathurst /Noogoora Burr				*	*		*				Mt Kaputar NP, Warrumbungle NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Boomi, Boomi West & Boronga NRs, Midkin & Careunga NRs, Planchonella & Gamilaroi NRs, Pilliga NR.	M	2
Khaki Weed				*	*	*					Warrumbungle NP.	M	2
Castor Oil Plant				*	*	*	*				Kirramingly & Boomi West NRs.	M	3
Prickly Pears				*	*	*	*				Mt Kaputar NP, Warrumbungle NP, Macquarie Marshes NR, Narran Lake NR, Brigalow Park & Claremont NRs, Boomi, Boomi West & Boronga NRs, Midkin & Careunga NRs, Planchonella & Gamilaroi NRs, Pilliga NR.	M	2
Mother-of-Millions				*	*	*	*			*	Mt Kaputar NP.	H	2
Blue Heliotrope				*	*						Warrumbungle NP	L	3
Paterson's Curse				*	*						Warrumbungle NP	L	3

6 Programs

The following sections summarise the control programs to be undertaken in the Northern Plains Region, based on the priorities established in Section 5.

6.1 Pest Animal Species

HIGH PRIORITY

6.1.1 Feral Pig - *Sus scrofa*

Distribution

Major populations occur in and around the Narran Lake, Macquarie Marshes and Planchonella NRs. Moderate populations occur in and around Mt Kaputar NP, Warrumbungle NP, Pilliga NR, Boomi and Boomi West NRs, Brigalow Park and Claremont NRs. Minor populations occur in all other Nature Reserves.

Impacts

Feral pigs can cause severe environmental degradation by:

- selective feeding on plant communities;
- creation of drainage channels in swamps;
- soil erosion and fouling of watering points by their habit of wallowing and rooting;
- direct predation on frogs, reptiles, ground-nesting birds and small mammals;
- aggressive competition for food with some species; and

- as an agent for the spread of weeds, particularly Noogoora and Bathurst Burrs.

Feral pigs can kill and eat lambs under two weeks of age, and as such can have an adverse impact on sheep breeding enterprises. They also compete with domestic livestock for pasture forbs, damage cereal crops and introduced pastures, and damage fences.

Pigs are a major potential host of a number of exotic diseases such as Foot and Mouth, African Swine Fever and Rinderpest, as well as viruses to which humans are susceptible, such as Murray Valley Encephalitis and Ross River Fever.

Control Methods

Control methods include:

- 1080 baiting
- live panel trapping (utilised on reserves and loaned to neighbours)
- aerial shooting
- ground shooting.

In Mt Kaputar NP, the Judas pig program is used to help determine the most appropriate locations and times to implement control programs.

Management Strategy

1. Continue to monitor pig distributions and populations, using ground inspections and comments from neighbours.

2. Continue with existing aerial shooting programs in Narran Lakes, Macquarie Marshes, Boomi, Boomi West and Planchonella NRs, and with ground shooting and trapping programs in Mt Kaptar NP, Warrumbungle NP and Pilliga NR.

3. Maintain cooperation and communication with adjoining landholders undertaking feral pig control.

4. Continue monitoring and evaluation of the effectiveness of control programs and migration rates post control in identified priority reserves. In Mt Kaputar NP the Judas Pig Program is used. Results from this program are still being collated. It is hoped that this program will aid in determining better logistical placement of traps and timing of trapping programs. Pre and post control counts are also used in Mt Kaputar NP and Narran Lake NR. In other reserves a combination of aerial surveys and neighbours' comments are used for monitoring.

Performance Measures

Pre and post counts, evaluations of control programs, and results from ground inspections of reserves indicating a reduction in pig activity.

Comments from neighbours and visitors.

6.1.2 Feral Goat- *Capra hircus*

Distribution

Major populations occur in Mt Kaputar NP, Warrumbungle NP and parts of the Pilliga and Narran Lake NRs. A small population was on one occasion located in Brigalow Park NR (and was subsequently shot from a helicopter), and similar small populations have been seen in Planchonella and Weetalibah NRs and the Macquarie Marshes NR.

Impacts

Feral goats compete with native animals for water, food and shelter. They are a major contributor to soil erosion, and can have substantial impacts on vegetation structure through overgrazing, and on cultural heritage sites. They may also carry exotic disease, especially Footrot and Ovine Johnes Disease (OJD).

Control Methods

Control methods include:

- Judas Goat program
- aerial control programs
- ground shooting.

Management Strategy

1. Monitor feral goat distribution and populations on NPWS managed lands.
2. Undertake Judas Goat program and aerial culling in cooperation with neighbours and government departments, and some ground shooting in Mt Kaputar NP and the Warrumbungle NP.
3. Undertake aerial culling and ground shooting in Narran Lake and Pilliga NRs.
4. Monitor goat populations in areas where control activities are being undertaken. Observations of goat numbers and movements by neighbours, as well as on-ground assessments of damage caused by goats are utilised.

