

# PRELIMINARY DRAFT



NSW National Parks  
and Wildlife Service

North Coast Region

# Pest Management Strategy

2007-2010



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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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## 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. The Threatened Species Priorities Action Statement (PAS) outlines the broad strategies and detailed [priority actions](#) in NSW to: promote the recovery of threatened species, population and ecological communities; and manage key threatening processes.

Pest programs are also integrated with other park management programs such as fire management.

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## **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 *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 threat abatement plans. 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.



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## **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 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 aerially apply pesticides under both the Act and regulations.

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*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 eg. 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](http://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 national park estate land.

## **Other Relevant Legislation**

- *Environment Protection and Biodiversity Conservation Act 2000* (Australian)
- *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.

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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 may include Catchment Action Plans for each of the 13 Catchment Management Authorities, regional weed plans, state and national strategies, and reserve Plans of Management.

## **4 Regional overview**

The NPWS North Coast Region manages approximately 380,000 hectares of land in northern NSW. The Region contains significant biogeographic landscapes including coastal plains and estuaries, river gorges and valleys, rugged escarpments and tablelands. Within the Region the NPWS manages in partnership with the community 20 National Parks, 42 Nature Reserves, 16 State Conservation Areas and 2 Aboriginal Areas. The Region is one of the most biodiverse environments in NSW. The Region's Parks and Reserves conserve a diversity of plant and animal communities including World Heritage-listed rainforests and remnant Old Growth Forest, important populations of threatened species, and significant Aboriginal and non-Aboriginal heritage. Parts of several parks and reserves are declared Wilderness Areas.

The land use patterns of past and present together with the diversity of natural environments have resulted in a wide and varied range of pests. Some of the pests have been present for a long time eg lantana, introduced to Port Macquarie in 1838, while new introductions eg crazy ants at Goodwood Island in 2004 and extensions of range eg Indian mynas are occurring. Pest control programs continue to be a high priority within the region. Long standing pest programs such as wild dog control have reduced the impacts of the targeted species and the region continues to respond to new and emerging threats such as cane toads. With the advent of threat abatement plans (bitou bush and foxes) the region has increased implementation of a number of control programs that protect threatened species. Wherever possible, collaborative



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programs with neighbours and community groups are undertaken to increase the effectiveness of control.

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## 5 Pest Distribution Tables

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

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

	Red fox	Wild dog	Feral horse	Feral cat	Cane toad	Feral pig	Black rat	Feral deer	Feral goat
<b>COFFS COAST AREA</b>									
Bindarri NP		○							
Bollanolla NR		○							
Bongil Bongil NP	○	○		○		○			
Bowraville NR		○							
Coffs Coast RP	○	○		○					
Coramba NR									
Dunggir NP	○	○		○				⊙	
Ganay NR									
Garby NR	○	○		○					
Gumbaynggirr NR									
Jaanningga NR									
Jagun NR	○			○					
Juugawaarri NR									
Korora NR	○								
Moonee Beach NR	○			○					
Muttonbird Island NR	○			○			●		
Ngambaa NR	○	○							
Solitary Islands NR									
Ulidarra NP	○	○							
Valla NR	○			○					
Yarriabini NP	○	○		○					
Nambucca AA									
Nunguu Miirral AA									
<b>DORRIGO PLATEAU AREA</b>									
Baalijin NR									
Bagul Waajaar NR									
Bellinger River NP	○	○		○					
Cascade NP				●					
Cathedral Rock NP		○				○			⊙
Chaelundi NP		○							
Cunnawarra NP		○							
Deervale NR				○					
Dorrigo NP	○	○		○					
Guy Fawkes River NP	○	○	●	○		⊙		⊙	⊙
Guy Fawkes River NR	○								
Jobs Mountain NR		○							
Junuy Juulum NP									
Mount Hyland NR	○			○		○			
Muldiva NR									

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New England NP	○	○						○	
Nymboi-Binderay NP		○							
Serpentine NR		○				○			

	Red fox	Wild dog	Feral horse	Feral cat	Cane toad	Feral pig	Black rat	Feral deer	Feral goat
<b>CLARENCE NORTH AREA</b>									
Banyabba SCA	○	○		○					
Banyabba NR	○	○		○					⊙
Bundjalung NP	○	○		○		●			⊙
Clarence Estuary NR	○			●					
Chapmans Peak NR									
Chatsworth Hill SCA	○	○							
Corymbia SCA									
Everlasting Swamp NR	○								
Fortis Creek NP	○	○		○					
Gurranang SCA									
Iluka NR				○		○	○		
Kooyong SCA	○	○							
Lawrence Road SCA	○					○			
Mororo Creek NR						○			
Mount Neville NR	○	○	○			○			
Mount Pikapene NP		○							
Munro Island NR									
Warragai Creek NR	○	○							
Wombat Creek NR									
Woodford Island NR	○								
Yaegl NR	○								
Yuraygir NP	○	○		●	⊙				
<b>CLARENCE SOUTH AREA</b>									
Byrnes Scrub NR		○							
Chambigne NR		○							
Flaggy Creek NR									
Hortons Creek NR									
Koukandowie NR	○	○							
Nth Rock NR									
Nth Solitary Island NR									
NW Solitary Island NR									
Nymboi-Binderay NP		○		○					
Nymboida NP	○	○							
Ramornie NP	○	○							
Sherwood NR	○	○		○					
Susan Island NR	○						○		
Tallawudjah NR									
Yuraygir SCA	○	○	○			○			
Yuraygir NP	○	○	○	●		○			

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

	Bitou bush	Blackberry	Groundsel bush	Glory lily	Exotic vines	Lantana	Pine species	Woody weeds	Herbaceous weeds	Exotic grasses
<b>DORRIGO PLATEAU AREA</b>										
Baalijin NR						●			⊙	○
Bagul Waajaar NR		○			○			○	○	○
Bellinger River NP					⊙	●		⊙	⊙	○
Cascade NP		○	○		○	○	○	○	○	○
Cathedral Rock NP		○								○
Chaelundi NP		○				●				○
Cunnawarra NP		○				○	○			○
Deervale NR					○			○		○
Dorrigo NP					○	○		○	○	○
Guy Fawkes River NP		●				○				○
Guy Fawkes River NR		●								○
Jobs Mountain NR						●				○
Junuy Juulum NP		○			○			○		
Mount Hyland NR		○							○	○
Muldiva NR		⊙			○			○	⊙	
New England NP		⊙				○			○	○
Nymboi-Binderay NP		○				○		○	○	○
Serpentine NR		○								○
<b>COFFS COAST AREA</b>										
Bindarri NP			⊙		⊙	○		○	○	○
Bollanolla NR						●		○	●	○
Bongil Bongil NP	○		○	○		○	○	○	○	●
Bowraville NR						●		○	○	○
Coffs Coast RP	●		⊙	⊙	○	○		●	●	●
Coramba NR					⊙			○		
Dunggir NP					○	○		○	○	○
Ganay NR						●				○
Garby NR			○							○
Gumbayngirr NR						○			○	○
Jaanninga NR			⊙		○	○		○	●	
Jagun NR	○		⊙	⊙		○		○		○
Juugawaarri NR			⊙			●			○	○
Korora NR					⊙	○		⊙	○	○
Moonee Beach NR	○		○		⊙	⊙		⊙	⊙	○
Muttonbird Island NR	○				○	○			○	○
Ngambaa NR					○	○		⊙	○	○
Solitary Islands NR	○				○	○				
Ulidarra NP			⊙		○	●		○	⊙	○
Valla NR	⊙					○		⊙	⊙	○
Yarriabini NP	○		⊙			○		○	○	○
Nambucca AA			⊙			○				○
Nunguu Miirral AA			⊙			○				○



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

	Bitou bush	Blackberry	Groundsel bush	Glory lily	Exotic vines	Lantana	Pine species	Woody weeds	Herbaceous weeds	Exotic grasses
<b>CLARENCE NORTH AREA</b>										
Banyabba SCA						●	○			○
Banyabba NR			○			●	○		○	○
Bundjalung NP	●		●		●	●		●	●	○
Chapmans Peak NR						○		○		○
Chatsworth Hill SCA			○			○		○	○	
Clarence Estuary NR	○		○		○			○	○	○
Corymbia SCA						○				○
Everlasting Swamp NR						○		○		●
Fortis Creek NP			○			●	○			○
Gurranang SCA						○				○
Kooyong SCA										
Iluka NR	●		○	○	●	○		●	●	○
Lawrence Road SCA						○				○
Mororo Creek NR			○			○		○	○	○
Mount Neville NR						●	●		○	●
Mount Pikapene NP						●	○			○
Munro Island NR			○		●	○		○	○	○
Warragai Creek NR						●			○	○
Wombat Creek NR						○				
Woodford Island NR			○		○	○		○	○	○
Yaegl NR			○		○	○		○	○	○
Yuraygir NP	●		●	○	●	○	●	●	○	○
<b>CLARENCE SOUTH AREA</b>										
Byrnes Scrub NR						●				
Chambigne NR						○				○
Flaggy Creek NR						○			○	○
Hortons Creek NR						○				○
Koukandowie NR						○		○	○	○
Nth Rock NR									○	○
Nth Solitary Island NR					○				○	○
NW Solitary Island NR					○				○	○
Nymboi-Binderay NP		⊙				●		●	○	○
Nymboida NP						●		○		○
Ramornie NP						●				○
Sherwood NR			○			●			○	
Susan Island NR					●	○		●	●	○
Tallawudjah NR			○		○	○		○		○
Yuraygir SCA			○		○	○				
Yuraygir NP	●		●	●	○	○	●	●	●	●

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## 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 eg. 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 (eg. 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 ie. 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 (eg. 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.

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- 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 eg. undertake fox control at the Warrumbungles priority site for brush-tailed rock wallaby as identified in the Fox Abatement Plan;
2. Programs that target pests which impact significantly on human health or are part of a declared national emergency eg. outbreak of foot and mouth disease or control of feral pigs in the catchment area of a domestic water supply reservoir;
3. Programs targeting pests that impact significantly on agricultural production eg. 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) eg. control of serrated tussock in an area previously free of the weed;

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## High Priority

5. Programs that target pests (other than those covered in priorities above) that impact significantly on World Heritage or international heritage values, eg. control of rabbits impacting on World Heritage values of Mungo NP; pest control in RAMSAR wetlands;
6. Programs targeting pests that impact significantly on important cultural heritage values eg. control of feral goats where they are inhabiting an area containing Aboriginal rock art; control of rabbits undermining an historic building;

## 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 eg. 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, eg. control of blackberry on the margins of camping areas; control of weeds in an area of natural beauty that is visited frequently;
9. Community or cooperative programs targeting pests that impact significantly on park values or agricultural production and that have ongoing, proven effectiveness and participation, eg. control of willows with the assistance of an established community group; control of Regionally Controlled Noxious Weeds (Control Class 3 weeds);
10. Community or cooperative programs that are implemented as part of an endorsed state or regional plan (and not covered above in higher priorities), eg. 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, eg. 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, eg. the maintenance of areas treated previously for serrated tussock to continue keeping them weed free.

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

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Future priorities for pest control will need to reflect changes in the distribution, abundance or impacts of pests that may occur in response to environmental changes including climate change. NPWS is supporting research to understand the interaction between climate change, pests and biodiversity.

## **9 Pest Program Recording and Monitoring**

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.

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 variation is often complex. Where populations cannot be counted directly, measurement is dependent on using indices of abundance. Rigorous attempts to measure population responses need to consider experimental design (eg. treatment and non-treatment sites, replication, time scale for measurable responses to occur), sampling design (because the entire population can rarely be measured) and standardisation of population measures to allow data to be collated across NPWS (across sites, times and land tenure where appropriate). As a result, measuring the response to pest control is expensive and can be afforded for only a small sub-set of control programs.

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 which may be easy to capture.

The monitoring of response of pest species distribution and abundance provides an interim measure of effectiveness essential:

- to aid comparison between control effort and biodiversity response;
- to provide useful data where biodiversity, other park values or agricultural responses are too difficult to measure or there is insufficient resources to make proper measurement;
- to provide an interim measure where native species may take some time to respond to pest control.

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 to control. 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.

Where appropriate, monitoring programs should also include measures to verify the results of research being undertaken to gain a better understanding of the interaction between pests and climate change.



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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.

In North Coast Region, all weed treatment records are entered into the GIS. The backlog of previous records, and species/ infestation mapping is entered into the GIS as resources allow. Fox, dog baiting data and stock loss reports are entered into spreadsheets and then digitised onto a Geographical Information System (GIS) annually.

## **10 Regional coordination and support of pest control programs**

Pest control programs are coordinated by the local NPWS Area and Region in order to ensure that resources are utilised to achieve the best possible outcomes. Area and Regional assistance is also required to efficiently work with neighbours, community groups and other agencies. Education of staff and the broader community are essential requirements in integrated pest management and are also best achieved by centralised coordination. In North Coast Region priority is given to building relationships and working with local community groups in the coastal reserves, as they are very important in achieving bushland restoration goals.

