



City of Ryde

# FIELD OF MARS RESERVE

## Plan of Management

AUGUST 2009  
Revision B



Adopted by the City of Ryde, 9 September 2009

This Plan of Management was adopted by the City of Ryde, 9 September 2009.

## **DOCUMENT CONTROL**

<b>ISSUE NAME</b>	<b>ISSUE DATE</b>	<b>PURPOSE</b>
August 2009 Rev B	21 September 2009	Correction to Map 6, Page 27.
August 2009 Rev B	31 August 2009	Plan of Management issued to General Manager for adoption 8 September 2009
August 2009	18 August 2009	Plan of Management presented to the Committee of the Whole Meeting 18 August 2009
June 2009	28 July 2009	Revised draft following meeting and representations received from Ryde Hunters Hill Flora and Fauna Preservation Society 8, 17 and 23 July 2009.
May 2009	16 June 2009	Recommended for adoption at the Public Facilities and Services Committee, 16 June 2009.
August 2007	25 May 2007	Public Exhibition

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## EXECUTIVE SUMMARY

### ***Background***

The Field of Mars Reserve is located in East Ryde and it is bounded by Cressy Road, Buffalo Creek, Pittwater Road, Moncrieff Drive, Finch Avenue and Kellaway Street. The Reserve forms part of a wider open space system and habitat corridor network which includes, to the east the Field of Mars Cemetery and linkage parks such as Pidding, Barton and Burrows Parks and to the west, the Lane Cove National Park.

The Field of Mars Reserve was formally established as a Reserve for Public Recreation and Promotion of the Study and the Preservation of Native Flora and Fauna, with care, control and management devolving upon Ryde Council pursuant to the provisions of Section 344 of the Local Government Act in 1975. The Reserve is a collection of Crown Land, Community Land and land owner by the NSW Department of Planning and was gazetted as a Wildlife Refuge in 1977 under the National Parks and Wildlife Act 1974.

This Plan of Management shall provide the practical means of establishing and implementing the future uses and management of the Field of Mars Reserve. The legislative requirements of the Local Government Act (1993) and the Crown Lands Act (1989), as amended, guided the drafting of the Plan of Management.

### ***Existing Landscape***

The Field of Mars Reserve is the largest remnant bushland reserve under the care, control and management of the City of Ryde covering approximately 50 hectares. It consists of forty three blocks of land owned by three land owners; City of Ryde the NSW Departments of Lands, and NSW Department of Planning.

The soils within the Field of Mars are derived from Hawkesbury Sandstone, except along the lower creeks where they are alluvial, and on the ridges where there is a capping of Wianamatta shale. The influence of the shale extends for some distance down slopes in to the shallow valley of upper Stranger's Creek where there is a transition from clay to sandy soils.

The Field of Mars Reserve contains no fewer than six distinct indigenous plant communities being:

- Sydney Sandstone Ridgetop Woodland,
- Shale Sandstone Transition Forest,
- Sydney Sandstone Gully Forest,
- Coastal Saltmarsh,
- Sydney Turpentine - Ironbark Margin Forest and
- Riparian scrub.

This provides the opportunity for scientific and educational study in the Reserve as well as an understanding of the effect the changes in topography and soil type have on native species, as one walks from the lower estuarine flats up to the ridge tops on the trail network.

The Field of Mars Reserve contains a number of critically endangered, endangered and vulnerable vegetation communities, flora and fauna under various Commonwealth and State Legislation. This is summarised in the table below.

**Table EX1: Flora and Fauna Conservation Status**

NAME	NSW THREATENED SPECIES CONSERVATION ACT 1995 (STATE)	ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (COMMONWEALTH)
<b>VEGETATION COMMUNITY</b>		
Sydney Turpentine - Ironbark Marginal Forest	Endangered Ecological Community	Critically endangered
Shale Sandstone Transition Forest	Endangered Ecological Community	Endangered
Coastal Saltmarsh	Endangered Ecological Community	Not listed
<b>FLORA</b>		
<i>Epacris purpurascens var purpurascens</i>	Vulnerable	Not listed
<i>Pimelia curviflora var curviflora</i> ,	Vulnerable	Vulnerable
<b>FAUNA</b>		
<i>Ninox strenua</i> (Powerful Owl)	Vulnerable	Not listed
<i>Myotis macropus</i> (Large-footed Myotis or Mouse-eared Fishing Bat)	Vulnerable	Not listed

### **Planning Context**

This Plan of Management has been prepared under the requirements of the Local Government Act 1993 and the Crown Lands Act 1989. However there are many other pieces of legislation that will influence and prescribe specific management regimes within the Reserve. This includes Environmental Planning and Assessment Act 1979; National Parks and Wildlife Act 1974, Threatened Species Conservation Act 1995, Disability Discrimination Act 1992, Heritage Act 1977 and Ryde Planning Scheme Ordinance.

The policies and guiding council documents considered when writing this plan of management include the: City of Ryde Management Plan; Parks on Track for People 2025; Generic Plan of Management; Social Plan; Access and Equity Policy and Disability Action Plan in addition to the planning framework noted later in the Plan of Management.

### **Values and Management Objectives**

The management objectives, whilst guided by the legislative background, recognise that the environmental values of the Reserve are paramount and underpin management policies, actions and decisions. The environmental values of the Reserve were established by the local community, Councillors, City of Ryde staff and stakeholders of the Field of Mars Reserve through a series of stakeholder meetings.

The Field of Mars Reserve will be used in future for low impact, environmental recreation. Because of the value of the unique qualities and location of the Field of Mars Reserve the following specific values were recognised;

- Preservation of the environmental values contained within the Field of Mars Reserve,
- Conservation of the natural vegetation of Field of Mars Reserve,
- Promotion to enhance greater public awareness and appreciation of:
  - the features and value of the Field of Mars Reserve, and
  - the need to protect remnant communities within the Sydney region.
- Encouragement of community involvement in environmental and historic education,

research, bush regeneration and heritage protection.

- Encouragement of cooperative management with adjacent neighbours to preserve the natural significance of the Field of Mars Reserve.
- Ensure protection of potential and known archaeological resources.

Despite this, the overwhelming significance of this Reserve is as a:

- Reserve for the purposes of the promotion of the study and the preservation of native flora and fauna
- Viable remnant of natural bushland which is rare in the region, and
- Unique area of biodiversity for both flora and fauna in Ryde.

Management will aim to protect these values. The principles of land management as expressed in the Crown Lands Act and the Local Government Act support this position.

### ***Action Plan***

The Action Plan details the means by which the Plan of Management and the community roles and values can be implemented in a staged manner. The actions explicit in the Action Plan relate to the values as described in section 5.1. Some of the actions include: education of visitors and those working within the Reserve of its environmental benefits, using best practice bush regeneration techniques and improving access for the disabled.

### ***Conclusion***

The Field of Mars Reserve is a significant wildlife refuge, being the largest natural reserve within the City of Ryde with geographic linkage to the Lane Cove National Park. It is valued highly by local residents and community groups. Its importance as a natural area and wildlife refuge cannot be underestimated and is reflected in the values and actions outlined in this Plan of Management.

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## 1 - INTRODUCTION

This document is a Plan of Management for Field of Mars Reserve. It provides means of establishing and implementing the future uses and management of the reserve. The Plan of Management's objectives, policies and actions described in this document should be seen as a framework for the implementation of future works. This Plan of Management, once adopted, shall be in effect until a new one is requested by Council, the Minister responsible for Lands or it is rescinded.

### 1.1 What is a Plan of Management

A Plan of Management is a formal document that provides guidance for the future planning and management of public open space. It achieves this by identifying the values open spaces possess and outlines how that open space can be improved, used, managed and maintained in the future.

### 1.2 Why prepare a Plan of Management for Field of Mars Reserve

The Field of Mars is the largest reserve under the care, control and management of the City of Ryde. The reserve is dedicated for public recreation and promotion of the study and the preservation of native flora and fauna and accordingly it is used for environmental education and passive recreation, involving walking and appreciation of the natural environment. This has been the major focus of management for recreation within the Reserve since the 1960's.

Recently the community and the City of Ryde have been undertaking projects focused on rationalising access into and through the reserve, providing environmental information and directional signage along nominated and improved tracks.