Performance Measures

Reduced goat populations as indicated by occasional index-removal-index or more frequent on-ground monitoring programs. Scat counts are undertaken around Brush-tailed Rock-wallaby colonies in the Warrumbungle NP.

Visual assessments indicating regeneration of native vegetation susceptible to impacts attributed to feral goats, and reduced soil damage (e.g. goat pads).

Ongoing evaluation of the Judas Goat program and aerial control programs.

Comments from neighbours and visitors regarding feral goat sightings.

6.1.3 European Red Fox - *Vulpes vulpes*

Distribution

Widespread throughout the Northern Plains Region. They are a particular problem in the Narran Lake NR and Macquarie Marshes NR where ground-nesting birds are found in large numbers on occasions. They are also a problem around Careunga, Brigalow Park, Claremont, Kirramingly, Boomi West, Planchonella and Pilliga NRs, Warrumbungle and Mt Kaputar NPs and where neighbours have sheep breeding enterprises.

Further work is to be carried out in relation to scat analysis, the results from which may raise the priority for fox control within the Northern Plains Region. Key recommendations from the Fox Threat Abatement Plan will aid in determining priorities in regard to fox control programs and where they should take place.

Impacts

Fox predation is a major threat to native animal populations, including threatened species, and can have a serious impact on farm livestock. Foxes are an agent for the dispersal of noxious weeds and are a potential carrier of disease.

The Fox TAP highlights the threat from foxes to the Brush-tailed Rock-wallaby population in Warrumbungle NP, Black-striped Wallabies in Claremont and Brigalow Park NRs, Brolgas at Narran Lakes, and Brolgas and Australasian Bitterns at the Macquarie Marshes (NSW NPWS 2001a).

Control Methods

Fox control should be undertaken in the peak dispersal period (Autumn) but more frequently in relation to predation on threatened species (NSW NPWS 2001a).

Methods include:

- ground baiting with 1080, using best practice;
- trapping; and
- opportunistic shooting (under endorsed shooting plans).

Management Strategy

Fox management will occur in accordance with management models proposed within the Fox Threat Abatement Plan (NSW NPWS 2001a). Management activities include:

1. Monitor fox populations Region-wide.
2. Undertake coordinated programs in cooperation with other agencies and immediate neighbours and stakeholders (e.g. landcare groups and fox control committees) to protect threatened and other native species (as per Threat Abatement Plan, NSW NPWS 2001a and recovery plans, e.g Brush-tailed Rock-wallaby population, NSW NPWS 2002). Strategic 1080 baiting programs are carried out on all estate along with ground shooting. Priorities are during waterbird breeding events at Narran Lake and the Macquarie Marshes NRs, around the Brush-tailed Rock-wallaby colonies in Warrumbungle NP, and during lambing periods.
3. Undertake monitoring in all areas where fox control programs are undertaken.

Performance Measures

Increased recovery of threatened species as per high priority programs identified in the Fox Threat Abatement Plan.

Short-term reduction in fox numbers as indicated by bait uptake (all programs), and spotlight surveys (e.g. Narran Lake NR). These techniques are used to monitor the population of animals that will take baits.

Comments from neighbours.

MEDIUM PRIORITY

6.1.4 European Wild Rabbit - *Oryctolagus cuniculus*

Distribution

Rabbits occur in scattered populations throughout the Region. Rabbit populations vary throughout all NPWS managed lands and are more common in areas of disturbance or on areas adjacent to agricultural lands. The largest populations occur within the Warrumbungle NP. Small populations are present in Narran Lake and Pilliga NRs and Mt Kaputar NP.

Impacts

Rabbits cause environmental damage in the following ways:

- soil erosion;
- grazing on native vegetation & reducing regeneration;
- competition with native animals for suitable habitat; and
- impacts on historic sites through foundation disturbance.

Control Methods

Rabbit control uses a combination of control techniques, mainly warren destruction and fumigation, but also including baiting, trapping, shooting and biological controls. For example, European Flea was established in the Warrumbungle NP populations about seven years ago, and assists with the spread of myxomatosis, which is reintroduced each year. Myxomatosis was also released at the Narran Lake NR in 1996.

Programs also make use of natural outbreaks of myxomatosis and calicivirus to further suppress populations.

Ground shooting is the principal technique used in Northern Plains Region.

Management Strategy

1. Monitor rabbit activity and evaluate their impact in NPWS reserves, using spotlight surveys, ground inspections, and comments from neighbours.

2. Undertake ground shooting programs for small populations.

3. Continue with warren ripping and bio-control in Warrumbungle NP and Pilliga NR.

Performance Measures

A reduction in rabbit activity as indicated by spotlight surveys and ground inspections.

Comments from neighbours.

6.1.5 Wild Dogs - *Canis familiaris*

Distribution

There have been very few reports of wild dogs in the Northern Plains Region. In recent years one report was made each for the Warrumbungle and Mt Kaputar NPs (see section 4.1.1). The NPWS has responded to each of these incidents, undertaking control programs in conjunction with neighbours and RLPBs.