The Region liaises closely with other land management agencies (e.g. Local Councils, Forests NSW, Department of Lands, RLPBs) and community groups to coordinate vertebrate pest control programs across land tenures.

Coordination between other agencies and community groups and access to best management practices is assisted through active involvement in groups such as the NSW North Coast Weeds Advisory Committee, North Coast Vertebrate Pest Working Group, North East Pest Animal Advisory Committee and North Coast Indian Myna Working Group.

## **11 Pest Program Overviews**

### **PEST ANIMALS**

#### **Cane Toad (*Bufo marinus*)**

##### Distribution and abundance

Cane toads are restricted to the northern region of NSW, with well-established colonies occurring in the Tweed River Valley, Byron and Lismore areas. Their range extends along the coast as far south as Yamba, with isolated colonies around Angourie, Mororo-Ashby, Brooms Head and Port Macquarie. Established colonies of cane toads have been found up to 90km west of Ballina with the western boundary currently situated around Kyogle/Casino. Vagrants are regularly reported in Sydney, Wollongong, Coffs Harbour and the Central Coast area. Vagrant reports are typically only one animal often found near tourist parks or landscape/nursery supplies or along railway or highway corridors.

##### Impacts

The cane toad is poisonous at all stages of its life (eggs, tadpoles, toadlets and adult toads) and they impact on native fauna during all of these stages. Their ability to survive in a range of habitats and wide temperature ranges (5-40°C) increases their

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threat to native species. Insects, smaller toads and native frogs, small snakes and the occasional small mammal are all part of the cane toads' diet. Not only do they prey on native fauna, but they also compete for food, shelter and breeding sites. Summers in Northern NSW provide ideal breeding conditions for cane toads. Females lay between 8,000-35,000 eggs at a time and may lay two clutches each year.

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

The native species most likely to be impacted at the population level in North Coast Region include tiger quoll, goannas, frog eating snakes and certain bird species. Native invertebrates are predated.

## Priorities for control

Priorities for control are guided by the Northern Branch Cane Toad Management Strategy. In North Coast Region the focus will be on minimising the impact on native species by:

- controlling existing isolated populations on and nearby to DECC estate at Angourie and Brooms Head (Yuraygir NP).
- Preventing the establishment of new populations
- Maintaining and developing community interest and awareness in cane toad control

## Control

Cane toad management in North Coast Region is largely undertaken by DECC staff, contractors and volunteers with assistance from Department of Lands and local government. Raising public awareness and encouraging members of the public to hand in suspected live toads minimises the likelihood of native frogs being accidentally killed. Sightings and reports from the public are crucial in providing a quick response to new incursions. Following a confirmed report of toads in a new area, DECC will, where possible, undertake a mailbox-drop to surrounding residents, conduct spotlight surveys and will set traps to detect and remove any new colony that may have established.

## Monitoring

North Coast Region will attempt to confirm and document any new sighting of a cane toad in national parks in North Coast Region. Data for PWD is collated by Northern Branch PACS staff and reviewed annually for distribution to key stakeholders.

## **European Red Fox (*Vulpes vulpes*)**

### Distribution and abundance

Foxes occur in most environments in Australia; however, they are generally most abundant in agricultural areas with patches of uncleared vegetation, as these areas provide abundant food, cover and den sites. In contrast, foxes appear to be rare in closed forest distant from cleared land.

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## Impacts

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

Native species most likely to be impacted at the population level in NCR include little terns, beach stone curlew, pied oystercatcher, bush stone curlew, brolga, emus, rufous bettong, brush-tailed rock wallaby, and freshwater turtles including Bellinger River emydura. A range of other species including bandicoots, brush turkeys and brush tailed possums are also impacted.

## Priorities for control

The NSW Fox Threat Abatement Plan identifies high priority sites for fox control in North Coast Region. These are:

- Clarence River Entrance - Brolga, Pied Oystercatcher, Beach Stone Curlew
- Yuraygir Mid - Beach Stone Curlew, Pied Oystercatcher, Little Tern
- Yuraygir South - Beach Stone Curlew, Pied Oystercatcher, Little Tern
- Sawtell/Bongil Bongil - Little Tern
- Nambucca Heads / Warrell Creek - Little Tern, Beach Stone Curlew
- Upper Bellinger River - Bellinger River Emydura
- Ramornie-Jackadgery - Rufous Bettong
- Ngambaa NR /Ingalba SF– Rufous Bettong

Chaelundi-Kangaroo River site (rufous bettongs) was removed as a priority due to very low density of foxes; The Grange and Glenugie (rufous bettongs, Forests NSW) sites are non treatment sites.

DECC has implemented control programs at these priority sites since 2002 and in some cases for longer periods. In 2007 funding through the NHT/CMA has enabled fox control to be extended to private and other lands around some of the priority sites. DECC is providing assistance at some of these sites for this work.

Expansion of the Northern Rivers Region Bombing Range site (Bundjalung NP-Pied Oystercatchers) into the southern portion of Bundjalung NP will be considered.

There are no other priorities for fox control on DECC estate within North Coast Region. Requests for fox control for biodiversity conservation will only be considered if the resources required do not impact on existing programs. Fox control for agricultural production will be considered on a case by case basis, DECC preference is to participate in group baiting schemes.

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## Control

Regular systematic baiting using 1080 is the preferred method of fox control and is used throughout the region. This is supplemented by soft-jaw trapping, den fumigation and shooting.

## Monitoring

The impact of fox predation on the priority species and conversely, the effectiveness of the control program are being assessed through long-term monitoring of priority species at the sites and fox populations. Rufous bettong populations are being measured annually via cage trapping. Emydura populations are measured regularly by snorkelling and trapping surveys and shorebirds are monitored by counting adults, eggs and fledglings. Fox and other medium-sized mammal populations are being measured biannually via track counts on sandpads at rufous bettong sites. At shorebird sites fox activity is monitored through bait take and presence of tracks and other signs. Data is analysed by the Pest Management Unit and published periodically as part of the review of the Fox Threat Abatement Plan.

## **Feral Cats (*Felis catus*)**

### Distribution and abundance

Cats have been present in Australia at least since European settlement, and may have arrived as early as the 17th century. Feral cats are now found throughout Australia. There are estimated to be 400,000 feral cats in NSW and around 12 million across Australia.

Feral cats are solitary and predominantly nocturnal. Studies in western NSW have shown that males usually occupy a home range of 280 hectares, while females had smaller ranges of about 150 hectares but this may be larger if food supplies are scarce. They are less common in closed forests, preferring open, dryer habitats such as grasslands. Although no specific systematic surveys have been undertaken for feral cats in the North Coast Region, it is believed that they are present to varying degrees in all reserves; particularly near main urban centres. Opportunistic surveys, anecdotal reports and sand pad surveys undertaken as part of the implementation of the Fox TAP indicate that there are feral cats in Cascade NP, Mt Hyland NR, Dorrigo NP, Bongil Bongil NP, Coffs Coast RP, Moonee Beach NR, Yuraygir NP, Iluka NR and Bundjalung NP.

### Impacts

Feral cats are carnivores and can survive with limited access to water. They generally eat small mammals, but also catch birds, reptiles, amphibians, fish and insects, taking prey up to the size of a brush-tail possum.

There is clear evidence that feral cats have had a significant impact on island fauna. On the mainland, they contributed to the extinction of many small to medium sized mammals and ground-nesting birds; particularly in the arid zone. In some instances, feral cats have directly threatened the success of recovery programs for endangered species.

Threatened species recorded in North Coast Region that are known to be preyed on by feral cats include Hastings River Mouse *Pseudomys oralis*, Little Tern *Sterna albigularis* and Brush-tailed Rock Wallabies *Petrogale penicillata*.

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Feral cats carry infectious diseases such as toxoplasmosis and sarcosporidiosis, which can be transmitted to native animals, domestic livestock and humans.

Predation by feral cats is listed as a key threatening process under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and the *NSW Threatened Species Conservation Act* (TSC Act). The *Threat Abatement Plan for Predation by Feral Cats* has been produced under the EPBC Act and is currently being produced under the TSC Act.

## Priorities for control

A number of control techniques and a list of high priority locations for control are currently being compiled as part of the production of the NSW Threat Abatement Plan for predation by feral cats.

NPWS North Coast Region will continue to implement opportunistic control and cooperative programs with concerned neighbours and undertake trapping in identified problem areas.

NPWS North Coast Region will continue to support research into feral cat control and utilise any appropriate new control techniques.

## Control

Control of feral cats is problematic as they are hard to trap, do not readily take baits unless during periods of food shortage, and generally difficult to shoot as they avoid human contact. Even if cats are removed from an area, it is quickly recolonised (Dept. Environment and Heritage, 2004).

Registration of the vertebrate pesticide sodium fluoroacetate (1080) is currently being sought for the control of feral cats where conditions for its use are suitable. Audible recorded lures for feral cats and other predators are available through a number of sources. Night shooting is assisted by the cat's distinctive, green eyeshine. Rubber-jawed, leg-hold traps can be laid in the same manner as they are laid for wild dogs and foxes. Cats can also be trapped in wire 'treadle-type' box traps although this method is most practical for semi-feral urban cats (Qld Natural Resources, 2006).

## Monitoring

Sand pads across forest tracks can provide some indication of feral cat numbers in remote locations and will continue to be recorded as part of the implementation of the Fox Threat Abatement Plan. A coordinated and standardised reporting system will be developed as part of the implementation of the Threat Abatement Plan for predation of Feral Cats.

## **Feral Deer (family Cervidae)**

### Distribution and abundance

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

All deer species present in NSW have patchy distributions in forest and woodland in eastern New South Wales, with two species (Red and Fallow Deer) extending west of the Great Dividing Range (Adam 2004).



# PRELIMINARY DRAFT

Deer live in herds with complex social organisation, often involving considerable competition between males in the breeding season. Deer are generally cryptic and although there is no state-wide census of numbers, deer populations in NSW are believed to have increased dramatically in recent years. This is mainly attributed to escapes and deliberate releases from deer farms, expansions of acclimatisation herds and possibly in some areas deliberate translocation by hunters (Adam 2004).

They are nocturnal or semi-nocturnal, sheltering by day in forest or woodland and emerging to graze from late afternoon to early morning in native grassland, improved pasture, crop or other agricultural land.

Within North Coast Region, Feral Deer are known to occur in Guy Fawkes River NP, New England NP (Red Deer), and Dunggir NP. Feral deer (Chital deer) are also present on private and Forests NSW lands in the Bruxner Park area north of Coffs Harbour.

## Impacts

“Herbivory and environmental degradation caused by feral deer” have been declared a Key Threatening Process under the TSC Act.

Feral deer can have major impacts in parks and reserves, by:

- destroying native plants. Deer can trample plants; graze on them, and ring-bark young trees. Deer can have a major impact on the variety and abundance of plant species where populations are high;
- fouling waterholes;
- causing soil erosion;
- transmitting diseases such as foot-and-mouth disease, and;
- spreading weeds.

High densities of Feral deer have been found to reduce understory plant species in the Endangered Ecological Community Littoral Rainforest by as much as 70%. Feral deer populations elsewhere in the State have had significant impacts on the rare temperate and sub-tropical Illawarra rainforest, the threatened species *Syzigium paniculatum*, Littoral rainforest around Port Macquarie and trampling and browsing of threatened species in the Oxley Wild Rivers NP (Adam 2004). Deer have been found to browse on lantana, crofton weed, mistflower and mother of millions (Moriarty et al 2000). The dietary overlap between Rusa Deer and the Swamp wallaby (*Wallabia bicolor*) is estimated to be 15 – 50%, with one deer eating approximately the same amount of vegetation as three swamp wallabies (DEC 2005).

Feral deer on roads have caused several major car accidents in NSW in recent years.

## Control

A number of techniques are available for the control of Feral Deer including shooting (DECC, contract & private recreational shooters), fencing, trapping using feed based lures, oral sedation, mustering, and judas control. However, in remote areas on NPWS lands there are few viable cost-effective options available.

## Priorities for control

Work with other land management agencies, stakeholders and adjoining landholders to determine the current extent of feral deer populations in the North Coast Region. Ensure no new populations of feral deer establish on NPWS lands. Investigate and where appropriate implement species specific control programs to remove feral deer populations from NPWS lands.

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## Monitoring

Undertake a public survey in conjunction with Forests NSW and Local Councils to form the basis of a feral deer GIS database. Site based spotlight transect counts, sand plots and scat count transects.

## **Wild Dogs (Dingoes, feral dogs & their hybrids)**

### Distribution and abundance

Wild dogs can be divided into three groups. Dingoes, which arrived in Australia about 4000 years ago, Feral dogs – domestic dogs living in the wild, and hybrids - the result of cross-breeding between dingoes and feral dogs.

Dingoes originally occurred throughout NSW but today populations of wild dogs, including dingoes occur mainly in the east of the state on public and private lands along the Great Dividing Range and coastal hinterlands.