Access through the reserve, even for appreciation of the environmental assets, does compromise environmental values. Activities contrary to the conservation and environmental values and protection have also been known to occur in the reserve. Such activities have included access by motorbikes and bicycles, unauthorised construction of BMX style circuits, domestic animal access (as a Wildlife Refuge, domestic animals are not permitted in the reserve), vandalism, dumping, and deliberately lit fires. These are all issues which require management, but also reinforce the need for promotion of the reserve as an environmental education and passive recreation area to provide the best chance of protection and provision of the recreation benefits that the Reserve offers. Because of its size and importance environmentally, a specific Plan of Management is required.

### 1.3 Land to which this Plan of Management applies

This Plan of Management specifically applies to Field of Mars Reserve. Key features of this reserve include:

- Ecological significance as a core bushland habitat area which contains three Endangered Ecological Communities, four threatened species and species that are locally rare.
- Its use by students from primary, secondary and tertiary institutions across Sydney;
- Its circular boardwalk track and Visitors Centre facilities accessible for people with a disability;
- Surrounding uses which influence how the park is used;
- Informal recreational use;
- A range of landscape settings from large open areas to more intimate spaces; and

- Having distinct environmental values and historic characteristics.

#### 1.4 Objectives of this Plan of Management

The Plan of Management aims to:

- Protect and support the conservation and interpretation of the natural and cultural heritage values of the Reserve;
- Ensure appropriate management of all vulnerable, threatened and endangered flora and fauna within the Reserve;
- Ensure that appropriate public use, educational opportunities and enjoyment of the Reserve is encouraged without compromising the natural values of the Reserve;
- Meet all legislative requirements; and
- Be consistent with City of Ryde's plans, strategies and policies.

#### 1.5 Process of preparing this Plan of Management

The process followed in preparing the Field of Mars Reserve Plan of Management follows the legislative requirements stated below and the process used by Council. The process in relation to community consultation and the documents produced at each stage is detailed in Figure 1 - Process for the preparation of this Plan of Management.

#### ***Crown Lands Act 1989***

The Crown Lands Act (1989) sections 112 to 115 provide the following information relating to the process of preparing a draft Plan of Management:

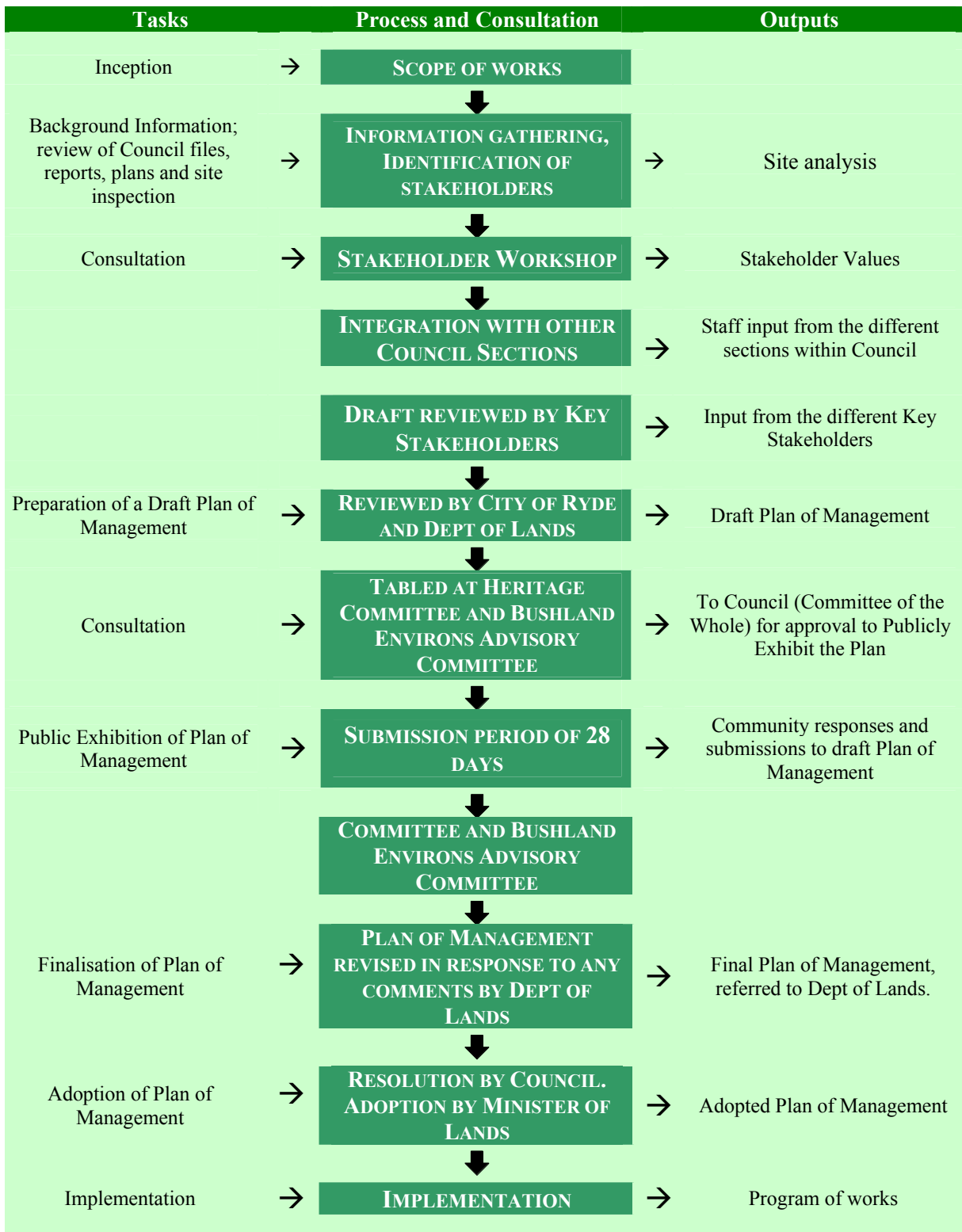
- The preparation of a draft Plan of Management for a reserve commences either through the direction or consent of the Minister. Additionally, a reserve trust may prepare a draft Plan of Management either with the Minister's consent or as directed by the Minister;
- A copy of the draft Plan of Management must be forwarded to the Minister prior to public exhibition;
- Place a copy of the draft Plan of Management on public display for not less than 28 days;
- Refer public submissions regarding the draft Plan of Management to both the Minister and the City of Ryde as Trust Manager for consideration by the Minister before adoption;
- Alterations to the Plan of Management are made if requested by the Minister;
- Adopt the Plan of Management by Council, and by the Minister; and
- If the Minister adopts a Plan of Management, the reserve trust shall carry out and give effect to it. No operations may be undertaken on or in relation to the reserve unless they are in accordance with the plan.

#### ***Local Government Act 1993***

Under the Local Government Act 1993, the preparation of a Plan of Management must adhere to the following prescriptive process.

- Place a copy of the draft on public display in accordance with Section 38 of Local Government Act 1993, that states:

Figure 1: Process for the preparation of this Plan of management



- a council must give public notice of a draft plan of management.
- the period of public exhibition of the draft plan must be not less than 28 days.
- the public notice must also specify a period of not less than 42 days after the date on which the draft plan is placed on public exhibition during which submissions may be made to the council.
- The council must, in accordance with its notice, publicly exhibit the draft plan together

with any other matter which it considers appropriate or necessary to better enable the draft plan and its implications to be understood.

- Adoption of the Plan of management is to be in accordance with Section 40 of Local Government Act 1993, that states:
  - After considering all submissions received by it concerning the draft plan of management, the council may decide to amend the draft plan or to adopt it without amendment as the plan of management for the community land concerned.
  - If the council decides to amend the draft plan it must either: (a) publicly exhibit the amended draft plan in accordance with the provisions of this Division relating to the public exhibition of draft plans, or (b) if it is of the opinion that the amendments are not substantial, adopt the amended draft plan without public exhibition as the plan of management for the community land concerned.
  - If a council adopts an amended plan without public exhibition of the amended draft plan, it must give public notice of that adoption, and of the terms of the amended plan of management, as soon as practicable after the adoption.
  - The council may not, however, proceed to adopt the plan until any public hearing required under section 40A has been held in accordance with section 40A. Following the public display period, consider all submissions received by it concerning the draft Plan of Management and amend the Plan of Management where appropriate.