Impacts

Wild dogs prey on domestic stock and native fauna. They can act as a vector spreading disease to native fauna. Wild dogs can also hybridise with dingoes.

Control Methods

Wild dog control methods include:

- 1080 baiting;
- trapping;
- shooting; and
- fencing.

Effective wild dog control requires cooperative control with neighbours. Prompt notification to the local RLPBs and adjoining neighbours of an issue can result in the development of a coordinated program to address particular concerns.

Management Strategy

1. Increase community awareness of responsible dog ownership in urban areas in conjunction with local government.

2. Improve communication and cooperation with adjoining landholders.

3. Maintain a regional database of reports/complaints by reserve to monitor wild dog activity.

4. Undertake 1080 baiting and opportunistic shooting where necessary.

Performance Measures

Increased neighbour participation in identifying where wild dogs are observed.

Increased neighbour participation in control of isolated wild dog incidents.

Reduced incidence of wild dog problems, as indicated by a reduction in the number of reports/complaints.

6.1.6 Feral Cat - *Felis catus*

Distribution

Known to occur throughout the Region but abundance unknown.

Impacts

Feral cats predate on native reptiles, frogs, small mammals and bird species, compete for food and act as a reservoir for diseases and parasites which can be transferred to native fauna, domestic stock and humans.

Control Methods

No pesticide is currently licensed for use on cats. Other control methods include trapping, opportunistic shooting and fencing, however they are largely ineffective. Feral cats are a difficult pest animal to control, and major advances in their control will depend on further progress with the cat-specific toxin and baiting system currently being developed.

Management Strategy

1. Develop a database of cat sightings to record the distribution/abundance of feral cats on NPWS reserves.

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

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

4. Undertake cat trapping when required for problem animals.

Performance Measures

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

Better understanding of abundance and distribution of cats.

Removal of identified problem cats using available techniques.

6.2 Weed Species

HIGH PRIORITY

6.2.1 Sweet Briar - *Rosa rubiginosa*

Distribution

Sweet Briar is found in the lower altitude disturbed areas of the Warrumbungle NP and of Mt Kaputar NP, along the Horton River on the eastern boundary. Also along the Horsearm Creek around the historic Scutt's Hut. Major control works were completed in 1994/95 however this will require a large follow up program. Vigilance will need to be maintained as plants in near proximity to the eastern edge of the park present a possible source of infestation.

Impacts

Sweet Briar is an invasive weed that competes with native species. It occurs on disturbed areas, growing densely if left unchecked, and can harbour noxious animals such as rabbits and pigs.

Control Methods

Application of registered herbicides according to label directions:

- basal bark application for bushes up to 5cm diameter, with stems saturated up to 30cm from ground level;

- cut and paint method: fully matured bushes are cut off close to ground level and the stump is treated immediately;

- broad spraying of foliage with herbicide.

Management Strategy

Apply registered herbicides at recommended rates in priority areas, particularly riparian zones.

Monitor and control spread from nearby infestations.

Performance Measures

Ground inspections indicating a reduction in the degree of infestation, both in area and plant density.

Comments from neighbours and park visitors.

6.2.2 Green Cestrum - *Cestrum parqui*

Distribution

Green Cestrum occurs only as a moderate population in the northern boundary of Warrumbungle NP and along the western boundary of Mt Kaputar NP (Ningadoo area). It is quite common on several properties neighbouring Mt Kaputar NP. Although these populations have been brought under control continued monitoring is vital if this weed is not to re-establish.

Impacts

Green Cestrum is an invasive weed that is also poisonous to stock. It produces a large seedbank, from which it readily re-establishes following treatment.

Control Methods

Green Cestrum can be controlled with herbicides or by manual removal. Herbicides effective in killing Green Cestrum are applied as an overall spray, thoroughly wetting the plants in the active growth stage before flowering. Flowers are produced over several months through summer and autumn.

Management Strategy

Apply herbicides at recommended rates in priority areas along waterways (e.g. Barradine Creek in Warrumbungle NP) and along boundaries, to prevent infestation of private land where stock are present.

Physical removal of isolated plants is undertaken in tributary headwaters within Warrumbungle NP.

Monitor for emergence of new plants, and control.

Continue cooperative programs with neighbours.

Performance Measures

Ground inspections indicating a reduction in abundance and requirements for follow up treatments.

Re-establishment prevented.

Comments from neighbours.

6.2.3 Lippia - *Phyla nodiflora*

Distribution

Located in the Macquarie Marshes NR and as isolated patches in Boomi West NR. Recently found in Midkin NR.

Impacts

A very invasive weed which competes with native plant species. Alleopathic (poisons the soil and prevents emergence of other plant species). Also contributes to erosion: roots grow down to 1 metre causing cracks to open and allowing rain and floodwater to penetrate and wash soil away.