Wild dogs are present in low to medium densities in thirty one reserves in the North Coast Region. Many of these reserves are identified Dingo Management Areas under Schedule 2 of the RLPB Wild Dog Pest Control Order. Pest Animal Distribution Tables in this strategy provide a full list of reserves where wild dogs are known to occur within the Region. An analysis of wild dog DNA samples (total 247) collected throughout the NPWS Northern Directorate indicate that more than 70% of the entire wild dog population are dingoes (varying from 100% to 50% pure). Pure dingoes comprised approximately 20% and feral dogs only 8% of the general wild dog population. (Nesbitt 2007)

DNA analysis of wild dog populations in North Coast Region show a significant proportion of wild dogs in the larger reserves of New England NP and Cathedral Rock NP are either pure or greater than 75% pure dingo (Nesbitt 2000). Conservation of dingoes in an environment where they are also a declared pest species is a significant challenge.

### Impacts

Wild dogs, including dingoes, can cause significant livestock losses to the pastoral industry. Livestock affected include goat, sheep and cattle. Significant impacts occur where forested and gorge areas interface with fine wool sheep country. Impacts on cattle operations are most pronounced during calving.

Breeding between dingoes and feral dogs is one of the biggest threats to remaining native dingo populations. Maintenance of dingo pack structure within identified Dingo Management Areas (Schedule 2 lands) is seen as important to minimize further hybridisation and reduce predation impacts on neighbouring livestock operations. Wild dogs can suppress populations of pest species such as feral goats, pigs and foxes. This means the positive management of dingo populations is an important element of biodiversity conservation.

Dingo habituation and aggression towards park visitors has been identified as a potential risk in popular camp grounds in Yuraygir NP.

Wild dogs, including dingoes, are declared as a pest animal throughout NSW under the Rural Lands Protection Board Act. NPWS seeks to find a balance between conserving dingoes and controlling dingoes and other wild dogs in areas where they impact on livestock.

### Control

# PRELIMINARY DRAFT

A fully integrated suite of control techniques will be used to manage wild dogs within the North Coast Region. Control programs will be undertaken in partnership with the local RLPB, WDCA and individual landholders. Strategic control options, aimed at minimising the impact of wild dogs on livestock operations include:

- Ground/mound baiting and trapping in accessible areas
- Exclusion or barrier fencing along the boundaries of reserves such as Guy Fawkes River NP and Cathedral Rock NP, where the terrain is suitable and there is sufficient support from neighbouring landholders
- Aerial baiting in the rugged inaccessible areas where other control techniques may not be suitable

Reactive control options in response to reports of livestock predation or dog activity include:

- Ground/mound baiting
- Trapping using either DECC staff or contract trappers

Campers are prohibited from feeding dingoes around campsites in reserves such as Yuraygir NP. NPWS will monitor dingoes in these areas and if required will remove aggressive dingoes.

## Priorities for control

Wild dogs, including dingoes, have been declared as a pest animal under the Rural Lands Protection Act and they must be controlled on Crown lands. Although the dingo is unprotected under Schedule 11 of the *National Parks and Wildlife Act 1974*, it is a native animal, and there is a requirement for it to be conserved both on NPWS managed lands and within NSW generally.

Wild dog management plans are prepared in conjunction with the local Rural Lands Protection Boards (RLPBs) and Wild Dog Control Associations (WDCA). The plans must include the dual aims of minimising livestock predation and the conservation of the dingo in the core areas of all reserves listed under Schedule 2 of the Wild Dog Pest Control Order. While the overarching management plans are developed by the RLPBs, operational plans are negotiated with individual WDCAs on an Association area basis.

Priorities for wild dog control on reserves in North Coast Region are based primarily on the level of livestock predation reported by adjoining landholders, in accord with the relevant wild dog management plans. Wild dog control measures will be focused on areas of reserves where there are current and/or historic records demonstrating significant impact on livestock from wild dogs emanating from the reserves. There will be close liaison with the local WDCA and landholders when developing control programs.

NPWS will continue to work with RLPB to develop and review wild dog management plans. NPWS commitments in these plans include implementing cooperative 1080 baiting programs in conjunction with neighbours in problem areas. Contract wild dog trapping occurs on an annual or biannual basis to control wild dogs adjacent to some New England tableland reserves.

## Monitoring

# PRELIMINARY DRAFT

Monitoring will include the maintenance of a GIS database of all reports of stock loss , wild dog activity and results of DNA analysis. The regular review of the database and the generation of GIS maps to assist in the annual review of the NPWS North Coast Region wild dog management programs

Samples of all wild dogs trapped by NPWS staff or contractors sent for DNA analysis. Ongoing monitoring of dingoes in high visitor use areas such as Yuraygir NP camping grounds.

## **Feral Goat (*Capra hircus*)**

### Distribution and abundance

Feral goats occur across a wide range of habitats in all states of Australia. Isolated feral goat populations are present in the Guy Fawkes River NP and Cathedral Rock NP. Recent records of feral goats in lower Bundjalung NP and Banyabba 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. Feral goats can survive on highly fibrous, low nutrient herbage, provided sufficient water is available and will consume litter, fruit fall, bark and sticks. This 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.

Competition and habitat degradation by feral goats has been listed as a *key threatening process* under the NSW *Threatened Species Conservation Act* (TSC Act). 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.

### Priorities for control

- Esk River Islands, Bundjalung NP
- Banyabba NR - confirm current presence
- Cathedral Rock and Guy Fawkes River NP - monitor populations and control as required
- Monitor new populations in other reserves

### Control

Effective control of feral goats requires an integrated approach using several complementary control techniques. In NCR, the main control techniques will be aerial and ground shooting and trapping programs. In addition, if landholders adjacent to reserve boundaries have feral goats they will be encouraged to reduce feral goat numbers through mustering and trapping. The maintenance of native dingo populations is likely to assist in controlling feral goat populations in NCR reserves.

### Monitoring

# PRELIMINARY DRAFT

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

## **Rabbits (*Oryctolagus cuniculus*)**

### Distribution and abundance

Rabbits are found in most habitats throughout Australia below the tropic of Capricorn where there is suitable harbour or soil for digging warrens. They do not generally occur above 1500m altitude, in dense forests, or on the black soil plains.

Although rabbits are present in many reserves in the North Coast Region most are not ideal habitat for the species. Moderate densities of rabbits occur in Guy Fawkes River NP, Dorrigo NP, Bundjalung NP, Yuraygir NP and one location within New England NP. European hares (*Lepus capensis*) are also known from a number of reserves in the region.

### Impacts

Rabbits have significant impacts on native vegetation. Selective grazing and browsing of more palatable species leads to changes in species composition and habitat structure and even at low densities, rabbits can prevent the regeneration of impacted species through consumption of seed and seedlings. During drought, rabbits will also consume the bark and roots of native species, resulting in the death of large numbers of plants. Their digging activities also scratch out seedlings and damage root systems and combined with the damage they cause to both above and below ground vegetation, can lead to increased soil erosion. The resultant habitat degradation in turn affects native fauna, which may also be impacted by rabbits through competition for food and shelter. Rabbits also provide a food source for cats and foxes, maintaining high numbers of these introduced predators, which in turn impact native prey species.

Competition and grazing by feral European rabbits has been listed as a *key threatening process* under the NSW *Threatened Species Conservation Act* and rabbits are a declared pest animal under the *Rural Lands Protection Act 1998*. Rabbits can also cause damage to Aboriginal heritage sites, compete with neighbouring livestock and impact forestry operations. The impacts of rabbits have been reduced since the release of myxomatosis and more recently rabbit haemorrhagic disease (RHD), however even at low densities rabbits can prevent the regeneration of impacted plant species and recent reports suggest rabbit numbers may be increasing again.

### Priorities for control

The highest priority sites in North Coast Region are Guy Fawkes River NP, Dorrigo NP, Bundjalung NP and Yuraygir NP. Densities of rabbits in these reserves are generally low, however where numbers have increased control programs have been implemented in these locations.

Priorities for control are:

- High public use areas such as picnic areas where the lawns are favoured by rabbits
- Where opportunistic surveys in known locations highlight an increase in densities and associated negative impacts

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- Where rabbit populations have the potential to impact on threatened flora and fauna species

## Control

Effective control of feral rabbits requires an integrated approach using several complementary control techniques. In North Coast Region, the main control techniques are 1080 baiting, pindone baiting, and RHD baiting. Warren fumigation is only used occasionally and warren ripping rarely, due to the remote nature of most populations and as rabbits do not always use warrens in coastal areas.

## Monitoring

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

As most significant rabbit populations within North Coast Region are found in remote areas, rabbit population abundances will be monitored using opportunistic recordings of warrens and counts of active entrances.

## **Wild pigs (*Sus scrofa*)**

### Distribution and abundance

Domestic pigs were introduced to Australia at the time of European settlement as a food source, and by the 1880's were regarded as a pest in several areas of western NSW and Victoria. Today there are estimated to be between 13 million and 23 million pigs in Australia. Significant populations occur in all states and territories except Tasmania.

Wild pigs are mainly found along watercourses and floodplains and in hot weather they are usually found within two kilometers of water. Densities vary depending on conditions, with about one feral pig per square kilometer in eucalypt woodland, forest and grazing land, and as many as 10–20 in wetlands and seasonally inundated floodplains. Feral pigs are active from late afternoon to early morning. They eat a wide range of foods including plants and small animals, and they will scavenge on dead animals. Adult male feral pigs (boars) generally roam alone over an area of up to 43 square kilometers, while females (sows) range over areas smaller than 20 square kilometers (Dept. Environment and Water Resources 2006).

Within North Coast Region, pigs are most common in the New England tableland area and in the lower Clarence floodplain. Populations of pigs occur in Cathedral Rock NP, Guy Fawkes River NP, Bundjalung NP, Iluka NR and Yuraygir NP. Feral pigs have recently been recorded in Bongil Bongil NP; these are suspected as introduced by persons unknown.

### Impacts

Feral pigs are a serious environmental and agricultural pest. Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a Key Threatening Process through the relevant National (EPBC Act) and State (TSC Act) legislation. Feral pigs are listed as a declared pest under the Rural Lands Protection Act.

Feral pigs have significant impacts on the environment, including:

- Eating or destroying native plants and animals;



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- Wallowing in, fouling and disturbing soils in dams, waterholes and other moist or swampy areas.
- Creating drainage channels in swamps;
- Digging for food. This can have major impacts on vegetation and forest litter, particularly along drainage lines and around swamps and lagoons, or after rain when the ground is softer. These actions destabilise stream banks and accelerate erosion;
- eating frogs, reptiles, birds and small mammals, and;
- spreading weeds and possibly disease.

Feral pigs can be a serious agricultural pest. They eat and destroy grain crops, improved pastures, and damage fences. They have been known to kill and eat up to 40% of newborn lambs. Feral pigs carry endemic diseases such as leptospirosis, brucellosis and melioidosis (Dept. Environment and Water Resources 2006).

## Control

A number of techniques are available to control feral pigs including shooting, trapping and baiting. Traps built near areas where pigs are active, such as watering holes can be successful when baited with grain. 1080 baiting is also used in some areas.

In Cathedral Rock NP the 'Judas pig' technique has been utilised, where their gregarious nature enables pigs fitted with radio collars to guide shooters to the location of other feral pigs. The maintenance of native dingo populations is likely to assist in controlling feral pigs populations in North Coast Region reserves.

Illegal hunting of pigs on NPWS lands is discouraged as it can result in escape of pig dogs, release of domestic pigs by shooters, damage to traps being used by NPWS and safety concerns to the general public. Extended drought can provide a window of opportunity for control of wild pigs due to their need for regular water.

## Priorities for control

Cooperative control programs with park neighbours and the RLPB will continue to be supported by NPWS. Control programs focus on trapping and baiting in areas of current activity. On the Dorrigo Plateau / Ebor area, traps have been built by NPWS staff and loaned to park neighbours to assist in their control programs.

High priority sites for control programs include Cathedral Rock NP, where a long-term program has been in place, Bundjalung NP and Yuraygir NP to reduce their impacts on native flora and fauna, watercourses and wetlands in the area.

Following the listing of "predation, habitat degradation, competition and disease transmission by feral pigs" as a Key Threatening Process in NSW, a Threat Abatement Plan will be produced that will identify high priority sites for control programs across NSW.

## Monitoring

The number of pigs trapped or shot is recorded during control programs. Wild pig sightings and evidence of rooting behaviour are recorded by NPWS staff. Reports from park neighbours are also recorded.

## **WEED SPECIES**

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

### Distribution and abundance

Bitou bush is widespread in all coastal reserves in the North Coast Region. Most foredunes and hind dunes are or have been heavily infested. It has also established in coastal heath and woodlands, littoral rainforest and grassy headlands.

### 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 2006). Bitou bush can also disturb cultural heritage sites by destroying the fabric of the site. It can provide food and shelter to feral animals, such as the red fox.