### **Consultation**

Community consultation for this project has been through Stakeholder workshops and meetings with the various interest groups and the Department of Lands. The Stakeholder workshops provided specific values and were a means of transposing those values into ideas. The consultation for this Plan of Management has also included discussions with internal Council staff.

#### 1.6 What is included in this Plan of Management

This Plan of Management is divided into sections as set out in Table 1:

**Table 1: Structure of this Plan of Management**

Section	Contents	
1.0	Introduction	Background to the Plan of Management
2.0	Description of the Field of Mars Reserve	Natural / Physical, Cultural, Heritage, Maintenance
3.0	Planning Context	State/Federal government planning legislation, local planning context.
4.0	Basis for Management	Values of the community and stakeholders, overall vision, management policies and objectives
5.0	Action Plan	Proposed on the ground improvements and the actions required to implement management strategies
6.0	Implementation and Review	Proposed timeframe and review process
7.0	Appendices	Additional information

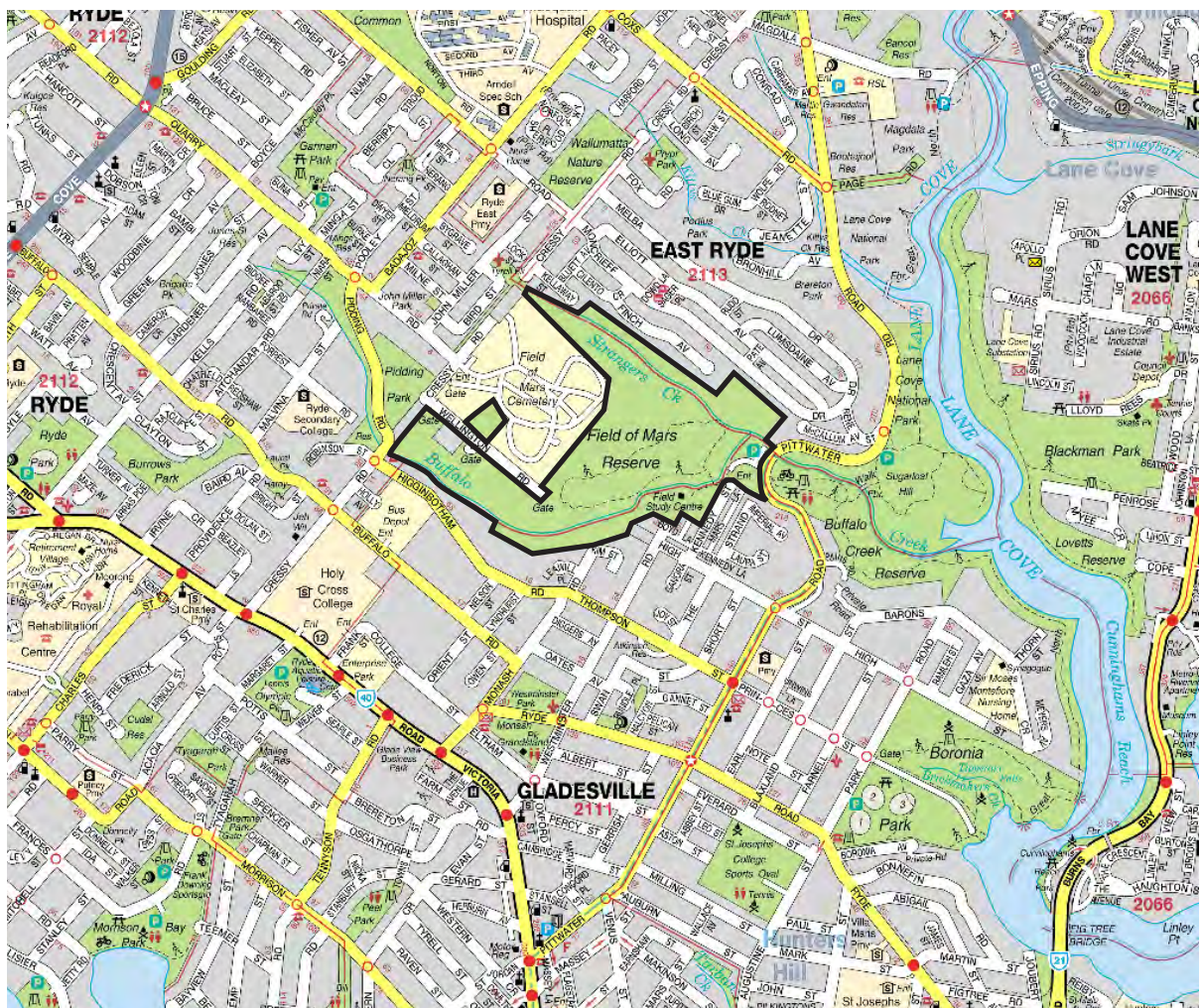
## 2 - DESCRIPTION OF FIELD OF MARS RESERVE

### 2.1 Location and Context

The Field of Mars Reserve is located in the suburb of East Ryde, within the City of Ryde local government area.

The Reserve is bounded by Cressy Road, Buffalo Creek, Pittwater Road, Moncrieff Drive, Finch Avenue and Kellaway Street as illustrated in Map 1 – Location of Field of Mars Reserve within the City of Ryde and Map 2: Field of Mars Reserve Boundary.

**Map 1: Location of the Field of Mars Reserve within the City of Ryde (Sydney UBD, 06)**



The Field of Mars Reserve forms part of a wider current and potential open space system which includes to the east: the Field of Mars Cemetery and linkage parks such as Pidding, Barton and Burrows Parks and to the west, the Lane Cove National Park.

### 2.2 Land ownership and management

#### 2.2.1 Land Title Information

The Field of Mars Reserve is composed of forty three land parcels comprising three land owners being the City of Ryde, New South Wales Department of Planning and NSW Department of Lands (Map 3). Land Title and Tenure information is displayed in Table 2.

On 20 June 1975 the reserve was “re-reserved for public recreation and promotion of the



KEY

- Warada Track
- Doyle Track
- Sand Track
- Kunzea Track



study and the preservation of native flora and fauna, with care, control and management devolving upon Ryde Council pursuant to the provisions of section 344 of the Local Government Act” (NPWS, Plan of Management, p2a). This was further ratified on the 29 April 1988 when the City of Ryde was appointed to be the trustee of the reserve within the New South Wales Government Gazette No. 79 “R. 89474 for Public Recreation and Promotion of the Study and the Preservation of Native Flora and Fauna, notified on 20th June, 1975: The Council of the Municipality of Ryde.”

**Table 2: Land title / Tenure information**

Lot number	DP Number	Zoning / Dedication	Size (metres <sup>2</sup> )	On date
Land owned by the City of Ryde:				
Lot 1	DP208410	Open Space – Recreation Existing	5,119.26	4 June 1963
Lot 1	DP602025	Reserved for County Open Space	5,114.34	11 April 1979
Lot 1	DP605140	Unzoned	606.86	29 March 1990
Lot 1	DP500228	Open Space – Recreation Existing	15,046.69	18 May 1973
Lot 102	DP791791	Residential	112.00	12 September 1989
Lot 11 Sec. 1	DP2183	Open Space – Recreation Existing	2,196.99	19 September 1975
Lot 2	DP419992	Open Space – Recreation Existing	25,798.94	2 August 1961
Lot 3	DP1072597	Residential	89.67	30 August 2004
Lot 3	DP707829	Residential	809.62	4 October 1984
Lot 306	DP752035	Open Space – Recreation Existing	14,597.98	15 August 1961
Lot 308	DP752035	Open Space – Recreation Existing	14,414.04	22 August 1956
Lot 4	DP504909 (Parcel 36525)	Residential	3,029.05	26 July 1974
Lot 4	DP504909 (Parcel 41952)	Open Space – Recreation Existing	131.64	
Lot 5	DP814502	Residential	201.93	11 December 1991
Lot 625	DP 31680	Open Space – Recreation Existing	6,281.88	
Lot 8	DP711149	Reserved for County Open Space	2,556.69	18 February 1985
Lot A	DP 433420	Open Space – Recreation Existing	726.44	28 June 1961
Lot B	DP433420	Open Space – Recreation Existing	726.27	28 June 1961
Lot C	DP31192	Open Space – Recreation Existing	6,800.01	18 May 1961
Lot C	DP433420	Open Space – Recreation Existing	1,902.73	23 December 1957
Lot S	DP31252	Open Space – Recreation Existing	4,349.74	17 December 1960