Plant segments break off and float away in flood waters, resulting in establishment of infestations distant from the source.

Control Methods

Some chemical control possible, however effective control options are limited in proximity to crops and waterways.

Management Strategy

Trial control options and assess efficacy and surrounding impacts.

On the basis of trial results, implement an effective control technique, monitoring spread. The Boomi West infestation has present priority given the small area of infestation, affordable cost of treatment, and isolation from crops.

Keep up to date on latest developments for Lippia control. Liase with Murray Darling Lippia Management Committee.

Performance Measures

Ground inspections indicating a reduction in abundance and requirements for follow up treatments.

Spread is controlled.

6.2.4 Golden Dodder - *Cuscuta campestris*

Distribution

Golden Dodder has established itself throughout a large proportion of the Narran Lake NR (initial aerial mapping was undertaken in 1996). It has also recently been detected along the Bullawa Creek area of Mount Kaputar NP. An isolated population also occurs in the Macquarie Marshes NR.

Impacts

Dodder is a parasitic weed that is attacking Lignum in the Narran Lake NR. It is degenerating the Lignum in areas where it is used by water birds for nesting. Along the Bullawa Creek the weed has been observed on native and exotic grasses.

Seeds float away in flood waters, resulting in establishment of infestations distant from the source.

Control Methods

Golden Dodder can be controlled with herbicides, however the parasitic nature of this species necessitates that the host plant is also killed.

Management Strategy

Aerial and ground spraying in the spring or when conditions permit (good soil moisture, healthy growing plants).

Performance Measures

Pre and post control aerial transects indicating a reduction in the degree of infestation, both in area and plant density.

Regular ground monitoring.

Comments from neighbours.

6.2.5 Spiny Burr Grass – *Cenchrus incertus*

Distribution

Spiny Burr Grass was identified on the sandy ridges on the western side of Boronga Nature Reserve, and occurs in areas near the Narran Lake NR. It is also distributed throughout reserves within the Coonabarabran Area.

Impacts

Spiny Burr Grass is an invasive weed that has the ability to spread rapidly into dense widespread infestations and compete with native species. Stock will graze on early growth but the burrs on mature plants cause health problems in stock, dogs and humans. The sharp rigid barbed spines means that the burrs are a major wool contaminant and their presence can degrade visitor areas.

Each plant can yield up to 1000 seeds, and these can lay dormant for as long as three years. Spiny Burr Grass can germinate at any time of the year if moisture is present.

Control Methods

Several herbicides are effective for the control of Spiny Burr Grass. These are applied to actively growing plants for non-selective control. This weed is generally sprayed in the summer.

To reduce spread of this weed vehicle movements are restricted to roads and limited to service access only.

Management Strategy

Apply registered herbicides at recommended rates. All infestations are of equal priority.

Monitor and control spread from nearby infestations.

Performance Measures

Ground inspections indicating a reduction in the degree of infestation, both in area and plant density.

Comments from neighbours.

6.2.6 St John's Wort – *Hypericum perforatum*

Distribution

This weed has been identified in areas outside of Mt Kaputar NP and as isolated patches in some open disturbed areas within the Warrumbungle NP.

Impacts

Invades disturbed areas with the capacity to move into open forest and along creeklines. It is considered to be a serious agricultural weed.

This noxious weed is poisonous to stock and native fauna, and can cause exposed skin to become photosensitive in many species. It also has the potential to cause irritation to humans.

St John's Wort competes with other plant species for light and nutrients throughout the year, and can outcompete almost all other understorey plant species. It spreads by seeds and lateral roots, and can form dense infestations of up to 250 stems per square metre.

Control Methods

Effective biological control agents (e.g. Chrysolina insect) are available subject to approval.

Strategic use of herbicides. The optimum stage of growth for spraying occurs in spring when plants are about 45cm tall and are actively growing. However, this varies with the herbicide being used (e.g. pre-flowering stage, or flowering stage).

Physical removal of isolated plants can also be employed.

Management Strategy

1. Treat St John's Wort in highly accessible and/or recreational areas. Continue to treat infestations along road and track edges to prevent further spread.

2. Continue existing targeted programs for all infestation areas within the Region's protected area network (ie. spot spraying and hand removal of isolated patches).

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

4. Liaise with Macquarie County Council and NSW Agriculture regarding release of biological control agents.

5. Investigate the potential effectiveness and the practicality for strategic release of biological control agents throughout the Region subject to appropriate approval and environmental impact determination process.

Performance Measures

Ground inspections and comments from neighbours indicating the successful

control of infestations, and the eradication of small isolated infestations.

Prevention of spread and establishment of new infestations.

6.2.7 African Boxthorn - *Lycium ferocissimum*

Distribution

Moderate populations of Boxthorn occur in Midkin, Careunga and Kirramingly NRs. Minor populations also occur in Planchonella, Claremont and Narran Lake NRs. Many of these populations have been chemically treated, however follow up spraying of regrowth is required each year.