Bitou bush is a Weed of National Significance, and is declared Class 4 under the *Noxious Weeds Act 1993* in the four coastal councils in North Coast Region (Nambucca, Bellingen Coffs Harbour, Clarence Valley). National, state and regional strategies have been prepared. The invasion of native plant communities by bitou bush is listed as a key threatening process under the *NSW Threatened Species Conservation Act 1995*, and a threat abatement plan (the bitou TAP) has been prepared.

Bitou bush infestations threaten the conservation values of endangered ecological communities such as littoral rainforests and Themeda grassy headlands in Coffs Coast Regional Park, Bongil Bongil, Yuraygir, Bundjalung NPs, Moonee Beach NR as well as the World Heritage listed Iluka NR. Invasion by bitou bush is the key threat to several endangered plants in the North Coast Region including *Thesium australe*, *Chamaesyce psammogeton*, *Zieria prostrata*, *Acronychia littoralis* and *Sophora tomentosa*. Forty two sites are identified in the NSW Bitou Bush TAP. Of these, 28 are listed as Category 1 (highest priority) sites.

### Priorities for control

The bitou bush TAP identifies 31 priority sites for control in North Coast Region:

- Bundjalung NP - Ten Mile Beach, Woody Head, Middle Bluff, Iluka Bluff
- Yuraygir NP – Angourie Pt, Angourie Back Beach, Bare Point-Wilsons Headland, Sandon Bluffs, Sandon north and south beaches, Sandon River, Redcliff, Station Ck Beach, Rocky Pt, Shelley Headland, Dirragan Headland, Plumbago Headland, Pebbly to Freshwater
- Clarence Estuary NR
- Coffs Coast RP – Diggers Head, Woolgoolga Beach and Headland, Macauleys Headland, Cabins Beach, Arrawarra Headland, Woolgoolga to Sandy Beach and north east of Korora
- Moonee Beach NR – Look-at-me-now Headland, Dammerels Headland, Diggers Point, Bare Bluff
- Bongil Bongil NP

Control programs are being implemented at all of these sites and vary between initial works to follow up and expansion of treatment areas as resources become available. Requirements have changed at some sites due to control success, re-infestation and / or need to treat other weeds. Many of these programs involve working with other stakeholders such as community groups.

Other control priorities include:

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- the Bundjalung NP bitou bush control program (joint program with Northern Rivers Region)
- treatment of isolated infestations especially along roadsides such as Angourie, Diggers Camp and Sandon Rds in Yuraygir NP and as part of ongoing bush regeneration programs such as in Coffs Coast RP
- Support for programs involving community groups
- Programs around visitor areas
- programs when a window of opportunity for control becomes available, e.g. implementing ground or aerial spraying programs within 12 months of a bushfire.

Importantly where bitou bush occurs as part of a multi species weed infestation or other weeds are likely to invade post bitou bush control, then control of these other species is required.

## Control

Bitou bush is controlled using an integrated approach. A number of different techniques are utilised including physical removal, cut & paint, 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 2000 for all coastal reserves and repeated for Yuraygir NP in 2005. This will also be repeated every five years. Transects have been established in Yuraygir NP with monitoring every two years. The Bundjalung program has 64 quadrats which have been measured biannually (annually since 2006) since 2002. This information will also provide information regarding the success of long term control programs. Records of bitou bush control programs are maintained on Arcview GIS.

The region will also monitor the success of the bitou bush control programs at selected TAP sites using the methods outlined in the bitou bush TAP monitoring guidelines.

## **Blackberry (*Rubus fruticosus* aggregate)**

### Distribution and abundance

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

Blackberry rarely invades pristine bushland but readily establishes in disturbed areas on agricultural lands, roadsides, banks of watercourses, forests and bushland. It is common throughout temperate Australia in areas where rainfall is greater than 750 mm per annum. Blackberry is widespread on the slopes and tablelands of NSW.

Within North Coast Region substantial blackberry infestations occur in Guy Fawkes River NP, New England NP, Cathedral Rock NP, Chaelundi NP and Nymboi-Binderay NP. Isolated infestations occur in all other reserves on the Dorrigo Plateau as well as escarpment reserves in the western Clarence catchment.

### Impacts

Blackberry is a *Weed of National Significance* because of its invasiveness, potential for spread, and economic and environmental impacts. It is listed as a Class 4B weed under the *Noxious Weeds Act* throughout most of NSW.

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

Blackberry can provide significant harbour for rabbits, foxes, feral pigs and other pest animal species.

## Priorities for control

Blackberry has been a high priority for control on reserves within elevated parts of the North Coast Region for many years. Major control programs have occurred in the Guy Fawkes River NP, Guy Fawkes River NR, Chaelundi NP, New England NP and Cathedral Rock NP. Priorities for control include:

- New or emerging infestations, or where the current distribution is limited;
- Areas where high conservation values are threatened;
- Areas where public access to significant natural features is restricted;
- Previously treated areas that require adequate follow-up control to prevent reinfestation.

## Control

- Update distribution maps of blackberry on DECC (PWD) estate;
- Reduce distribution and potential to spread by treatment with herbicide;
- Carry out follow-up treatment as required for a minimum of 10 years or until there is no further regrowth;
- Trial bio-control agents to determine effectiveness as a control measure.

## Monitoring

- Establish photo-points to monitor re-establishment;
- General mapping of blackberry distribution and abundance in key locations such as Guy Fawkes River NP to note changes in distribution and density and to ensure all infestations are treated two out of three years;
- Monitor the quantity of herbicide used at each location, as the program proceeds.

## **Exotic grasses**

- Giant Parramatta Grass (*Sporobolus fertilis*)
- Hairy Panic (*Panicum maximum* var. *trichoglume*)
- Spiny Burrgrass (non native *Cenchrus* spp.)
- Pigeon Grasses (*Setaria* spp.)
- Kikuyu (*Pennisetum clandestinum*)
- Whisky Grass (*Andropogon virginicus*)
- Broad leafed paspalum (*Paspalum wettsteinii*)
- Coolatai Grass (*Hyparrhenia hirta*)
- Buffalo grass (*Stenotaphrum secundatum*)
- Molasses grass (*Melinis minutiflora*)

## Distribution and abundance

Infestations of most exotic grass species occur along roads, tracks and trails and previously disturbed areas within many reserves of the North Coast Region. Giant Parramatta grass is present almost exclusively along roadsides, often growing in dense swards. Large areas of Yuraygir NP were previously sown with the pasture

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species of pigeon grass and it still dominates much of the landscape. Kikuyu is present on headlands in Bundjalung and Yuraygir NPs, Moonee Beach NR and Coffs Coast RP as well as Susan Island NR. Buffalo grass also occurs on these headlands as well as in saltmarsh areas. Hairy panic outcompetes understorey species in Iluka NR and Bundjalung NP and Coffs Coast Regional Park, preventing natural rainforest regeneration. A large infestation of Whisky grass occurs west of Sandon in Yuraygir NP and also occurs along roadsides. Broad leafed paspalum is an emerging problem in coastal reserves and Coolatai grass has recently been detected along roadsides in several coastal reserves.

Molasses grass is present in dense infestations in disturbed areas in Coffs Coast RP, and scattered infestations in Yariabinni NP. In addition there are often localised but dense infestations of other grasses such as elephant grass (*Arundo donax*), Giant Paspalum (*Paspalum urvillei*) and Carpet Grass (*Axonopus affinus*) in other reserves.

A number of temperate climate grasses such as African lovegrass (*Eragrostis curvula*), Serrated tussock (*Nasella trichotoma*) and Chilean needlegrass (*Nassella neesiana*) threaten reserves in elevated areas such as Guy Fawkes River NP, Cathedral Rock NP and New England NP.

## Impacts

Exotic grasses are vigorous, persistent and invasive weeds in disturbed areas. Once established they can displace low vegetation and native grasses, and provide a seed source for dispersal by vehicular and pedestrian traffic. Pigeon grasses and kikuyu form dense mats, elevating fuel loads that place woody native species at risk in wildfire. Kikuyu inhibits seed germination and seedling establishment in all vegetation communities, with regenerating rainforest of particular concern.

On headlands in Moonee Beach NR, Kikuyu and Giant Paspalum control is undertaken as a recovery action for the endangered *Zieria prostrata* populations. Hairy panic outcompetes understorey species in Iluka NR and Bundjalung NP, preventing natural rainforest regeneration. Spiny burrgrasses and kikuyu have interfered with the nesting success of ground-nesting seabirds in Muttonbird Island NR, in addition to spiny burrgrass being an irritant for animals and park visitors.

Broad leafed paspalum is becoming invasive, dominating ground cover layers in full sun to shade. Buffalo grass can carpet the ground in the saltmarsh/swamp oak and grassy headland EECs. Whisky grass is a threat to swamp sclerophyll forest and heaths/sedgleands. Coolatai grass has proven very invasive in open woodlands on the slopes and tablelands and is a threat to heath lands, especially the graminoid clay heaths which are a feature of Yuraygir NP.

## Priorities for Control

- Endangered ecological communities littoral rainforest and grassy headlands in Moonee Beach NR, Coffs Coast RP and Bundjalung & Yuraugir NPs
- Shorebird nesting habitat, Muttonbird Island and Solitary Islands Nature Reserves
- Isolated and new infestations in all reserves
- Where control of grasses are required as part of a bush regeneration program

Control of large long standing infestations of whisky grass and pigeon grass in previously disturbed areas of Yuraygir NP is best addressed through preparation of a pest management plan for Yuraygir NP (identified as a high priority in Yuraygir POM).

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In the interim, the exclusion of fire as much as practical to allow for the recovery of native shrubland/forest is currently the only realistic control technique.

## Control

Most grass infestations are treated with herbicide and/or hand removed depending on their location.

## Monitoring

NPWS will continue to record and map all occurrences and treatments of exotic grasses. Treatments will be assessed for their effectiveness.

## **Exotic Vines**

- Cats claw creeper (*Macfadyena unguis-cati*)
- Madeira vine (*Anredera cordifolia*)
- Introduced Morning glory (*Ipomoea* spp.)
- Balloon vine (*Cardiospermum grandiflorum*)
- Dutchman's pipe (*Aristolochia elegans*)
- Moth vine (*Araujia sericifera*)
- Asparagus ferns (*Asparagus* spp.)
- Japanese honeysuckle (*Lonicera japonica*)

## Distribution and abundance

Vine weed infestations occur in all major catchments within the North Coast Region. As most vine weeds are readily spread by water movement, riparian zones are particularly threatened.

Cats claw creeper is widespread within the Clarence catchment, infesting over 80km of the Clarence River, as well as many tributaries. Ongoing control programs are undertaken in Susan Island NR, Mt Pikapene NP and Coramba NR. Elsewhere in the region it has an isolated occurrence and any infestations are a high priority for control. Cats claw creeper is declared a Class 4 noxious weed in Bellingen Shire.

Madeira and balloon vines are readily spread by water, especially floods. Infestations occur in Coffs Coast RP, Bellinger River NP, Dorrigo NP, Susan Island NR and madeira vine only in Iluka NR and Bundjalung NP. Introduced Morning glory species are widespread in the region, particularly near urban areas, and infestations occur in Coffs Coast RP, Yuraygir NP, Susan Island NR, Iluka NR, Yaegl NR and Yarriabini NP.

*Asparagus* spp. are common garden escapes that readily invade many coastal reserves. Significant climbing asparagus (*A. plumosus*) infestations have been controlled in Iluka NR and Susan Island NR. Ground asparagus (*A. aethiopicus*) occurs in Coffs Coast RP, Susan Island NR, Iluka NR, Bundjalung NP, Yuraygir NP and Clarence Estuary NR. Dutchman's pipe occurs in Iluka NR and Susan Island NR.

Japanese honeysuckle is a significant weed on the Dorrigo plateau and infestations occur in Nymboi-Binderay NP, Chaelundi NP, Dorrigo NP, Junuy Juluum NP, Muldiva NR and Deervale NR. Moth vine has an isolated occurrence in some coastal reserves.



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## Impacts

Vine weeds have been ranked by the NSW North Coast Weeds Advisory Committee as having the most impact on biodiversity of all weeds species present in the region. Vine weeds are easily transported, grow quickly and many are capable of climbing to the top of trees and stripping branches due to their weight. This leads to mass germination of vine weeds and other weeds with the increased sunlight reaching the forest floor and hence the destruction of floristic and structural diversity and fauna habitat. Heavy infestations result in trees being transformed to poles, often falling down in future flood events.

Substantial *Asparagus* infestations often create impenetrable thickets of thorny vine between the ground and 4m in height. Morning glory commonly occurs in coastal heaths, woodlands and swamp forests where it outcompetes, smothers and displaces native species.

Vine weeds reduce human access and can impact on physical infrastructure such as fencelines and picnic facilities.