Lot number	DP Number	Zoning / Dedication	Size (metres <sup>2</sup> )	On date
Lot Z	DP445797	Open Space – Recreation Existing	12,770.90	16 December 1960
TOTAL =			123,383.67m <sup>2</sup>	

Land owned by the New South Wales Department of Lands (Crown Land):				
Lot 172	DP752035	Open Space – Recreation Existing	60.67	19 April 1973
Lot 215	DP752035	Open Space – Recreation Existing	5,761.99	
Lot 258	DP752035	Open Space – Recreation Existing	6,352.27	19 April 1973
Lot 259	DP752035	Open Space – Recreation Existing	3,984.01	19 April 1973
Lot 261	DP752035	Open Space – Recreation Existing	10,995.75	19 April 1973
Lot 3000	CRL22732	Special Uses 'A' – Cemetery Cemetery/Open Space – Recreation	37,290.71	5 July 1974
Lot 307	DP752035	Reserved for County Open Space	13,372.98	21 January 1987
Lot 7010	DP93919	Open Space – Recreation Existing	1,341.91	25 October 1974
Lot 7011	DP1069836	Special Uses 'A' – Cemetery Cemetery/Open Space – Recreation	7,583.34	5 July 1974
Lot 7012	DP1065735	Special Uses 'A' – Cemetery Cemetery/Open Space – Recreation	268,852.55	5 July 1974
Lot 755	DP752035	Open Space – Recreation Existing	244.14	28 November 1969
Lot 898	DP820350	Promotion Of The Study And The Preservation Of Native Flora And Fauna and Public School Purposes	1885.46	26 June 1987
TOTAL =			357,725.78m <sup>2</sup>	

Land owned by the New South Wales Department of Planning:				
Lot 2	DP500228	Reserved for County Open Space	1,541.21	12 September 1975
Lot 7	DP711149	Reserved for County Open Space	6,983.72	28 November 1986

Lot number	DP Number	Zoning / Dedication	Size (metres <sup>2</sup> )	On date
Lot 11	DP240228	Reserved for County Open Space	1,716.18	13 January 1989
Lot 12	DP240228	Reserved for County Open Space	571.94	13 January 1989
Lot 13	DP240228	Reserved for County Open Space	582.44	13 January 1989
Lot 14	DP240228	Reserved for County Open Space	580.33	27 May 1975
Lot 15	DP240228	Reserved for County Open Space	576.15	27 May 1975
Lot 16	DP240228	Reserved for County Open Space	1,782.61	13 December 1991
Lot C	DP310314	Reserved for County Open Space	2,946.26	28 November 1986
TOTAL =			17,280.84m <sup>2</sup>	

**Table 3: Area of the Field of Mars Reserve in hectares**

Owner	Area in hectares
City Of Ryde	12.33
NSW Department of Land (Crown Land)	35.77
NSW Department of Planning	1.72
<b>Total</b>	<b>49.83</b>

### ***Leases and Licences***

Council currently manages no leases/licences within the Field of Mars Reserve. However The Environmental Education Centre is a direct arrangement between the NSW Department of Education and NSW Department of Lands.

#### 2.2.2 Key stakeholders in Field of Mars Reserve




Stakeholders responsible for management of facilities within the Field of Mars Reserve are outlined in Table 4.

**Table 4: Key stakeholders in Field of Mars Reserve**

Organisation	Role
City of Ryde	Land owner, maintenance, supervision
Ryde-Hunters Hill Flora and Fauna Preservation Society	Consultative body
Various Bushcare Groups	Interest group
Field of Mars Environmental Education Centre	Dept. of Education, State Government
Department of Planning	Land owner
Department of Lands	Land owner

#### 2.2.3 Ongoing Consultation with the Ryde-Hunters Hill Flora and Fauna Preservation



KEY	
	Crown Land
	City of Ryde
	NSW Department of Planning



### Society (RHHFFPS)

Consultation and communication between the Council and the RHHFFPS is vital to the ongoing management of the Reserve and the implementation of this Plan of Management. This ongoing relationship maintains the following principles:

- Council has the responsibility for making decisions that affect the outcomes and future of the Reserve; and
- RHHFFPS should be consulted about matters that affect the protection of the ecological integrity, biodiversity and bushland amenity of the Reserve.

In alignment with the above principles,

- Council will undertake consultation with the RHHFFPS, where practical, in relation to future decisions that affect the protection of the ecological integrity, biodiversity and bushland amenity of the Reserve; and
- Council will consult with the RHHFFPS in relation to the implementation of decisions that affect the protection of the ecological integrity, biodiversity and bushland amenity of the Reserve.

To facilitate this consultation Council and RHHFFPS shall meet four times per year to discuss the implementation of the Plan of Management and other matters that affect the management of the Reserve. The scope of these meetings shall include, but not be limited to:

- Transfer of information between both parties regarding the management and planning of the Reserve; and
- Discussion of the annual works program within the Reserve.

#### 2.2.4 Maintenance

Field of Mars is maintained by the City of Ryde and its volunteer bushcare workers. Regular maintenance includes:

- Bush regeneration (natural areas); and
- Removing rubbish;
- Lawn maintenance (mowing, edging, line trimming, herbicide application, cleaning drains and paths);
- Pathways, pavements and car parking area inspections and repairs etc;
- Tree maintenance (weeding, dead plant removal, pruning, herbicide application);
- Repairs to built structures including amenities, lights;
- Inspecting and repairing fixtures and furniture;
- Trail maintenance

#### 2.2.5 Financial management

##### **Cost recovery**

No income from use of the Field of Mars is derived from temporary licences on hire fees for use of the buildings or Reserve.

Costs associated with the management of the reserve include maintenance, plant and equipment, product (such as turf and plants), weed spraying, capital improvements and bush regeneration. The estimated annual management, capital and maintenance costs for the Field of Mars in 2008-09 was \$150,000. Based on the income and costs associated with the Reserve, cost recovery of maintenance expenditure in the Field of Mars in the past has been negligible and is likely to so remain.

### ***Guidelines for expenditure***

Under Section 106 of the Crown Lands Act 1989, income generated from a Crown reserve must be spent on improving that reserve or for the general purposes of the reserve trust, or unless the Minister makes a specific direction. Such income must not be placed in general revenue of the Trust Manager, in this case the City of Ryde.

## 2.3 Natural

The Field of Mars Reserve contains a large urban bushland remnant which transitions from wetland areas along Stranger's and Buffalo Creeks to shale derived vegetation community in its higher sections. It contains three endangered ecological communities, four threatened species as well several vegetation associations and species that are rare in the Sydney basin bioregion.

The Reserve is the largest remnant bushland reserve in the under the care, control and management of the City of Ryde and represents a significant area of bushland adjacent to the southernmost extent of the Lane Cove National Park, making it a part of a much larger bushland network in the Sydney Region. The Reserve also provides the base of an important bushland "green" corridor to the west through the City of Ryde. Adjoining bushland reserves along Buffalo Creek and Stranger's Creeks extend through to Ryde Park providing a linkage of mature natural vegetation.

### 2.3.1 Climate

The Field of Mars Reserve is located between two major meteorological stations located at Sydney and Parramatta.

Taking an average of Sydney and Parramatta meteorological data, Field of Mars Reserve would experience:

- Mean daily maximum summer temperature of 27°C.
- Mean daily minimum temperature in winter of 7-8°C.
- Mean annual rainfall of approximately 1,100 mm.
- 10-11 wet days per month.
- Mean wind speed at 9am of 9-10 km/hour.