Impacts

Can be an aggressive invader in areas where soil disturbance occurs. High soil reserves of dormant seed can germinate under ideal conditions.

Occurs mostly in watercourses and provides ideal cover for feral pigs, rabbits and cats. Smothers and outcompetes native vegetation and threatens the conservation and recreational values of service estate.

Control Methods

Basal bark application of registered herbicide-diesel mix is used in conjunction with physical removal of large plants, such as stump grubbing. Six months after physical removal, stumps, small bushes and regrowth are treated with an appropriate herbicide

Management Strategy

Continue an integrated approach using chemical and mechanical control measures.

Reduce plant numbers in all areas via high volume and basal bark spraying.

Monitor plants treated for regrowth, and for newly germinated seeds.

Encourage neighbour participation in similar control programs.

Performance Measures

Ground inspections indicating a reduction in abundance and requirements for follow up treatments.

Comments from neighbours.

6.2.8 Blackberry - *Rubus fruiticosus*

Distribution

Blackberry is a declared noxious weed in NSW and is often restricted to disturbed areas. Blackberry occurs in small populations in the Warrumbungle and Mt Kaputar NPs.

Impacts

Rapidly invades disturbed areas from underground suckers and has the capacity to move into open forest and along creeklines.

Blackberry forms dense thickets, thereby excluding light from the soil surface and reducing the area of ground available to native species. This enables it to seriously impede the regeneration of native species. It is highly visible to the public and provides shelter and foraging habitats for feral animals.

Control Methods

Strategic herbicide application is the most effective, efficient and cost effective method to control populations of Blackberry. Dead shrubs are subsequently burnt in some areas to allow any new growth to be accessed and treated.

A biological control agent, Rust Fungus exists, but is not used in NPR.

Management Strategy

1. Identify and map Blackberry infestations on NPWS managed lands.

2. Treatment of Blackberry by staff and contractors with subsequent follow-up as per annual works programs.

3. Annual monitoring of treatment sites.

4. Increase public awareness through involvement with local government and Noxious Weeds Advisory Committee.

Performance Measures

Reduction in isolated infestations, both in area and plant density, of Blackberry across the Region, as indicated by annual monitoring.

6.2.9 Bathurst Burr & Noogoora Burr - *Xanthium* spp.

Distribution

These weeds occur in isolated patches throughout the Region. The Macquarie Marshes and Narran Lake NRs have at times major populations. The problem of regular inundation makes these species hard to control in the wetlands. The extended dry periods that occur in the Narran Lake NR make the weed less of a problem in that reserve.

Impacts

Designated as a noxious weed primarily due to its spoiling effect on wool. It is prevalent in disturbed locations, such as along roadside drains, around natural and man-made water points and floodout areas.

Each burr contains two seeds, one of which may not germinate for several seasons after the first seed has germinated. Mature burrs are readily dispersed by animals and flowing water.

Noogoora Burr is highly invasive in flood prone areas on a range of soils from sandy clay loams to heavy self mulching clays. Masses of seedlings establish after late spring of summer flooding, crowding out other species of plants. It is a vigorous competitor against all native pasture species.

Control Methods

Control methods include:

- hoeing and manual removal (hand removal) of small outbreaks;

- selective herbicide application using spot spraying.

Management Strategy

All known Bathurst and Noogoora Burr infestations will be treated with annual follow up.

Contain current areas of infestation and monitor areas for new outbreaks. Treat all outbreaks as they occur and before they set seed.

Performance Measures

Ground inspections indicating a reduction in the degree of infestation, both in area and plant density.

6.2.10 Khaki Weed – *Alternanthera pungens*

Distribution

Warrumbungles NP and around some disturbed areas in Mt Kaputar NP.

Impacts

Khaki Weed readily invades disturbed soils and is poisonous to animals. Its most objectionable feature is its prickly burrs which adhere to rubber tyres, footwear, clothing and animals, which may help it to spread.

Control Methods

Application of herbicides prior to seeding.

Management Strategy

Apply registered herbicides at recommended rates in priority conservation areas e.g. campsite areas, high visitation areas, walking trails, and roadsides.

Performance Measures

Ground inspections and comments by visitors indicating a reduction in the degree of infestation, both in area and plant density. Specifically, management is aimed at control within high visitation areas, eradication of small isolated patches and preventing spread of this weed.

6.2.11 Castor Oil Plant - *Ricinus communis*

Distribution

Castor Oil Plants have been identified in the Boomi West Nature Reserve and are a major cause of concern to the neighbouring landholders. A minor population also exists in Mt Kaputar NP. These infestations occur in disturbed areas on old farmland sites. Chemical control of this weed in Boomi West seems to have eliminated this weed from the reserve.

Impacts

Outcompetes native plant species.

Seeds of the Castor Oil Plant are known to contain toxins that can cause gastro-intestinal upsets, dermatitis, conjunctivitis and bronchial irritation in humans. It is also suspected of poisoning stock, and may cause poisoning of native animals.