## Priorities for control

- Endangered ecological communities lowland subtropical rainforest on floodplain, coastal floodplain forest, littoral rainforest, Themeda grassland on headlands and swamp forest.
- Near threatened species and known threatened species habitat including flying fox camps
- New and isolated infestations
- Bush regeneration programs targeting the most upstream infestations
- Maintenance of existing long-term control programs, particularly following a window of opportunity such after flood events

## Control

The first priority for control in most vine weed infestations is to control the vine in the upper canopy. This is generally achieved through cutting and painting or scraping and painting, depending on the species, with herbicide. For madeira vine and balloon vine infestations aerial tubers / seed pods should be bagged and composted.

Follow up control generally involves foliar spraying seedlings and regrowth with glyphosate or hand removal of isolated plants.

In heavy *Asparagus* infestations there may be a need for physically clearing away stems tangled in trees before foliar spraying the remaining plants with herbicide. Light infestations can be controlled through crowning.

## Monitoring

Vine weed infestations need to be controlled at least 3 times per year to ensure that native regeneration is not adversely affected, and for madeira / balloon vine, that tubers / seed pods are not produced within that time. Isolated infestations are controlled immediately where possible, however it is important that their location is mapped to ensure adequate follow up control occurs.

Monitoring the effectiveness of key vine weed programs is undertaken through mapping the size and density of infestations, and establishing photo points. In some locations, quadrats are used to record the number and diversity of native and introduced plants.

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## **Glory lily (*Gloriosa superba*)**

### Distribution

Glory lily occurs in dunal areas and headlands with highest densities found in disturbed areas and/or where bitou bush control has been undertaken. Major infestations occur in Bongil Bongil NP, with moderate infestations in Coffs Coast RP, Yuraygir NP, and minor infestations in Bundjalung NP and Iluka NR.

### Impacts

Glory lily is an aggressive perennial scrambler or climber that spreads by seed and vegetative means. It is suspected of heavy competition for water and nutrients, and contains harmful alkaloids that can cause fatal poisoning of mammals, including humans. It invades coastal plant communities from the incipient foredune to littoral rainforest.

### Priorities for Control

- Endangered ecological communities littoral rainforest and grassy headlands in Coffs Coast Regional Park , Bongil Bongil NP and Yuraygir NP
- Isolated and new infestations in coastal reserves
- Maintain existing successful long term program in central Yuraygir NP around Sandon and Bare Point-Wilsons Headland Bitou Bush TAP sites
- Where populations are likely to increase in response to other weed control.

### Control

Thorough manual control of isolated plants with few stems is the most effective control option but is of limited practicality for any larger infestations. Herbicide application has shown variable success with the most effective option currently a mixture of glyphosate and metsulfuron methyl (used in accordance with Permit 9907) and applied early in the growing season with a follow up treatment late summer/early autumn. A problem with herbicide application is the potential for off target damage, particularly in heavy infestations, and careful application is needed. Alternate herbicide control options should continue to be investigated.

### Monitoring

Existing Infestations are treated biannually. New infestations are recorded and treated within that growing season.

## **Groundsel Bush (*Baccharis halimifolia*)**

### Distribution and abundance

Groundsel bush occurs in many reserves in the North Coast Region, generally on poorly drained soils or adjacent to estuarine areas, watercourses, coastal wetlands and swamp forest areas. Major infestations are found on former farmland in Yuraygir NP in the Brooms Head and Station Creek areas.

### Impacts

Groundsel bush is an aggressive invader of disturbed areas and readily invades and proliferates in undisturbed low-lying areas. It has a rapid growth rate and produces

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vast quantities of windborne seed, which germinates readily. It successfully out-competes and shades native species, prohibiting natural regeneration, and often forms dense thickets that grossly alter the structure and floristic composition of native plant communities (including some SEPP 14 wetlands). Groundsel bush is a declared Class 4 weed under the *Noxious Weeds Act 1993* in the four coastal LGAs in North Coast Region. Groundsel bush can readily invade farmland, thereby imposing additional costs for farm management and is toxic to horses.

## Priorities for control

- Continue and expand control programs in the endangered ecological communities; coastal saltmarsh, swamp oak floodplain forest, sub tropical coastal floodplain forest and swamp sclerophyll forest. These occur in Bundjalung NP, Yuraygir NP, Moonee Beach NR, Bongil Bongil NP (including habitat of *Alexfloydia repens*).
- Isolated and new occurrences
- Infestations near neighbouring properties
- Large infestations with existing programs where ongoing effort is required to maintain previous benefits.

## Control

Herbicide control programs involving aerial, vehicle based and cut stump have been utilised extensively within Bundjalung Yuraygir NPs and Moonee Beach NR since the mid 1990s. Infestations have either been eradicated or reduced significantly where follow up treatments have occurred. Biological control agents such as the gall fly and stem borer are present throughout the area but generally only have minor impacts at the population level.

## Monitoring

NPWS will continue to record and map all occurrences and treatments of groundsel bush. The extensive mapping undertaken in Yuraygir NP and southern Bundjalung NPs in 1995 will be repeated and extended to all other coastal reserves by 2010.

## **Herbaceous weeds**

- Mistflower (*Ageratina riparia*)
- Crofton weed (*Ageratina adenophora*)
- Wandering Jew (*Tradescantia fluminensis*)
- Coral berry (*Rivinia humilis*)
- Formosa lily (*Lilium formosanum*)
- Painted spurge (*Euphorbia cyathophora*)

## Distribution and abundance

All of the herbaceous weeds listed as a high priority for control have been deliberately introduced to Australia as ornamental garden plants. They either produce large numbers of bird or wind-dispersed seeds and grow vigorously in the warm humid environment of eastern Australia. At a landscape level, most of the herbaceous weeds listed above are beyond control, however, important control programs are undertaken in specific locations or as part of programs focused on a number of weeds due to their significant adverse environmental impacts.

Herbaceous weeds are widespread in disturbed areas of the North Coast Region, especially in riparian zones, areas previously cleared and adjacent to urban areas.

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Mistflower is a widespread weed in moister areas of many reserves in the North Coast Region, preferring disturbed areas in damp gully lines such as Dunggir NP, Banyabba NR and shingle banks of major waterways in New England NP, Dorrigo NP, Bellinger River NP and Juugawaarri NR.

Crofton weed commonly occurs on well-drained soils where rainfall exceeds 1200mm/year and frosts are rare. It has an isolated distribution in reserves with disturbed areas along roadsides.

Wandering Jew and Coral Berry occur in most reserves in the Region that support rainforest and moister forest types, particularly following disturbance.

Formosa lily and painted spurge are generally limited to coastal reserves, particularly adjacent to villages and urban areas, access tracks and visitor areas though their prevalence has been increasing.

## Impacts

Heavy herbaceous weed infestations can totally cover the forest floor and exclude all native regeneration from an area. Mistflower, wandering jew and coral berry thrive in shady rainforest and moist forest areas, forming dense infestations that smother groundcover and understorey species and inhibit seed germination and regeneration. Mistflower, wandering jew and coral berry outcompete native rock orchids, riparian and rainforest species. Mistflower and coral berry produce large amounts of easily dispersed seed. Wandering jew spreads by vegetative means. Crofton weed produces large quantities of wind and water borne seed and is toxic to stock.

Before major bush regeneration works commenced in Coramba NR in the late 1990s, the forest floor was almost completely covered with a severe wandering jew infestation reaching heights of up to 80-100cm. The infestation had virtually stopped all native regeneration and restricted native fauna and human access in the reserve.

## Priorities for control

- Maintain and expand where possible existing successful long term control programs in Coramba NR, New England NP, Coffs Coast RP, Iluka NR, Yuraygir NP and Bundjalung NP
- Protection of important assets such as the endangered ecological community lowland subtropical rainforest on floodplain, and threatened species habitat
- High profile locations around key visitor use areas
- Where control of herbaceous weeds are required as part of a bush regeneration program

## Control

Control is firstly targeted towards protecting significant plants and habitats before expanding to adjoining areas. Although the main control technique used is foliar spraying with glyphosate, great care is required to ensure that native plants and fauna such as threatened frog species are not adversely affected. In moist creek and riparian environments, hand removal techniques such as rolling back of wandering jew and removing from the site can be very effective and not too labour intensive for light and scattered infestations. Where mistflower is removed by hand, it must be securely hung up to ensure that it does not re-grow. Where foliar spraying is required, herbaceous weeds should first be manually removed from around native species.

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## Monitoring

Monitoring programs have been established in key herbaceous weed control sites and where herbaceous weeds are being controlled as part of larger bush regeneration programs such as in Coramba NR, New England NP and Iluka NR. Monitoring usually consists of photo points and either transects or quadrats through the effected area and adjoining areas to compare native and weed species distribution and abundance as well as rates of recruitment.

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

### Distribution and abundance

Lantana infests over 4 million hectares east of the Great Dividing Range from Eden in the South to Cape York Peninsular in the north, with isolated infestations found elsewhere in Australia. Although favouring warm humid environments, it is able to survive long droughts and frost by temporarily “shutting down”, losing it’s leaves before re-shooting from its base following rainfall.

Lantana is the most common weed in the North Coast Region and is present to varying degrees in all reserves below 800m above sea level. Lantana favours disturbance and hence is particularly common in previously logged / cleared areas and along drainage lines and roadsides.

Heavy lantana infestations occur in parts of Bongil Bongil NP, Dorrigo NP, Bellinger River NP, New England NP, Chaelundi NP, Bindarri NP, Yuraygir NP, Banyabba NR, Fortis Creek NP, Valla NR, Ngambaa NR, Yarriabini NP, Ramornie NP and the Bollanolla group of reserves. A successful control program has significantly reduced lantana infestations in Guy Fawkes River NP.

### Impacts

Lantana readily invades forest edges, coastal woodlands, riparian zones, disturbed rainforest and open eucalypt woodland; particularly following soil or vegetation disturbance. Its dense thickets exclude native plant species through smothering and allelopathic effects. It can dramatically alter forest structure and fauna habitat, and restrict the movement of native fauna and people. Lantana thickets increase the intensity of wildfires (van Oosterhout 2004).

Lantana is listed as one of 20 Weeds of National Significance, a Key Threatening Process on the NSW *Threatened Species Conservation* Act and a declared noxious weed throughout Australia.

### Priorities for control

- Endangered ecological communities Themeda grassland on headlands, littoral rainforest, subtropical floodplain forest, lowland subtropical rainforest on floodplain and swamp sclerophyll forest.
- Immediately adjacent to known threatened species populations
- As part of bush regeneration projects where a number of weeds are being targeted

### Control

Integrated control techniques are required, where a range of techniques are used in combination, depending on the individual situation. Specific techniques include foliar spraying with herbicide (by back pack, quad bike, tractor-mounted quick spray unit or

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by splatter gun), cut-and-paint, hand removal and release of biological control agents. Mechanical techniques can be effective at controlling lantana and encouraging native regeneration, however, great care must be taken to minimise impacts on existing native vegetation, and significant follow-up control is required due to increased soil disturbance.

Effective herbicide or biological control is made more difficult by the plant's habit of temporarily "shutting down" during dry periods or after frost. Effective herbicide applications require the plant to be actively growing.

## Monitoring

Programs focused in EECs or adjacent to threatened species are monitored through mapping and in some cases photo points and / or transects. This is particularly the case where lantana is being controlled at Bitou Bush TAP sites.

## **Pines - Slash Pine (*Pinus elliottii*) and Radiata Pine (*P. radiata*)**

### Distribution

Major pine infestations occur at dense stands and scattered individuals that have spread from plantations and other plantings in or adjacent to reserves, e.g. southern Yuraygir NP, Mt Neville NR, Banyabba State Conservation Area, Fortis Creek NP, Mt Pikapene NP, Bongil Bongil NP (all Slash Pine) and Cascade NP (Radiata pine). Some recent additions to existing parks include small trial pine plantations, including a plot in southern Yuraygir NP also containing Queensland kauri pine (*Agathis robusta*) and cypress pine (*Cupressus* sp.), in addition to slash and radiata pines.

### Impacts

Pine species invade native plant communities, displacing native species. Plantations provide seed source for dispersal by wind and birds to neighbouring areas. Pine infestations are readily established, even in undisturbed environments, due to prolific rates of growth and seed production. Dense stands radically alter the structural and floristic characteristics of vegetation, creating dense shade, altering soil chemistry, depleting nutrients and displacing native species.

### Priorities for control

- Control of new and isolated infestations is a high priority in all reserves.
- The ongoing program in southern Yuraygir NP to contain and reduce the pine population will continue.
- The control program outlined in the Southern Richmond Range reserves POM for Mt Neville NR is a high priority.
- In northern Bongil Bongil NP, ongoing suppressive control of isolated pines will continue.

### Control

Pines are usually controlled by felling or by tree injection. Younger trees and seedlings can be treated by spraying with herbicide.

### Monitoring

New infestations are recorded and controlled where feasible. A survey of Southern Richmond Range reserves will be undertaken to determine priority areas.