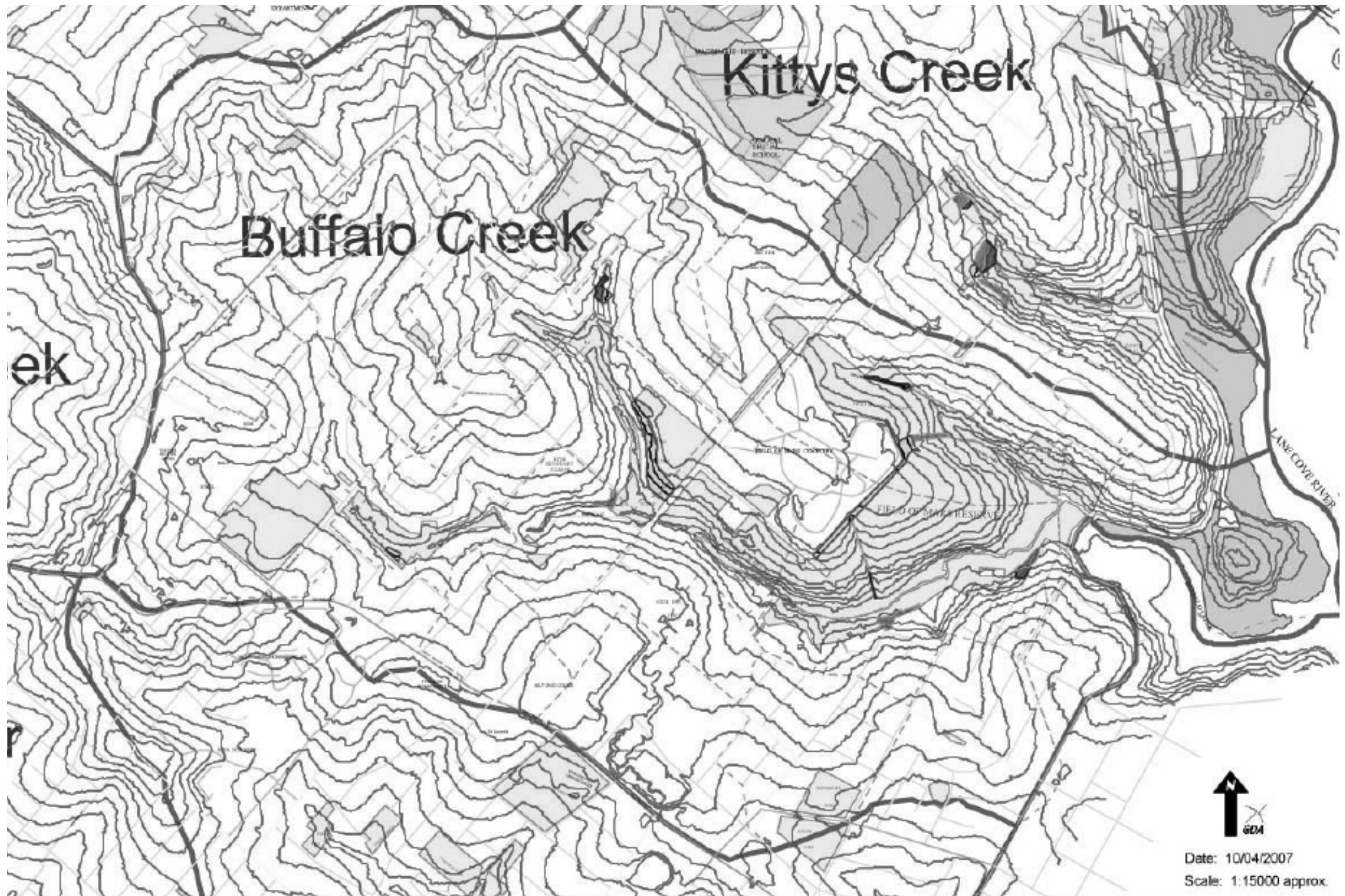
The localised conditions within the reserve will vary due to local wind and temperature patterns formed by orientation of and changes in the landforms and vegetation cover within the reserve.

### 2.3.2 Landform, soils and drainage

#### ***Landform and topography***

The Field of Mars Reserve is the largest remnant bushland reserve under the care, control and management of the City of Ryde. It is 49.83 hectares in area. It is positioned in varied







topography and soil types on a diverse range of underlying geology, and supports a diverse range of vegetation communities. It is physically linked to Lane Cove National Park (Sugarloaf Point).

The higher points of the Reserve are shale based to a level between 55m and 40m above sea level, transitioning to shale/sandstone to the north and east of the Field of Mars Cemetery. The slopes are based on sandstone between 20 and 10m above sea level to richer alluvial flood plains (in the eastern part of the reserve) and tidal estuarine flats closer to Pittwater Road.

Beside the tidal estuarine flats are grassed areas which are over an old tip. Therefore some issues of land contamination and leaching exist. The grassed areas are used for informal recreation and possess some shelters and seats of moderate quality and also act as an important buffer for the sensitive saltmarsh zone.

### ***Geology and soils***

The soils within the Field of Mars are derived from Hawkesbury Sandstone, except along the lower creeks where they are alluvial, and on the ridges where there is a capping of Wianamatta shale. The shale influence extends for some distance down slope. In the shallow valley of upper Stranger's Creek there is a transition from clay to sandy soils (from Allan Fox and Judith Rawling, (1990) Draft Plan of Management Ryde Bushland Reserves, Page 118).

### ***Hydrology and drainage***

From Map 4: Field of Mars Reserve showing one metre contour intervals it can be seen that the western area of the reserve occupies a ridge with the land falling away to the north-east and south where it forms two creek lines – Buffalo and Stranger's Creeks. At the confluence of the two creeks at the eastern edge of the Reserve is an intertidal zone in close proximity to the Lane Cove River. There are also drainage lines coming off the high ground at the Cemetery to the south-west, west (draining to Buffalo Creek) and north-east (draining to Stranger's Creek).

The Field of Mars is located at the bottom of the larger Buffalo Creek catchment which takes in part of Ryde, Top Ryde, East Ryde and Gladesville as shown in Map 5: Field of Mars Reserve in relation to the Buffalo Creek Catchment with 5 metre contour intervals shown.

### ***Water quality***

Water quality monitoring across Ryde has shown that all creeks are atypical within an urban environment. Monitoring of Buffalo Creek indicates that urban pollution is having a impact on in-stream water quality. This impact is notable with the low levels of dissolved oxygen (historically no sample has produced acceptable levels) and the high levels of nutrients.

Sedimentation within the watercourses from the surrounding development and industrial area has also caused deterioration in water quality. The reduced water quality with raised nutrient levels and elevated levels of moisture allow more weed species along Stranger's and Buffalo Creeks.

#### 2.3.3 Flora and fauna

##### ***Flora***

Today the Field of Mars Reserve contains a core of good quality bushland with weed species being present around the perimeter and along the two creek lines. Bush regeneration has

been undertaken to remove weed and facilitate regeneration. A series of walking tracks are located within the core bush area providing access throughout the Reserve.

Urban drainage, raised nutrient levels and elevated levels of moisture allow more weed species along Stranger's and Buffalo Creeks.

### ***Urban Bushland***

The variety of vegetation and habitats created by the diverse topography and soil provides an important living example of the interaction between species of plants and animals.

A flora and fauna study commissioned by the City of Ryde, "Ryde Flora and Fauna Study 2006" and subsequent study in 2007 undertaken by Biosphere Environmental Consultants Pty Ltd, has mapped the distribution of the different vegetation communities (Map 6: Vegetation types of the Field of Mars Reserve) below, six distinct indigenous plant communities were identified being:

- Sydney Sandstone Ridgetop Woodland,
- Shale Sandstone Transition Forest,
- Sydney Sandstone Gully Forest,
- Coastal Saltmarsh
- Turpentine-Ironbark Marginal Forest, and
- Riparian scrub.

A recommendation for reclassification of some of the communities is based on information gained from a general survey of the plant species in the reserve and survey of particular bushland areas in the reserve (using 7 stage Braun-Blanquet technique). The methods used for this biodiversity survey were identical to that used by National Parks and Wildlife Service (NSW).