Control Methods

Dig out and burn single plants. Herbicides are effective on larger colonies. Overall sprays are applied when the plants are actively growing, thoroughly wetting leaves and stems. With very large plants slash and immediately paint the cut stumps.

Physical removal of mature plants in isolated patches. Foliar spraying of seedlings.

Management Strategy

Apply registered herbicides at recommended rates.

Performance Measures

Ground inspections indicating a reduction in the degree of infestation, both in area and plant density. Long-term management involves eradication of infestations from these disturbed sites.

Comments from neighbours.

6.2.12 Prickly Pears - *Opuntia* spp.

Distribution

Prickly Pear is located throughout Mt Kaputar NP in variable densities. High numbers of this plant are present at Boronga, Boomi, and Boomi West NRs. Moderate to low populations exist in most other reserves. Tiger Pear is located in Midkin NR in moderate numbers. Prickly Pear has been treated with herbicide in all northern reserves and follow up spraying in these areas is required. This follow up work has been ongoing for a number of years. Prickly Pear has been treated with herbicides treated in the Narran Lake NR also and this area also requires follow up spraying.

Impacts

This plant is particularly invasive, and as such poses a threat to native plants. New plants grow from seed, or when a segment breaks off, takes root and becomes established.

Control Measures

Biological agents (*Cactoblastis* or Prickly Pear Moth) are relied on to control this plant. In some areas the plant is being sprayed with Garlon and diesel.

Management Strategy

Distribute caterpillars of *Cactoblastis* moth.

Apply registered herbicides at recommended rates in areas where mechanical spread of the cactus has occurred (e.g. alongside vehicular access tracks).

Performance Measures

Ground inspections indicating a reduction in the degree of infestation, both in area and plant density.

Comments from neighbours.

6.2.13 Mother-of-Millions - *Bryophllum delagoense*

Distribution

This weed is located around an old hut found within the boundaries of Mt Kaputar National Park in the Spring Creek area. Access is gained to this site through the property 'Evansdale'.

Impacts

Mother-of-millions is toxic, however the chemical nature of the toxin is not known. It is known to have caused cattle deaths, and is apparently toxic to humans.

Control Measures

Repeated application of registered herbicide using a hand gun and knapsack spray will be used to control this small infestation. Thorough coverage of leaves and plantlets is necessary, and a wetting agent is needed to penetrate the cuticle.

Management Strategy

Apply registered herbicides at recommended rates.

Performance Measures

Ground inspections and comments from neighbours to ensure eradication.

6.2.14 Blue Heliotrope - *Heliotropium amplexicaule*

Distribution

Blue Heliotrope is predominantly found in the Central Valley of the Warrumbungle NP. It occurs along roadsides and old cultivation and pasture areas. Populations also occur on grazing areas adjacent to the Pilliga NR.

Impacts

Blue Heliotrope out-competes more palatable species grazed by native herbivores. Its domination of the Central Valley is linked to excessive grazing pressure by the heavy concentration of Eastern Grey Kangaroos. An experimental kangaroo exclosure has been established in the middle of the Central Valley. Within this 70 ha exclosure, the kangaroo population is controlled at approximately 1 per hectare. This control has resulted in a reduction in weed species, in particular Blue Heliotrope and an increase in the coverage of native grasses. Blue Heliotrope is a declared noxious weed and can cause liver toxicity in livestock although this has not been shown to occur in macropods.

Control Measures

Herbicide

Biological control

Reduced grazing pressure

Management Strategy

Revegetation of the central cleared areas of the Warrumbungle NP to shade out the weed.

Strategic spraying along fire trails and park boundaries to prevent further spread.

Maintenance of existing kangaroo exclosure and further fencing of selected areas to control kangaroo populations.

Investigation of other methods of controlling kangaroo populations.

Continued monitoring of changes in the density of Blue Heliotrope in the main kangaroo exclosure.

Continued co-operation with Blue Heliotrope Action Committee in the release of Blue Heliotrope leaf beetle.

Performance Measures

Prevent spread and establishment of new infestations.

6.2.15 Paterson's Curse - *Echium plantagineum*

Distribution

Paterson's Curse is predominantly found in the Central Valley of the Warrumbungle NP. It occurs along roadsides and old cultivation and pasture areas.

Impacts

Although not as aggressive and resilient as Blue Heliotrope, Paterson's Curse out-competes more palatable species grazed by native herbivores. Its domination of the Central Valley is linked to excessive grazing pressure by the heavy concentration of Eastern Grey Kangaroos.

Control Measures

Herbicide

Biological control

Reduced grazing pressure

Management Strategies

Revegetation of the central cleared areas of the Warrumbungle NP to shade out the weed.

Strategic spraying along fire trails and park boundaries to prevent further spread.

Manual spreading of the biological control agents through strategic placement of the shadecloth enclosures.

Spot spraying in high visual and high use areas such as the turf at Camp Blackman and around the visitor centre.