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## Woody weeds

- Narrow-leaved privet (*Ligustrum sinense*)
- Large-leaved privet (*Ligustrum lucidum*)
- Camphor laurel (*Cinnamomum camphora*)
- Winter senna (*Senna pendula* var. *glabrata*)
- Ochna / Mickey mouse plant (*Ochna serrulata*)
- Coastal tea-tree (*Leptospermum laevigatum*)
- Willow wattle (*Acacia saligna*)
- Mulberry (*Morus alba* and *Morus nigra*)
- Smooth senna (*Senna X floribunda*)
- Umbrella tree (*Schefflera actinophylla*)

### Distribution and abundance

Woody weeds are widespread in many urban, private forest and agricultural environments within the North Coast Region. Most woody weed infestations on NPWS estate have originated from adjoining urban plantings, abandoned habitation, or from major disturbances during previous land uses, e.g sand mining or clearing.

Privets are widespread on the Dorrigo Plateau and within the NPWS estate they are common in many disturbed areas, riparian zones and along roadsides in Dorrigo NP, Cascade NP, Junuy Juluum NP, Nymboi-Binderay NP, Muldiva NR and Deervale NR. Elsewhere in the region they occurs in Bellinger River NP, Bindarri NP, Coffs Coast RP, Coramba NR, Susan Island NR, Munro Island NR, Iluka NR and Bundjalung NP.

Camphor laurel mostly occurs as isolated infestations in reserves located on floodplains or near urban centres. Winter senna is common in coastal areas such as Coffs Coast RP, Moonee Beach NR, Yuraygir NP, Iluka NR and Bundjalung NP. Smooth senna occurs sporadically in disturbed moist forest areas of many reserves. Scattered ochna and umbrella tree infestations occur in coastal parks especially close to urban areas with a dense ochna infestation at Redcliff in northern Yuraygir NP

Dense stands of coastal tea-tree and willow wattle have resulted from deliberate introductions during post-sandmining rehabilitation efforts in Yuraygir NP, Bundjalung NP, Bongil Bongil NP, Iluka NR and Moonee Beach NR. A dense mulberry stand occurs on Susan Island NR.

### Impacts

Woody weeds can be invasive in native plant communities and in some areas they can dominate; restricting natural regeneration and the expansion of rainforest and other forest types. Examples include privets in Coramba NR, Dorrigo NP and Bindarri NP, mulberry in Susan Island NR, Ochna in Yuraygir NP and coastal tea-tree in Bundjalung NP and Iluka NR.

Most high priority woody weeds are capable of growing in semi-shade, are fast growing and are prolific seeders. Some have long-lived seed. Dense infestations alter the structural and floristic characteristics of native vegetation, displacing native canopy species, dominating the understorey and reducing the regeneration of native species. As an example, camphor laurel-dominated sites produce large quantities of fruit for 3 months of the year compared to a healthy diverse subtropical rainforest that may be dominated by over 100 individual species that fruit throughout the year.

# PRELIMINARY DRAFT

## Priorities for control

- High conservation value locations such as Endangered Ecological Communities and adjacent to threatened species and their habitats;
- New and isolated infestations;
- Existing successful long-term woody weed control programs;
- Bush regeneration programs focused on a number of weeds.

## Control

Woody weeds are either controlled as part of larger scale bush regeneration programs undertaken in all reserves, or single-species focused where significant infestations of a single species occurs; particularly where they threaten the conservation values of that area or reserve.

Specific control techniques vary depending on the individual weed species, however, most woody weed trees are controlled through stem-injection or in some cases cut, scrape and paint with herbicide. Woody shrub species may also be controlled through foliar spraying with herbicide or physical removal. Follow up control of seedlings and regrowth generally consists of foliar spraying, or hand removal of isolated plants.

## Monitoring

Mapping of woody weeds has been undertaken as part of specific reserve-based weed control strategies such as Coffs Coast RP and Moonee Beach Coastal Weeds Strategy, Junuy Juluum Weed Control Strategy and Bindarri NP Pest Control Strategy. For other locations monitoring in the form of photo points, transects and / or quadrats is undertaken occasionally.

# PRELIMINARY DRAFT

## 12 References

Dept. Environment and Heritage (2004) The Feral Cat (*Felis catus*). Dept. EWR. <http://www.environment.gov.au/biodiversity/invasive/publications/cat/index.html>

Dickman, C.R. (1996) *Overview of the impacts of Feral Cats on Australian native fauna*. Australian Nature Conservation Agency: Canberra

Nesbitt B.J., A. Wilton & D Jenkins (2000). *Dingoes of the New England and Guy Fawkes River National Parks of Northeast NSW – Are there any left?* In: Proceedings of NSW Vertebrate Pest Conference 2000. NSW Dept. Agriculture.

Nesbitt B. (2007). *Management of endangered populations of dingoes in north-eastern New South Wales*. In: Proceedings of The Biodiversity Extinction Crisis– an Australian and Pacific Response Conference 2007. University of NSW, Sydney.

Qld Natural Resources and Water (2006). *Pest series: Feral cat ecology and control*. Qld NRW. <http://www.nrw.qld.gov.au/factsheets/pdf/pest/pa26.pdf>

# PRELIMINARY DRAFT

## APPENDIX 1 SUMMARY OF PEST PROGRAMS

### Pest animals

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Cane Toads</b>	Critical - control at Angourie / Brooms Head	Implement NB Cane Toad strategy	Populations reduced
	Critical – prevent establishment of new populations	Implement NB Cane Toad strategy	72hr response to new reports, feasibility assessed
	High – maintain community interest	Implement NB Cane Toad strategy	Community involved in collections / survey
<b>Dingoes, feral dogs and their hybrids</b>	Critical – gather relevant information	Obtain relevant information about dingo and feral dog populations and livestock impacts	Obtain wild dog control and stock loss records.
			Obtain and analyse wild dog DNA information
			Maintain and analyse wild dog database
	Critical – coordinated management of wild dogs	Work with stakeholders to develop and implement effective and strategic management programs	Relevant information obtained / circulated with stakeholders
			Effective management programs implemented to minimise wild dog impacts on adjoining livestock operations
			Dingoes on DECC lands (including Schedule 2 lands) conserved
<b>Feral cats</b>	High – support strategic control	Assist development of Cat TAP	Relevant information from NC Region included in Cat TAP
	Medium – support local off park control programs	Requests for assistance responded to and assessed. Coordinated strategic programs encouraged	DECC provides assistance where necessary

# PRELIMINARY DRAFT

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Feral deer</b>	High – obtain distribution information	Establish a feral deer database and monitor established populations	Feral deer surveys conducted Records entered
	High – support management research	Liaise with stakeholders and support research into new survey and control techniques	Appropriate research supported by DECC
	High – control established populations	Work with stakeholders to develop management programs	No new populations establish on DECC lands
			Support control on adjoining lands where appropriate
<b>Feral Goats</b>	Medium priority	Annual monitoring of existing goat populations.	Existing goat populations do not expand,
		Implement control as required	No new goat populations establish
<b>Feral Horses</b>	High – control established populations	Implement feral horse control plans	Control programs implemented
			Reduction in feral horse populations
<b>Foxes</b>	Critical - Fox TAP programs	Control implemented	Breeding success of target or indicator species
	High - agricultural production	Requests for assistance responded to and assessed. Coordinated strategic programs encouraged	DECC provides assistance where necessary
	Medium - extension of Bundjalung program	Feasibility assessed	Program implemented if required
<b>Indian mynas</b>	Medium – control new roosting sites on DECC lands	Monitor areas at risk. Prepare action plan for potential sites	Action plan produced.
			No Indian Myna populations establish on DECC lands
	Medium – support coordinated management of Indian mynas off park	Maintain active involvement in Indian Myna working group	Relevant information circulated between stakeholders. Myna control on private lands implemented

## PRELIMINARY DRAFT

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Rabbits</b>	High – impacting on threatened species / EECs	Control populations impacting on threatened species / within EECs	All priority detections are controlled
	High – collaborative control programs	Assist collaborative control programs	DECC provides assistance where necessary
	Lower – other control programs	Control populations in lower priority areas	Lower priority populations controlled where possible
<b>Wild pigs</b>	High – support collaborative programs	Assist collaborative control programs	DECC assistance provided
	Critical – impacting on threatened species / EECs	Control populations impacting on threatened species / within EECs	All priority detections are controlled
	High – other control programs	Implement pig control program	Control program implemented Reduction in pig impacts
<b>Yellow Crazy Ants</b>	Critical – education and awareness	Maintain staff awareness of identification	Staff trained in identification annually
	High - liaison	Liaise with DPI re: Goodwood Island infestation	Monitoring programs discussed with DPI at least annually

### Weed species

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Bitou Bush</b>	Critical-TAP Sites	Develop and implement site plans	Reduction in bitou bush impacts at sites
	Medium -Bundjalung NP bitou program	Implement with NRR annual control program	Annual program implemented, ongoing reduction in bitou bush.
	Medium -treatment of isolated infestations	Control within 3 months of detection	All Priority detections controlled
	Medium -programs involving community groups	Assistance as required to ensure groups participation is productive.	Groups contribute effort to control of bitou bush on DECC estate.
	Medium-window of opportunity	Prepare response	All coastal fires assessed and programs implemented where feasible



## PRELIMINARY DRAFT

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Blackberry</b>	High – new or isolated infestations	Control Infestations prior to flowering and seeding where feasible	All priority detections are controlled
	High – within EECs or near threatened species	Prepare annual control programs	Control programs implemented and infestations reduced
	High – high profile and public use areas	Control Infestations prior to flowering and seeding where feasible	All priority infestations are controlled
	High – maintain existing programs	Control Infestations prior to flowering and seeding where feasible	Annual control programs implemented
<b>Exotic grasses</b>	Critical-Endangered ecological communities	Site plans prepared and implemented	Annual control programs implemented and populations reduced
	High - Shorebird nesting habitat	Annual control implemented	Shorebird populations not impacted by grasses
	Critical - Control of new and isolated infestations in all reserves	Increased awareness, detection and control where feasible	Increased reporting and control effort.
	High - bush regeneration programs	Requirements for grass control at sites considered and plans prepared	Grass control implemented as required
<b>Exotic vines</b>	Critical – EECs and near known threatened species populations	Site plans developed and implemented	Vine weed impacts reduced
	Critical - New and isolated infestations	Detections are controlled prior to flowering / seeding / tuber set where feasible	All priority detections are controlled
	High – bush regeneration programs	Site plans developed and implemented with priority given to vine weed control	Vine weeds controlled as required
	High – maintain existing control programs	Appropriate levels of control maintained or expanded as required	Infestations and their impacts reduced
<b>Glory Lily</b>	Critical-Endangered ecological communities	Prepare biannual control programs	Biannual control programs implemented and populations reduced
	Critical-Isolated and new infestations in coastal reserves	Detections are controlled prior to flowering and seeding where feasible	All priority detections are controlled
	Critical - Maintain existing program around Sandon and Bare Point-Wilsons Headland TAP sites	Prepare biannual control programs	Biannual control programs implemented and populations reduced
	High - Where populations are likely to increase in response to other weed control	Prepare biannual control programs	Areas at risk are monitored and planned for control

## PRELIMINARY DRAFT

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Groundsel Bush</b>	Critical- programs in EECs	Prepare annual control programs	Annual control programs implemented and populations reduced
	Critical-isolated and new occurrences	Detections are controlled prior to flowering and seeding	100% of occurrences in high risk habitats are controlled
	Medium –infestations joining neighbours	Infestations are controlled prior to flowering and seeding	All complaints requests from neighbours are followed up
	Medium- Large infestations with existing programs	Programs systematically implemented in line with resource availability.	Annual control programs implemented
<b>Herbaceous weeds</b>	High – protect EECs and threatened species	Control infestations annually prior to flowering and seeding where feasible	All priority detections are controlled
	High – maintain existing programs	Control infestations annually prior to flowering and seeding where feasible	Annual control programs implemented
	High – high profile areas around visitor facilities	Control infestations annually prior to flowering and seeding where feasible	All priority detections are controlled
	Medium – bush regeneration programs	Control herbaceous weeds as required	Annual control programs implemented
<b>Lantana</b>	Critical – Protect EECs and threatened species	Prepare annual control programs	Control programs implemented and infestations reduced
	Medium – bush regeneration programs	Lantana controlled as required	Annual control programs implemented
<b>Pines</b>	Critical - Control of new and isolated infestations in all reserves	Control within 6 months of detection	All priority detections controlled.
	Medium - ongoing program in southern Yuraygir.	Existing control to continue	Population contained and reduced
	High - control program in Mt Neville NR.	Program implemented as per plans	Population contained and reduced
	Medium - ongoing program in northern Bongil Bongil NP	Annual control implemented	Population contained and reduced

## PRELIMINARY DRAFT

<b>Pest</b>	<b>Priority for Control</b>	<b>Control Strategy Summary</b>	<b>Key Control Performance indicators</b>
<b>Temperate and subtropical grasses</b>	Critical – education and awareness	Maintain staff awareness of identification	Staff trained in identification annually
	High - liaison	Liaise with noxious Weeds Authorities and other stakeholders	Monitoring programs discussed with Noxious Weeds Authorities at least annually
<b>Woody weeds</b>	Critical – Protect EECs and threatened species	Prepare annual control programs	Control programs implemented and infestations reduced
	High – new and isolated infestations	Infestations controlled prior to flowering and seeding where feasible	All priority detections are controlled
	Medium – bush regeneration programs	Woody weeds controlled as required	Annual control programs implemented