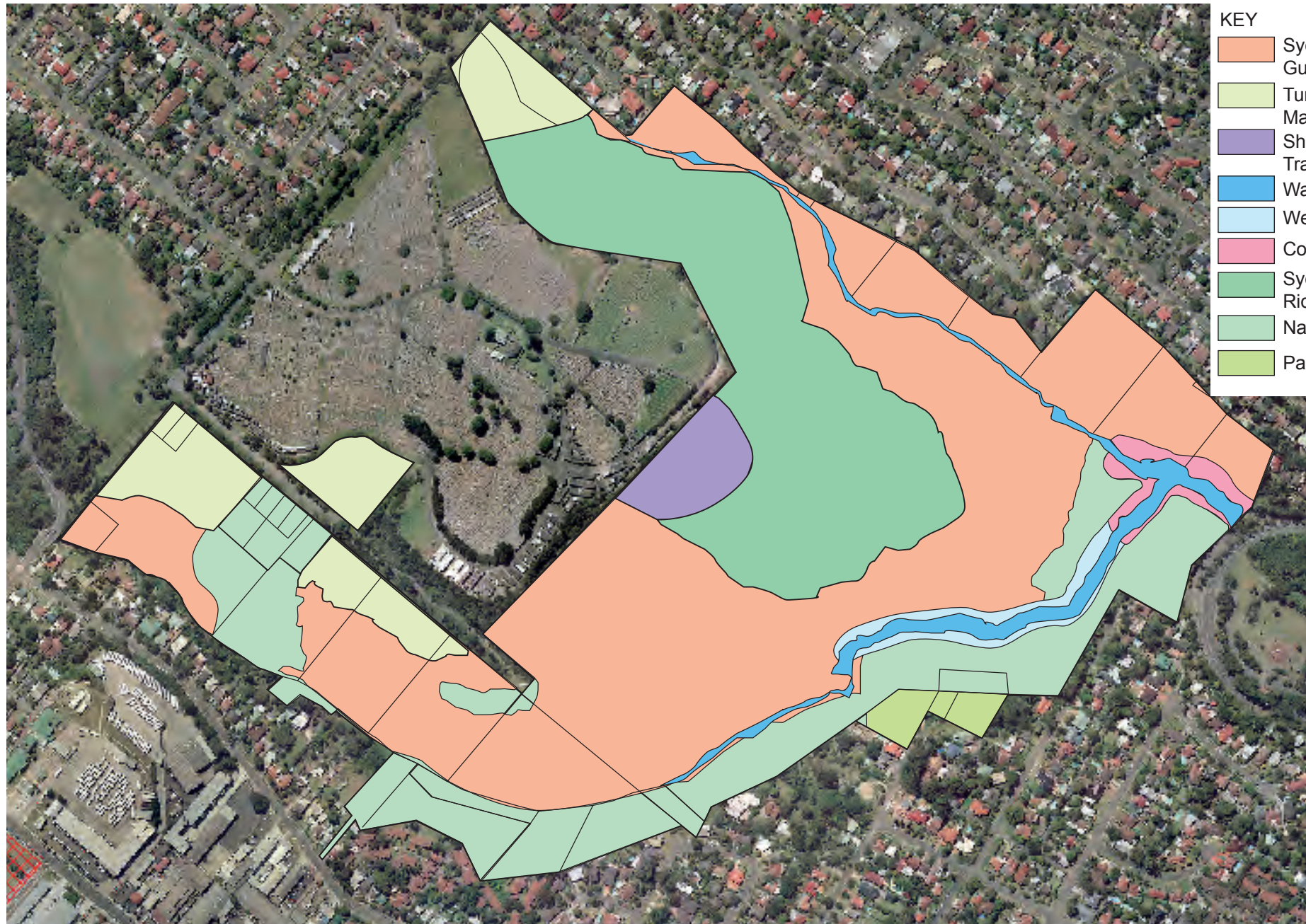
Put simply, the Reserve contains open forest of Scribbly Gum, Angophora and Banksia, Turpentine and Ironbark, river flat stands of Paperbark and Reeds to estuarine stands of Mangrove and Saltmarsh. It is the diversity of habitat and ecology found within the reserve which makes it a place of importance requiring protection and sensitive management. There is an opportunity for scientific and educational study in the Reserve as well as an understanding of the effect of changes in topography and soil type on native species, as one walks from the lower estuarine flats up to the ridge tops on the existing trails.

The Reserve is environmentally significant for its geographic location. It represents a significant area of bushland adjacent to the southernmost extent of the Lane Cove National Park, making it a part of a much larger bushland network in the Sydney Region. The Reserve also provides the base of an important bushland "green" corridor to the west through the City of Ryde. Adjoining bushland reserves along Buffalo Creek and Stranger's Creeks extend through to Ryde Park providing a linkage of mature natural vegetation.

Three endangered ecological communities (EEC) listed under the NSW Threatened Species Conservation Act 1995 are found within the Field of Mars. These are:

- Sydney Turpentine Ironbark Margin Forest;
- Shale Sandstone Transition Forest and
- Coastal Saltmarsh.

16 Priority Actions have been identified for the Sydney Turpentine Ironbark Margin Forest; and Shale Sandstone Transition Forest to recover each of these EEC. Actions include habitat management through bush regeneration and habitat protection. The Department of



- KEY**
- Sydney Sandstone Gully Forest
  - Turpentine Ironbark Margin Forest
  - Shale Sandstone Transition Forest
  - Watercourse
  - Wetland
  - Coastal Saltmarsh
  - Sydney Sandstone Ridgetop Woodland
  - Natural Area
  - Park



Environment and Heritage has prepared fact sheets for these communities. A Recovery Plan is being prepared for both EECs.

The Coastal Saltmarsh is the third endangered ecological community found within the Field of Mars. Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is an endangered ecological community under the NSW Threatened Species Conservation Act (1995). 12 Priority Actions have been determined for the recovery of this EEC and include habitat management through bush regeneration and habitat protection. A number of best practice management manuals are also available from the NSW Government.

Furthermore, Sydney Turpentine Ironbark Margin Forest; and Shale Sandstone Transition Forest are also listed under the *Commonwealth's Environment Protection and Biodiversity Conservation Act 1999* as critically endangered and endangered respectively

Two plant species, *Epacris purpurascens var purpurascens* and *Pimelia curviflora var curviflora*, are located within the Field of Mars Reserve. Both are listed as a vulnerable species under the NSW Threatened Species Act 1995. The Department of Environment and Climate Change has prepared Priority Action Statement for both these species with actions including habitat management through bush regeneration and habitat protection.

*Pimelia curviflora var curviflora* is also listed as vulnerable under the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999.

## Fauna

The flora and fauna study commissioned by the City of Ryde, "Ryde Flora and Fauna Study 2006" undertaken by Biosphere Environmental Consultants Pty Ltd, determined that the Field of Mars Reserve had the greatest number of native terrestrial mammals found within the four parks surveyed (being Brush Farm Park, Lambert Park, Darvall Park and the Field of Mars Reserve). It was the only Reserve to contain Sugar Gliders, Echidna and a diversity of bats. Unfortunately it also contained a high proportion of exotic mammals.

Seventy-nine species of day birds and five species of night birds, including the threatened Powerful Owl, were found. These birds represented a wide variety of feeding guilds including insect-feeders, nectar feeders and predatory birds.

Two threatened fauna species were identified in the Field of Mars. The Powerful Owl *Ninox strenua*, and the Large-footed Myotis or Mouse-eared Fishing Bat *Myotis macropus* are listed as vulnerable species under the NSW State Threatened Species Conservation Act (1995).

Threats to the Powerful Owl include habitat fragmentation, loss of hollow bearing trees and high frequency hazard reduction burns. Threats to the Mouse-eared Fishing Bat include loss of vegetation along foraging area, reduced water quality affecting food sources and pesticide use in foraging areas.

Introduced birds are also common in the Field of Mars, tending to be concentrated around the grassed and more open areas of the reserve.

Six fish species were caught in the Field of Mars with five being native species. The reserve has diversity of reptiles present with six lizard species and three snake species being found. Larger lizards, such as the Eastern Water Dragon were also found in reasonable numbers.

Four species of frog were found to be reasonably abundant within the Reserve. Two tree frog species were present, indicating the presence of relatively unpolluted water. The Field of Mars Reserve has a good diversity and abundance of invertebrates with insects dominating. Seventeen major insect taxa were present and occurred in great diversity. Insects ranged from flying to fossorial forms and included leaf eating, sap sucking, carcass feeding, aquatic and predatory forms. Also common in the reserve were slaters, snails, slugs, earthworms, centipedes and spiders.