Slashing at camp grounds and picnic areas to prevent the weed seeding.

Performance Measures

Prevention of spread and establishment of new infestations.

7 Conclusion

Pest management programs have been undertaken throughout Northern Plains Region based on priorities and recommendations in the previous regional plan. This review of the 1995 Pest Management Strategies will assist in the continuation of works programs for 2003-2006 and highlight planning needs.

Setting priorities is only the beginning of pest management. Once regional priorities are established, the planning, implementation of programs, monitoring and evaluation begins.

Successful pest management takes time. Programs are successful if they are well planned ensuring the appropriate control

techniques are used and follow-up is undertaken. Programs are also more effective if neighbours are encouraged to become actively involved in the overall implementation of the programs across the landscape.

This management strategy is only a tool to establish pest priorities and establish broad management guidelines. More detailed plans for individual pests or reserves have been prepared or require preparation as companions to this strategy.

The Northern Plains Region Pest Species Management Plan will be reviewed annually.

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Appendix 1: Timing of Pest Control Programs

The NPWS tries to adopt a strategic approach to pest animal control, whilst also allowing sufficient flexibility to capitalise on windows of opportunity which arise, (such as floods, droughts, fire). Similarly, some opportunistic weed control is undertaken in response to local events (e.g. control of mass germinations following flooding or rainfall events). Timing of control activities varies with the method used. For pest animal control activities, the timings indicated are general in nature and are influenced by factors such as varying seasonal conditions. Factors that determine timing of herbicide application include growth stage of the plant, time of year, herbicide used, mode of application and weather conditions. The following table outlines the best time for control or key pest species in the Northern Plains Region. Timing for weed species refer to herbicide treatment only.

Pest	Control Method	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Goat	Aerial shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Ground shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pig	Aerial shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Ground shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	1080 baiting	Y	Y	Y									
	Trapping	Y	Y	Y				Y	Y	Y			
Fox	1080 baiting						Y	Y	Y	Y	Y		
	Ground shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cat	Trapping	Y	Y	Y				Y	Y	Y			
	Ground shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rabbit	1080 baiting	Y	Y	Y									
	Ripping	Y	Y	Y									
	Fumigation							Y	Y	Y			
	Ground shooting	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sweet Briar	Herbicide treatment	Y	Y					Y	Y	Y	Y	Y	Y
Green Cestrum	Herbicide treatment										Y	Y	Y
Salvinia	Herbicide treatment										Y	Y	Y
Lippia	Herbicide treatment												
Golden Dodder	Herbicide treatment	Y	Y	Y	Y						Y	Y	Y
Spiny Burr Grass	Herbicide treatment	Y	Y	Y									
St John's Wort	Herbicide treatment										Y	Y	Y
African Boxthorn	Herbicide treatment							Y	Y	Y	Y	Y	
Water Hyacinth	Herbicide treatment	Y	Y	Y							Y	Y	Y
Bathurst Burr	Herbicide treatment	Y	Y									Y	Y
	Chipping							Y	Y	Y	Y		
Noogoora Burr	Herbicide treatment	Y	Y									Y	Y
	Chipping							Y	Y	Y	Y		

Pest	Control Method	Summer			Autumn			Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Khaki Weed	Herbicide treatment										Y	Y	Y
Castor Oil Plant	Herbicide treatment										Y	Y	Y
Prickly Pears	Herbicide treatment	Y	Y	Y									
	Biological agent	Y	Y	Y	Y							Y	Y
Mother-of-Millions	Herbicide treatment										Y	Y	Y
Devil's Claw	Herbicide treatment										Y	Y	Y
Parthenium Weed	Herbicide treatment	Y	Y	Y									
Mexican Poppy	Herbicide treatment	Y	Y	Y									