# PRELIMINARY DRAFT

## APPENDIX 2

### KEY THREATENING PROCESSES IN NORTH COAST REGION THAT ARE PEST BASED

Key Threatening Process	Major Issue
Invasion and establishment of <b>exotic vines and scramblers</b>	Y
Invasion of native plant communities by <b>bitou bush &amp; boneseed</b>	Y
Invasion of native plant communities by <b>exotic perennial grasses</b>	Y
Invasion, establishment and spread of <b><i>Lantana camara</i></b>	Y
Competition and grazing by the <b>feral European rabbit</b>	N
Competition and habitat degradation by <b>feral goats</b> ( <i>Capra hircus</i> )	E
Competition from <b>feral honeybees</b>	U
Herbivory and environmental degradation caused by <b>feral deer</b>	E
Importation of <b>red imported fire ants</b> into NSW	N
Invasion and establishment of the <b>Cane Toad</b>	N
Invasion of the <b>yellow crazy ant</b> ( <i>Anoplolepis gracilipes</i> )	E
Predation by <b>feral cats</b>	U
Predation by the <b>European Red Fox</b>	Y
Predation by the <b>Plague Minnow</b> ( <i>Gambusia holbrooki</i> )	U
Predation, habitat degradation, competition and disease transmission by <b>Feral Pigs</b> ( <i>Sus scrofa</i> )	N

Y-Yes, N-No, E-Emerging issue, U-unknown

## APPENDIX 3

### EMERGING PEST ISSUES

#### Common Indian myna (*Acridotheres tristis*)

##### Distribution and abundance

Indian mynas are a native of Asia from the Middle East to Bangladesh, and were introduced to Australia in the 1860s. From initial releases in Melbourne (1862) and in Queensland (Herberton, Johnstone River and Townsville by 1883) they have spread along coastal and inland south eastern Australia to north-east Queensland. Their range is continuing to spread northwards and westwards.

Although widespread in urban centres within their range, more recent spread of the species has included rural, forested and semi-forested habitats, with associated impacts to native fauna in these areas.

Within North Coast Region they are common within and around the urban centres of Coffs Harbour, Bellingen, Dorrigo and Grafton. Although no communal roosts are known to occur on NPWS estate, they have been recorded within Coffs Coast RP and occasionally in other reserves such as Moonee Beach NR, Bongil Bongil NP, Bellinger River NP, New England NP and Woodford Island NR.

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## Impacts

The Indian Myna has been rated by the World Conservation Union as one of the world's 100 most invasive species. They are aggressive birds and can outcompete both native birds and mammal species for food and nesting sites.

Indian mynas nest in tree hollows and they will evict birds such as rosellas, lorikeets and parrots, and mammals such as sugar gliders from their hollows. Hollow-dependant fauna including threatened species Glossy Black Cockatoo and Brown Treecreeper are impacted by the species. Approximately 42% of Australian mammals are hollow dependant so the further spread of Indian mynas is a serious problem for mammal species. They are also known to invade hollows occupied by other bird species and destroy their eggs and chicks.

Indian mynas are also known to nest in roofs, spreading mites, and are a potential disease carrier. They can also damage fruit and grain crops.

## Control

Control programs have been occurring off-park for a number of years by various groups such as the Coffs Harbour-Bellingen Indian Myna Action Group, which NPWS is a member agency. Traps have been built / purchased by member organisations Ulitarra Conservation Group, Bellingen Shire Council and Bellingen Landcare. Control programs usually involve trapping, successfully capitalising on the bird's gregarious nature, and incorporate the use of free feeding and sometimes decoy birds.

## Priorities for control

Locations of Indian myna populations have been obtained from NPWS staff as well as questionnaires filled out by the general community following promotion and education campaigns. As there are no current breeding colonies known to occur on NPWS lands in the North Coast Region, any new colonies that establish would be a high priority for control.

## Monitoring

Monitoring of populations and the success of current control programs in the Coffs Harbour-Bellingen area is undertaken by the Coffs Harbour-Bellingen Indian Myna Action Group. Monitoring includes updating spreadsheets of known Indian myna sightings, counts of Indian myna populations, and records of trapped Indian mynas. Within Clarence LGA, monitoring is undertaken by Clarence Valley Council and includes monitoring of Indian myna populations and records of trapped Indian mynas.

## **Pandanus planthopper**

### Distribution and abundance

The Pandanus planthopper occurs naturally in far north Queensland but has been introduced to southern Queensland and the far North Coast of NSW through plant trade and spread through natural means. It was first recorded in Northern Rivers Region (NRR) in March 2004 on the Tweed Coast near Kingscliff and Bogangar on Council managed lands.

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Extensive surveys were conducted on and off NPWS estate in North Coast Region in 2005. The only infestation found was on a transplanted plant used for landscaping a display home in Yamba. The surveys documented the location of all pandanus growing on public lands in the region.

Surveys focused on presence of sooty mould and leaf yellowing. This indicated an early stage of infestation and control was initiated immediately. All known records and new reports have been restricted to the Tweed, Byron and Ballina Shires north of the Richmond River, and have occurred largely through imported landscaping plants from Qld.

## Impacts

The pandanus planthopper (*Jamells australiae*) causes dieback in pandanus palms (*Pandanus tectorius*), an iconic tree of the NSW North Coast. Heavy infestations of the planthopper feeding between the tightly packed leaves of pandanus trees destroy leaf tissue and produce large amounts of honeydew, which encourages the growth of moulds. Affected leaves drop and growing points die. Tree death follows within 3-18 months of the initial infestation.

In the area between Tweed Heads and Ballina several trees died (off-park). There is potential for infestations to spread through natural pandanus populations. Local extinctions of pandanus could occur if infestations are left unchecked.

## Priorities for Control

Survey and assessment of pandanus populations and response to reports of sick pandanus palms will be responded to. Any infestations within North Coast Region are more likely to occur on local government lands or private property where pandanus palms are used for landscaping.

## Control

There are three potential methods of control:

- chemical (involving insecticide control by stem injection, and foliar spraying, or a combination of both);
- physical (leaf stripping and offsite disposal of affected leaves);and
- biological (a native wasp predator).

## Monitoring

The success of the planthopper management program will be determined by the detection of any infestations on DECC land and prevention of any populations establishing.

## **Temperate and sub-tropical exotic grasses**

- African love grass (*Eragrostic curvula*)
- Serrated tussock (*Nassella trichotoma*)
- Chilean needle grass (*Nassella neesiana*)
- Coolatai grass (*Hyparrhenia hirta*)

## Distribution and abundance

The temperate grasses African love grass, Serrated tussock and Chilean needle grass are major weeds of the NSW tablelands and are a significant threat to NPWS lands in the Dorrigo Plateau Area of North Coast Region. Coolatai grass is becoming an increasing problem species throughout the NSW north coast and threatens lower elevated NPWS lands within North Coast Region. The most common dispersal



# PRELIMINARY DRAFT

method of these species is by vehicle and stock movement along roadsides and stock routes.

African love grass is a widespread weed and is present in reserves in the Tenterfield and Glen Innes Areas of the Northern Tablelands Region. Roadside slashing and burning on access roads to National Park areas has increased the density and distribution of this weed dramatically over the previous 10 years.

Serrated tussock is a common weed on the Northern Tablelands and has established on many private properties. Imbota NR is the only reserve in the NTR where this weed has been recorded, however, it has been identified on numerous private properties adjoining several other reserves in that region.

Chilean needle grass can thrive in a wide range of soils and conditions and has the potential to be very invasive over a large part of the country in both pasture and native vegetation. It is well established in large areas of New South Wales, including the Northern Tablelands. It is increasingly invading native grasslands.

Coolatai grass is an aggressive weed that has become established in many reserves across the NTR and numerous infestations now occur outside of NPWS lands in North Coast Region.

## Impacts

African love grass is a summer growing perennial grass. It establishes from seed and has the potential to invade native communities by forming dense swards of tussocks. This weed is extremely aggressive, and has the ability to out compete many native grasses, particularly after fire or drought events when native flora species are suppressed. Serrated tussock is a Class 3 weed that dominates native pasture, seeds prolifically and is unpalatable to herbivores. It competes with native species and can impact on the conservation values of natural areas.

Chilean needle grass is listed as one of 20 Weeds of National Significance. It affects both sown pasture and native grasslands of southeastern Australia. As an environmental weed it reduces biodiversity in native grasslands, where it out competes native species.

Coolatai grass is quickly dominating grassy box woodland habitats and other vegetation communities. This weed completely smothers existing vegetation, is drought tolerant and is a major threat to native pasture and woodland biodiversity.

## Priorities for Control

A high priority will be given to preventing establishment of these grasses within reserves in North Coast region. Continued training of staff in identification of these grasses is a key to early detection.

## Control

- Map infestations on a regional basis.
- Vehicle and machinery hygiene is essential to reduce the spread of this weed. Vehicles or machinery that travel through infested areas should be thoroughly washed down before moving to areas where this weed is not present.
- Fostering the competitive ability of native species. This will provide competition and reduce re-invasion levels.

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- Cooperative programs with neighbours and local councils should be encouraged to suppress and control this weed.

## Monitoring

- Distribution and density as confirmed by mapping of annual control programs.

## **Yellow Crazy Ants (*Anoplolepis gracilipes*)**

### Distribution and abundance

Yellow crazy ants are naturally found in Africa or Asia and have been introduced into many tropical and subtropical areas. On the NSW North Coast yellow crazy ants were detected on Goodwood Island, lower Clarence River in July 2004.

### Impacts

Invasive ants are known to be ready invaders of disturbed habitats such as urban areas, forest edges or agricultural fields and are capable of invading undisturbed environments. High densities of the yellow crazy ant have the potential to devastate native 'keystone' species, resulting in a rapid alteration of ecosystem processes and negative effects on endemic species.

On Christmas Island, as well as significantly and quickly altering the natural ecosystem processes and the associated environment, the yellow crazy ant has reduced native bird, reptile and mammal life. The ant threatens many endemic and endangered species, especially on islands, and undermines any potential or actual tourism investments. The ant has the potential to impart significant damage, or alternatively be advantageous to agricultural systems and plant species, depending on variables such as the crop, the geographical region and the types of pest and/or beneficial insects present. ([http://www.issq.org/database/species/reference\\_files/anogra/anograimp.pdf](http://www.issq.org/database/species/reference_files/anogra/anograimp.pdf))

Yellow crazy ant (YCA), (Fr. Smith) is declared a notifiable pest under the NSW *Plant Diseases Act 1924*, Proclamation P163.

### Priorities for control

NSW DPI commenced control of the Goodwood Island infestation in September 2004. Control and surveillance has been ongoing since that time. DECC has assisted with planning works and annual surveys. No ants have been detected since February 2006.

### Control

NSW DPI has baited with the pesticides fipronil, formulated as *Presto*, and S-methoprene.

### Monitoring

Whole island surveillance has been carried out once a year with no detections away from the wharf area (original infestation). NSW DPI survey the wharf precinct every six months. If no ants are detected by February 2008 then the infestation will be declared as eradicated.

# PRELIMINARY DRAFT

## APPENDIX 4

### NOXIOUS WEEDS LIST FOR EACH LGA IN NPWS NORTH COAST REGION

Key to control requirements regarding each noxious weed "Class":

**Class 1:** The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.

**Class 2:** The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.

**Class 3:** The plant must be fully and continuously suppressed and destroyed.\*

**Class 4:** The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.\*

**Class 5:** There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

NOTE: All Class 1, 2 and 5 weeds are prohibited from sale in NSW.

\* In some cases the following wording has also been inserted "the plant may not be sold, propagated or knowingly distributed."