### ***Threats to the Field of Mars***

The adverse impacts on the Field of Mars Reserve as an island of bushland within an urbanized area are common to many urban bushland areas across Sydney. These impacts include:

- Weed invasion due to increased nutrient, pollutant and sediment levels in the local waterways;
- Weed invasion from movements of introduced fauna within and through the Field of Mars;
- Extended pooling of freshwater caused by stormwater volumes impacting the viability of the Coastal Saltmarsh community
- Weed invasion from the open and grassed areas which surround the Field of Mars and nearby gardens of adjoining houses;
- Reduced water quality due to high sediment loads from an urban and industrial upper catchment;
- Adverse impacts on native fauna including disturbance to habitat and breeding areas;
- Predation on native fauna including small birds and mammals by introduced fauna both local pets and recognised feral animals;
- Disturbance to structural diversity due to changed fire regimes;
- Loss of species due to human induced climate change;
- Degradation of track system due to illegal and inappropriate human activities which include motor bikes, mountain bicycles and man made track;

Reduced habitat quality due to canopy gaps and unprotected open areas; 2.4History and cultural heritage. Appendix F contains details on the key threatening processes as outlined by NSW Department of Environment and Conservation.

#### **2.4.1 Indigenous History**

Prior to European settlement, the area comprising today's Field of Mars Reserve was occupied by the Wallumedegal people, the local Aboriginal tribe. Evidence of their lifestyle is present in and around the Reserve. Shell middens, caves and engravings have been identified in the Reserve and in the adjoining Lane Cove River National Park.

The creeks and estuary of the Field of Mars provided a major food source in summer and sharp shells were used for cutting tools, fish hooks and barbs on spears. The moist gullies provided fruits such as figs, lillypilly and berries with drier areas of the Field of Mars providing nectar from flowers such as banksia and waratah and small animals such as bandicoots, bush rats and possums. The tall forests of the shale ridges with their grassy and bracken understorey was an area which attracted larger mammals such as kangaroos and wallabies where they were easier to hunt. The bracken fern root provided an important source of carbohydrate in winter.

Fire was also used to trap animals and encourage grassy areas which attracted kangaroos. Burning seemed to be of a mosaic pattern to ensure open areas for trapping

#### **2.4.2 Non-indigenous History**

Today's Field of Mars Reserve is the remnant of a district which once extended from Dundas to the Lane Cove River. In January 1792, the first land in the Ryde area was granted to eight marines, along the northern bank of the river between Sydney and Parramatta. The area was named

by Governor Phillip the 'Field of Mars'; Mars being the ancient Roman God of war, named to reflect the military association with these new settlers.

These grants were followed soon after by grants to ten emancipated convicts in February 1792, the land being further to the east of the marines grants, thus the area was called Eastern Farms or the Eastern Boundary. By 1794 the name Eastern Farms had given way to Kissing Point, a name believed to have originated from the way in which heavily laden boats passing up the Parramatta River bumped or 'kissed' the rocky outcrop which extends into the river at today's Kissing Point.

Further grants were issued in 1794 and 1795, gradually occupying most of the foreshores between Meadowbank and Gladesville. Some of the grants were at North Brush, north of the Field of Mars settlement, in the area of Brush Farm and Eastwood. Most of the grants were small, from 30 to 100 acres.

By 1803 most of the accessible land had been granted. Settlement was based along the Parramatta River and overlooking ridges. Governor King recognised that most of the smaller farms had insufficient land for their stock but it was not possible to grant them larger allotments. In 1804 it was decided that a 'traditional English common' - a large area of public land for use by local inhabitants - would be set aside. Six commons were gazetted.

The Field of Mars Common, an area of approximately 5,050 acres located north of the Field of Mars and the Eastern Farms, covered most of the Ryde Municipality. The village itself comprised only a modest scattering of houses in a few streets around the church, surrounded by farms, orchards and some large estates. Nevertheless the name was well-established by 12 November 1870 when the Municipal District of Ryde was officially proclaimed.

In 1874, the Common, by then a reported place of undesirables, was resumed as Crown land and subsequently cleared for the laying out of allotments and streets. In 1884 twenty-five acres were allocated for the Field of Mars Cemetery.

In the Government Gazette of 3 December 1887, 85 acres were proclaimed for Public recreation. This is the origin of today's Field of Mars Reserve. Ryde Council became trustee of the land in 1889.

The reserve remained a source of building and domestic materials for local residents, provided grazing land for cattle, a refuge during the depression years and a popular place for swimming, fishing and prawning until 1954.

In response to a waste disposal problem as residential development grew, the Field of Mars was identified as a location for a major putrescible waste tip in 1965. This was to prove the catalyst for significant resident mobilisation in relation to wildlife conservation.

The Ryde-Hunter's Hill Flora and Fauna Preservation Society was formed in February 1966 to advocate wildlife conservation and to specifically preserve, manage and develop the Field of Mars Reserve as a flora and fauna sanctuary.

In conjunction with the East Ward Anti-Tip Action Committee, the two groups successfully lobbied for an alternate site to satisfy the municipal tipping needs. In September 1966, the Council chose the Porters Creek site in North Ryde as its major reclamation tip. The Council further resolved "that the Ryde-Hunter's Hill Flora and Fauna Preservation Society be advised that Council agrees to their development of the Field of Mars Reserve as a flora and fauna sanctuary subject to any development being carried out to the satisfaction of the Council's Municipal Engineer".

Through the efforts of the Society, the Field of Mars Reserve has been managed in conjunction with the City of Ryde as a flora and fauna sanctuary since that time. In addition to extensive restoration works undertaken jointly by Council and the community volunteers of the Society, the Visitor's Centre building was officially opened in 1972 and has formed the base of the Society and community involvement since.

In further pursuit of recognition and protection of its environmental standing, the expanded lands of the reserve were consolidated under the Crown Land Act in 1975 and reserved for Public Recreation and Promotion of the Study and Preservation of Native Flora and Fauna.

On 9 May 1975, the reserve was proclaimed a "Wildlife Refuge" under the National Parks and Wildlife Act, 1974. (Field of Mars Wildlife Refuge No.339). A Plan of Management under the Act was adopted by Council and the National Parks and Wildlife Service in 1977. The Minister for Lands signed off on a Plan of Management on 24th August 1978.

Recognition of the importance of the value of wildlife conservation and education resulted in the approval for the creation of the Field of Mars Environmental Education Centre in 1986 by the Minister for Education and commenced operation in 1987. on 29 June 1988 the City Of Ryde was appointed trustee of the Reserve.

Today, the Field of Mars Environmental Education Centre offers a range of programs for NSW Department of Education and Training to primary and secondary schools. Students can visit the Field of Mars Environmental Education Centre and undertake activities at the Field of Mars Reserve or the adjoining Buffalo Creek Reserve.

Field of Mars Environmental Education Centre programs aim to:

- increase knowledge about and concern for the environment;
- encourage fieldwork by students; and
- promote environmental education resulting in action by students for their environment.

The Reserve has grown with the addition of various parcels of adjoining land. In 1988 all lots were again consolidated under the Crown Land Act to form the reserve which currently comprises 49.76 ha.

A Plan of Management for the Bushland Reserves in the Ryde LGA was prepared by Allan Fox and Judith Rawling in 1990. However, it was never adopted by Council.

In 1996, a review of the Management of the Reserve was undertaken as part of a larger "catchment basis" Plan of Management for the Buffalo Creek Catchment. This Plan of Management was prepared under the Local Government Act (1993) to comply with the requirements for Community Land Management. The Buffalo Creek Plan of Management was prepared by Clouston Associates and incorporated extensive community consultation to develop a plan for the management of the Buffalo Creek Catchment, of which the Field of Mars Reserve forms a part.

The Plan, completed in late 1996 remained in draft status whilst financial assessment was made with regard to the considerable raft of recommendations to ascertain funding availability and sources prior to presentation to Council for adoption. It was not adopted.

In 1998 an amendment to the Local Government Act in relation to Community Land Management was gazetted, requiring all Plans of Management to be reviewed and updated in accordance with the requirements of the amendment to the Act. This rendered the Buffalo Creek Plan of Management non compliant with the Act.

Notwithstanding, some of the key strategies recommended by the Draft Buffalo Creek Plan of Management have been implemented in the management of the Field of Mars Reserve. The strategies implemented include a Wayfinding Strategy, rationalisation of paths and trails, protection of the salt marsh communities, siltation control and water quality structures.