Appendix 2: Noxious Weeds of the Northern Plains Region

Common name	Botanical name	Brewarrina	Castlereagh/ Macquarie County Council	Gunnedah	Morree Plains	Nararbri	North West County Council
African Boxthorn	*Lycium ferocissium*	W2	W2	W3	W3	W3	W3
Alligator Weed	*Alternanthera philoxeroides*	W1	W1	W1	W1	W1	W1
Bathurst Burr/ Noogoora Burr.	*Xanthium* spp.	W3	W3	W3	W3	W3	W3
Blackberry	*Rubus fruiticosus*		W2	W3		W3	W3
Black Knapweed	*Centaurea nigra*	W1	W1	W1	W1	W1	W1
Blue Heliotrope	*Heliotropum amplexicaule*		W2	W2		W3	
Broomrape	*Orobanche* spp.	W1	W1	W1	W1	W1	W1
Cabomba	*Cabomba* spp.	W4g	W4g	W4g	W4g	W4g	W4g
Columbas Grass	*Sorghum x almum*	W2	W2	W3	W3	W3	W3
Dodder	*Cuscuta* spp.	W2	W2	W2	W2	W2	W2
Galvanised Burr	*Sclerolaena birchii*		W3	W2	W3	W3	W2
Giant Parramatta Grass	*Sporobulus indicus* var. *major*			W2			W2
Green Cestrum	*Cestrum parqui*	W2	W2	W2	W2	W2	W2
Harrisia	*Harrisia cactus*	W4f	W4f	W4f	W4f	W4f	W4f
Hawkeweeds	*Hieracium* spp.	W1	W1	W1	W1	W1	W1
Hemlock	*Conium maculatum*			W3	W3	W3	W3
Horsetail	*Equisetum* spp.	W1	W1	W1	W1	W1	W1
Johnson Grass	*Sorghum halepense*	W2	W2	W3	W3	W3	W3
Karoo Thorn	*Acacia karroo*	W1	W1	W1	W1	W1	W1
Kochia	*Kochia scoparia*	W1	W1	W1	W1	W1	W1
Lagarosiphon	*Lagarosiphon major*	W1	W1	W1	W1	W1	W1
Lippia	*Phyla* spp.			W4c	W4c		
Longstyle Feather Grass	*Pennisetum villosum*			W3	W3		W3
Mesquite	*Prosopis* spp.	W1	W1		W1	W1	
Mexican Feather Grass	*Nassella tenuissima* syn *Stipa*	W1	W1	W1	W1	W1	W1
Miconia	*Miconia* spp.	W1	W1	W1	W1	W1	
Mintweed	*Salvia reflexa*		W3		W3		
Mother-of-Millions	*Bryophyllum delagoense*			W3	W4c	W3	
Nodding Thistle	*Carduus nutans*		W2				W2
Parthenium Weed	*Parthenium hysterophorus*	W1	W1	W1	W1	W1	W1
Pampas Grass	*Cortaderia selloana*		W2	W2	W2	W2	W2
Paterson's Curse	*Echium* spp.			W3	W3		W3
Perennial Ragweed	*Ambrosia psilostachya*			W2			
Prickly Acacia	*Acacia nilotica*	W1	W1		W1	W1	W1
Prickly Pear	*Opuntia* spp.	W4f	W4f	W4f	W4f	W4f	W4f
Rhus Tree	*Toxicodendron succedaneum*	W2	W2	W2	W2	W2	W2
Salvinia	*Salvinia molesta*	W1	W1	W1	W1	W1	W1
Senegal Tea Plant	*Gymnocoronis spilanthoides*	W1	W1	W1	W1	W1	W1
Serrated Tussock	*Nassella trichotoma*		W2				W2
Siam weed	*Chromolaena odorata*	W1	W1	W1	W1	W1	W1
Silverleaf Nightshade	*Solanum elaeagnifolium*		W2	W2	W2	W2	W2
Spiny Burr Grass	*Cenchrus* sp.	W2	W3	W2	W2	W3	W2
Spotted Knapweed	*Centaurea maculosa*	W1	W1	W1	W1	W1	W1
St John's Wort	*Hypericum perforatum*		W2	W2	W2	W2	W2

Common name	Botanical name	Brewarrina	Castlereagh/ Macquarie County Council	Gunnedah	Morree Plains	Nararbri	North West County Council
Sweet Briar	*Rosa rubignosa*		W3				W3
Tree of Heaven	*Ailanthus altissima*			W2			
Water Hyacinth	*Eichhornia crasspipes*	W1	W1	W1	W1	W1	W1
Water Lettuce	*Pistia stratiotes*	W1	W1	W1	W1	W1	W1
Willows	*Salix* spp. except *S. babylonica*, *S. reichardtii* and *S. calodendron*	W4g	W4g	W4g	W4g	W4g	W4g

Table of Explanation:
W1 The presence of the weed on land must be notified to the local control authority, and the weed must be fully and continually suppressed and destroyed.
W2 The weed must be fully & continually suppressed and destroyed.
W3 The weed must be prevented from spreading & its numbers and distribution reduced.
W4 Various actions according to the following categories:
(c) The weed must not be sold, propagated or knowingly distributed, and the weed must be prevented from spreading to an adjoining property.
(f) The weed must not be sold, propagated or knowingly distributed. Any biological control or other control program directed by a local control authority must be implemented.
(g) The weed must not be sold, propagated or knowingly distributed.

Appendix 3: Emerging Pest Issues

Weed or pest animals which currently either do not occur or are suspected to occur on NPWS managed lands in Northern Plains Region and are a known problem in other natural areas. These species will be monitored and control programs developed where necessary.

Pest	**Locations**
Deer	Weetalibah NR, Warrumbungle NP
Feral Cattle	Narran Lake NR
Salvinia	Macquarie Marshes NR, Narran Lake NR
Water Hyacinth	Macquarie Marshes NR, Narran Lake NR
Parthenium Weed	All estate. Localised infestations have been found on major roads in NSW. Continual vigilance is required by all land managers to prevent spread of new outbreaks.

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