Weed species	Class	Nambucca	Belingen	Coffs Harbour	New England	Clarence
African feathergrass [ <i>Pennisetum macrourum</i> ]	5	✓	✓	✓	✓	✓
African lovegrass [ <i>Eragrostis curvula</i> ]	4				✓	
African turnipweed [ <i>Sisymbrium runcinatum</i> ]	5	✓	✓	✓	✓	✓
African turnipweed [ <i>Sisymbrium thellungii</i> ]	5	✓	✓	✓	✓	✓
Alligator weed [ <i>Alternanthera philoxeroides</i> ]	2	✓	✓	✓	✓	✓
Anchored water hyacinth [ <i>Eichhornia azurea</i> ]	1	✓	✓	✓	✓	✓
Annual ragweed [ <i>Ambrosia artemisiifolia</i> ]	5	✓	✓	✓	✓	✓
Arrowhead [ <i>Sagittaria montevidensis</i> ]	5	✓	✓	✓	✓	✓
Artichoke thistle [ <i>Cynara cardunculus</i> ]	5	✓	✓	✓	✓	✓
Athel tree [ <i>Tamarix aphylla</i> ]	5	✓	✓	✓	✓	✓
Bathurst/Noogoora/Californian/cockle burrs [ <i>Xanthium</i> species ]	4	✓	✓	✓	✓	✓
Bear-skin fescue [ <i>Festuca gautieri</i> ]	5	✓	✓	✓	✓	✓
Bitou bush [ <i>Chrysanthemoides monilifera</i> subspecies <i>rotundata</i> ]	4	✓	✓	✓		✓
Black knapweed [ <i>Centaurea nigra</i> ]	1	✓	✓	✓	✓	✓
Black willow [ <i>Salix nigra</i> ]	3		✓			✓

## PRELIMINARY DRAFT

Blackberry [ <i>Rubus fruticosus</i> aggregate species ] except cultivars Black satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan , Smoothstem, Thornfree	4	✓	✓	✓	✓	✓
<b>Weed species</b>	<b>Class</b>	<b>Nambucca</b>	<b>Bellingen</b>	<b>Coffs Harbour</b>	<b>New England</b>	<b>Clarence</b>
Boneseed [ <i>Chrysanthemoides monilifera</i> subspecies <i>monilifera</i> ]	4	✓	✓	✓		✓
Bridal creeper [ <i>Asparagus asparagoides</i> ]	5	✓	✓	✓	✓	✓
Broad-leaf pepper tree [ <i>Schinus terebinthifolius</i> ]	3	✓	✓	✓		✓
Broomrapes [ <i>Orobanche</i> species] Includes all <i>Orobanche</i> species except the native <i>O. cernua</i> variety <i>australiana</i> and <i>O. minor</i>	1	✓	✓	✓	✓	✓
Burr ragweed [ <i>Ambrosia confertiflora</i> ]	5	✓	✓	✓	✓	✓
Cabomba [ <i>Cabomba caroliniana</i> ]	5	✓	✓	✓	✓	✓
Camphor laurel [ <i>Cinnamomum camphora</i> ]	4	✓	✓			✓
Cat's claw creeper [ <i>Macfadyena unguis-cati</i> ]	4		✓			
Cayenne snakeweed [ <i>Stachytarpheta cayennensis</i> ]	5	✓	✓	✓	✓	✓
Chilean needle grass [ <i>Nassella neesiana</i> ]	4	✓	✓	✓	✓	✓
Chinese celtis [ <i>Celtis sinensis</i> ]	3	✓	✓	✓		✓
Chinese tallow tree [ <i>Triadica sebifera</i> ]	3	✓	✓	✓		✓
Chinese violet [ <i>Asystasia gangetica</i> subspecies <i>micrantha</i> ]	1	✓	✓	✓	✓	✓
Clockweed [ <i>Gaura lindheimeri</i> ]	5	✓	✓	✓	✓	✓
Clockweed [ <i>Gaura parviflora</i> ]	5	✓	✓	✓	✓	✓
Cockle burrs [ <i>Xanthium</i> species ]		✓	✓	✓	✓	✓
Columbus grass [ <i>Sorghum x almum</i> ]	4	✓	✓	✓		✓
Corn sowthistle [ <i>Sonchus arvensis</i> ]	5	✓	✓	✓	✓	✓
Crofton weed [ <i>Ageratina adenophora</i> ]	4	✓	✓	✓		✓
Dodder [ <i>Cuscuta</i> species] Includes All <i>Cuscuta</i> species except the native species <i>C. australis</i> , <i>C. tasmanica</i> and <i>C. victoriana</i>	5	✓	✓	✓	✓	✓
East Indian hygrophila [ <i>Hygrophila polysperma</i> ]	1	✓	✓	✓	✓	✓
English broom [ <i>Cytisus scoparius</i> ]			✓		✓	
Espartillo [ <i>Achnatherum brachychaetum</i> ]	5	✓	✓	✓	✓	✓
Eurasian water milfoil [ <i>Myriophyllum spicatum</i> ]	1	✓	✓	✓	✓	✓
European privet [ <i>Ligustrum vulgare</i> ]	4				✓	
Fine-bristled burr grass [ <i>Cenchrus brownii</i> ]	5	✓	✓	✓	✓	✓
Fireweed [ <i>Senecio madagascariensis</i> ]	4	✓	✓	✓		
Fountain grass [ <i>Pennisetum setaceum</i> ]	5	✓	✓	✓	✓	✓
Gallon's curse [ <i>Cenchrus biflorus</i> ]	5	✓	✓	✓	✓	✓
Giant Parramatta grass [ <i>Sporobolus fertilis</i> ]	4	✓	✓	✓	✓	✓
Giant rat's tail grass [ <i>Sporobolus pyramidalis</i> ]	3	✓	✓	✓		✓
Glaucous starthistle [ <i>Carthamus glaucus</i> ]	5	✓	✓	✓	✓	✓
Golden dodder [ <i>Cuscuta campestris</i> ]	4			✓	✓	
Golden thistle [ <i>Scolymus hispanicus</i> ]	5	✓	✓	✓	✓	✓
Gorse [ <i>Ulex europaeus</i> ]	3		✓		✓	
Green cestrum [ <i>Cestrum parqui</i> ]	3	✓	✓	✓	✓	✓
Groundsel bush [ <i>Baccharis halimifolia</i> ]	3	✓	✓	✓		✓
Harrisia cactus [ <i>Harrisia</i> species ]	4	✓	✓	✓	✓	✓
Hawkweed [ <i>Hieracium</i> species]	1	✓	✓	✓	✓	✓

# PRELIMINARY DRAFT

Honey locust [ <i>Gleditsia triacanthos</i> ]	3	✓	✓	✓		✓
Horsetail [ <i>Equisetum</i> species]	1	✓	✓	✓	✓	✓
<b>Weed species</b>	<b>Class</b>	<b>Nambucca</b>	<b>Bellingen</b>	<b>Coffs Harbour</b>	<b>New England</b>	<b>Clarence</b>
Hygrophila [ <i>Hygrophila costata</i> ]	2	✓	✓	✓		✓
Hymenachne [ <i>Hymenachne amplexicaulis</i> ]	1	✓	✓	✓	✓	✓
Italian bugloss [ <i>Echium</i> species ]					✓	
Johnson grass [ <i>Sorghum halepense</i> ]	4	✓	✓	✓		✓
Karoo thorn [ <i>Acacia karroo</i> ]	1	✓	✓	✓	✓	✓
Kochia [ <i>Bassia scoparia</i> ] except <i>Bassia scoparia</i> subspecies <i>trichophylla</i>	1	✓	✓	✓	✓	✓
Kudzu [ <i>Pueraria lobata</i> ]	3	✓	✓	✓		✓
Lagarosiphon [ <i>Lagarosiphon major</i> ]	1	✓	✓	✓	✓	✓
Lantana [ <i>Lantana</i> species ]	4	✓	✓	✓		✓
Lantana [ <i>Lantana</i> species ]	5	✓	✓	✓	✓	✓
Leafy elodea [ <i>Egeria densa</i> ]	5	✓	✓	✓	✓	✓
Long-leaf willow primrose [ <i>Ludwigia longifolia</i> ]	5	✓	✓	✓	✓	✓
Mesquite [ <i>Prosopis</i> species ]	2				✓	
Mexican feather grass [ <i>Nassella tenuissima</i> ]	1	✓	✓	✓	✓	✓
Mexican poppy [ <i>Argemone mexicana</i> ]	5	✓	✓	✓	✓	✓
Miconia [ <i>Miconia</i> species]	1	✓	✓	✓	✓	✓
Mimosa [ <i>Mimosa pigra</i> ]	1	✓	✓	✓	✓	✓
Mistflower [ <i>Ageratina riparia</i> ]	4	✓	✓	✓		✓
Mossman River grass [ <i>Cenchrus echinatus</i> ]	5	✓	✓	✓	✓	✓
Mother-of-millions [ <i>Bryophyllum</i> species and hybrids ]	3					✓
Mysore thorn [ <i>Caesalpinia decapetala</i> ]	3	✓	✓	✓		✓
Nodding thistle [ <i>Carduus nutans</i> ]	4		✓		✓	✓
Onion grass [ <i>Romulea</i> species] Includes all <i>Romulea</i> species and varieties except <i>R. rosea</i> var. <i>australis</i>	5	✓	✓	✓	✓	✓
Oxalis [ <i>Oxalis</i> species and varieties] Includes all <i>Oxalis</i> species and varieties except the native species <i>O. chnoodes</i> , <i>O. exilis</i> , <i>O. perennans</i> , <i>O. radicata</i> , <i>O. rubens</i> , and <i>O. thompsoniae</i>	5	✓	✓	✓	✓	✓
Pampas grass [ <i>Cortaderia</i> species ]	4	✓	✓	✓	✓	✓
Parkinsonia [ <i>Parkinsonia aculeata</i> ]	2				✓	
Parthenium weed [ <i>Parthenium hysterophorus</i> ]	1	✓	✓	✓	✓	✓
Paterson's curse, Vipers bugloss, Italian bugloss [ <i>Echium</i> species ]	4				✓	
Pond apple [ <i>Annona glabra</i> ]	1	✓	✓	✓	✓	✓
Prickly acacia [ <i>Acacia nilotica</i> ]	1	✓	✓	✓	✓	✓
Prickly pear [ <i>Cylindropuntia</i> species ]	4	✓	✓	✓	✓	✓
Prickly pear [ <i>Opuntia</i> species except <i>O. ficus-indica</i> ]	4	✓	✓	✓	✓	✓
Privet (Broad-leaf) [ <i>Ligustrum lucidum</i> ]	4	✓		✓	✓	✓
Privet (Narrow-leaf/Chinese) [ <i>Ligustrum sinense</i> ]	4	✓		✓	✓	✓
Red rice [ <i>Oryza rufipogon</i> ]	5	✓	✓	✓	✓	✓
Rhus tree [ <i>Toxicodendron succedaneum</i> ]	4	✓	✓	✓	✓	✓
Rubbervine [ <i>Cryptostegia grandiflora</i> ]	1	✓	✓	✓	✓	✓

# PRELIMINARY DRAFT

Weed species	Class	Nambucca	Belingen	Coffs Harbour	New England	Clarence
Saffron thistle [ <i>Carthamus lanatus</i> ]	4				✓	
Sagittaria [ <i>Sagittaria platyphylla</i> ]	5	✓	✓	✓	✓	✓
Salvinia [ <i>Salvinia molesta</i> ]	3	✓	✓	✓	✓	✓
Sand oat [ <i>Avena strigosa</i> ]	5	✓	✓	✓	✓	✓
Scotch broom [ <i>Cytisus scoparius</i> ]	4		✓		✓	
Senegal tea plant [ <i>Gymnocoronis spilanthoides</i> ]	1	✓	✓	✓	✓	✓
Serrated tussock [ <i>Nassella trichotoma</i> ]	4	✓	✓	✓	✓	✓
Siam weed [ <i>Chromolaena odorata</i> ]	1	✓	✓	✓	✓	✓
Smooth-stemmed turnip [ <i>Brassica barrelieri</i> subspecies <i>oxyrrhina</i> ]	5	✓	✓	✓	✓	✓
Soldier thistle [ <i>Picnomon acarna</i> ]	5	✓	✓	✓	✓	✓
Spiny burrgrass [ <i>Cenchrus incertus</i> ]	4	✓	✓	✓		✓
Spiny burrgrass [ <i>Cenchrus longispinus</i> ]	4	✓	✓	✓		✓
Spotted knapweed [ <i>Centaurea maculosa</i> ]	1	✓	✓	✓	✓	✓
St. John's wort [ <i>Hypericum perforatum</i> ]	3				✓	✓
Sweet briar [ <i>Rosa rubiginosa</i> ]	4				✓	
Texas blueweed [ <i>Helianthus ciliaris</i> ]	5	✓	✓	✓	✓	✓
Water caltrop [ <i>Trapa</i> species]	1	✓	✓	✓	✓	✓
Water hyacinth [ <i>Eichhornia crassipes</i> ]	3	✓	✓	✓	✓	✓
Water lettuce [ <i>Pistia stratiotes</i> ]	1	✓	✓	✓	✓	✓
Water soldier [ <i>Stratiotes aloides</i> ]	1	✓	✓	✓	✓	✓
Willows [ <i>Salix</i> species] Includes all <i>Salix</i> except <i>S. babylonica</i> , <i>S. x reichardtii</i> , <i>S. x calodendron</i>	5	✓	✓	✓	✓	✓
Witchweed [ <i>Striga</i> species] Includes all <i>Striga</i> species except native species and <i>Striga parviflora</i>	1	✓	✓	✓	✓	✓
Yellow bells [ <i>Tecoma stans</i> ]	3	✓	✓	✓		✓
Yellow burrhead [ <i>Limnocharis flava</i> ]	1	✓	✓	✓	✓	✓
Yellow nutgrass [ <i>Cyperus esculentus</i> ]	5	✓	✓	✓	✓	✓