In 2001, the Council adopted a Generic Plan of Management for Community Land in Ryde to comply with the 1998 amendment. This Plan of Management addressed the legislative requirements of the Act in relation to the management of all community land, and included the Field of Mars Reserve.

Much of the more recent history of the reserve has been dedicated to the protection and promotion of the natural environment values of the reserve. Certainly, the great interest in conservation of natural values within the community was brought about by waste disposal activities and the threat of massive expansion of this activity in the 1960's. Community concern and action has seen the cessation of tipping and thoughts of other uses, such as a golf course on the filled land, and raised the benefits of nature in the suburbs for its own sake, as a community value. The natural environment also provides its own recreational benefits. This "environmental recreation", involving walking and appreciation of the natural environment, has been the focus of management of the Reserve since the 1960's.

In more recent years, the community and the City of Ryde have been undertaking projects focused on rationalising access into and through the reserve, providing environmental information and directional signage along the nominated and improved tracks. This has included an upgrade of the Warada Track as a part of the Centenary of Federation celebrations and installation of water improvement devices and educational signage with funding received from the NSW Stormwater Trust.

Access through the reserve to allow appreciation of the environmental assets is not without its problems. Activities contrary to the environmental values include access by motorbikes and bicycles, unauthorised construction of BMX style circuits, domestic animal access (as a Wildlife Refuge, domestic animals are not permitted in the reserve), vandalism, dumping, and deliberately lit fires. The control of these activities requires management, but also reinforces the need for promotion of the reserve as an environmental recreation area to provide the best chance of protection and provision of the special recreation and conservation benefits that the Reserve offers.

A former Council works depot in Wellington Road has been decommissioned and is being rehabilitated to return it to bushland as part of the Reserve.



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## 3 - PLANNING CONTEXT

### 3.1 Introduction

This section describes the legislative and policy framework applying to the Field of Mars Reserve.

Full versions of the legislation summarised below is found on-line at:

- [www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au) and
- [www.austlii.edu.au](http://www.austlii.edu.au).

The relevant City of Ryde policy information can be found on its website:

- [www.ryde.nsw.gov.au](http://www.ryde.nsw.gov.au).

### 3.2 Federal planning context

#### 3.2.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) protects the environment, particularly matters of National Environmental Significance (Protected matters). It streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places. The EPBC Act came into force on 17 July 2000.

The objectives of the EPBC Act are to:

- Provide for the protection of the environment, especially matters of national environmental significance;
- Conserve Australian biodiversity;
- Provide a streamlined national environmental assessment and approvals process;
- Enhance the protection and management of important natural and cultural places;
- Control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife; and
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources

The EPBC Act promotes the conservation of biodiversity by providing strong protection for threatened species and ecological communities, migratory, marine and other protected species. The Act provides for:

- Identification of key threatening processes;
- Protection of critical habitat;
- Preparation of management plans; and
- Issuing of conservation orders and regulation of wildlife import/export.

The EPBC Act protects:

- Fauna and flora on land controlled or owned by the Commonwealth;
- Fauna and flora that may be harmed by the activities of the Commonwealth or a

Commonwealth agency; and

- Nationally listed threatened species or community which might be significantly impacted by an activity or development.

At the time of preparation of this Plan of Management two endangered ecological communities and one vulnerable flora species were listed under this legislation. A number of Key Threatening Process listed under this legislation have relevance to the management of the Field of Mars and include:

- Competition and land degradation by rabbits,
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gasestion; and
- Predation by European red fox.

### 3.2.2 Disability Discrimination Act 1992

The Disability Discrimination Act 1992 aims to eliminate, as far as possible, discrimination against people with disabilities in many areas, including access to premises. The Act also aims to promote recognition and acceptance in the community that people with disabilities have the same fundamental rights as the rest of the community.

The Act covers a range of areas including sport and recreation, and access to premises. The Act requires that people be able to access any building which the public is entitled to enter or use through the primary entrance used by the general public. It further requires that people should have access to any services and facilities provided in those buildings. The NSW Anti-Discrimination Act 1997 also makes it unlawful to discriminate on the ground of disability and sex.

## 3.3 State planning context

### 3.3.1 Crown Lands Act 1989

70.6% of the Field of Mars Reserve is comprised of Crown Land managed by the City of Ryde as trustee. 25.8% of the Reserve is listed as Community Land under the Local Government Act 1993.

The Field of Mars has been reserved for public recreation and promotion of the study and the preservation of native flora and fauna and accordingly, all uses of the Reserve must be in accordance with this purpose.

On 9 May 1975 the Reserve was declared a Wildlife Refuge under the National Parks and Wildlife Act 1974 and is also listed as an item of National and State significance under Ryde Local Environmental Plan No.105 (Heritage). These four instruments provide a clear definition of the principles under which this Reserve is to be managed. The protection of its environmental attributes is clearly paramount in all four instruments.

The Act defines the planning, management and use of Crown land, including reservation or dedication for a range of public purposes, and leasing and licensing. The Department of Lands, together with Reserve Trusts appointed by the Minister, are responsible for management of the Crown reserve system throughout New South Wales to ensure that Crown land is managed for the benefit of the people of New South Wales, and having regard for the principles of Crown land management.

#### 3.3.1(a) Use and management of Crown land

The use and management of Crown land is determined or influenced by:

- The objectives of the Crown Lands Act (Section 10), particularly that Crown lands are

- managed for the benefit of the people of NSW;
- The principles of Crown land management (Section 11 of the Act);
  - The public purpose(s) of the land (Sections 80 and 87). Crown land is reserved or dedicated for a public purpose(s), which means the reserve must provide a public benefit. Uses, activities, developments and agreements in a Crown reserve are defined by the public purpose(s) of the reserve. All uses of Crown reserves must be acceptable according to their public purpose(s). The definition of 'Public Recreation' is 'formal and informal sporting activities; and informal, passive recreational, social and cultural activities taking place on either land or water'; and
  - Department of Lands' policies, such as the Food and Beverage Outlets on Crown Reserves Policy Position 2004.

### 3.3.1(b) Principles of Management

Section 11 of the Crown Lands Act identifies the following principles for management of Crown Land:

- Environmental protection principles be observed in relation to the management and administration of Crown Land;
- The natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible;
- Public use and enjoyment of appropriate Crown land be encouraged;
- Where possible, multiple use of Crown Land be encouraged;
- Where appropriate, Crown Land should be used and managed in such a way that both the land and its resources are sustained in perpetuity; and
- Crown Land be occupied, used, sold, leased, licenced or otherwise dealt with in the best interests of the State consistent with the above principles.

Section 98 of the Crown Lands Act indicates that where a Council manages a reserve trust that the trust has all the functions of a council under the Local Government Act in relation to public reserves except in its power to classify public reserve as operational land under the Local Government Act.

For the purposes of consistency of management of areas under the care and control of the City of Ryde, this Plan of Management shall follow those principles set out above and those core objectives as set out in section 36 Preparation of draft plans of management for community land within the "Local Government Act 1993 No 30, Division 2 Use and management of community land".

### 3.3.1(c) Public Purposes

Field of Mars Reserve was dedicated for the purpose of public recreation and promotion of the study and the preservation of native flora and fauna on 8 April 1914. Under the Act, numerous public purposes are identified. Public recreation is one such public purpose. The Act identifies the relationship between the dedication of public purpose and the land to which it applies:

- A reserve for a public purpose must deliver a public benefit – either a public good or service;
- A public purpose defines the suitable and appropriate land use, activities, development and management practices for the reserve;

- Any lease or licence must be consistent with the public purpose; and
- A Plan of Management further defines the appropriate uses, activities and developments for the public purpose.

#### 3.3.1(d) Plans of Management under the Crown Lands Act 1989

Unlike the Local Government Act 1993, it is not mandatory to prepare a Plan of Management for a Crown Reserve, unless directed to do so by the Minister.

In this instance, no directive from the Minister has been issued to prepare this Plan of Management.

#### 3.3.1(e) Leases and Licences

Crown Land may be leased or licensed directly with the Crown by the Minister. The Reserve Trust may lease or licence Crown reserves, with the Minister's consent. Any lease over five years (including options) must be publicly notified. Leases on Crown Land can permit sub-leases. Reserve Trusts may issue temporary licences, without the requirement for Ministerial consent if listed as a prescribed purpose under the Crown Lands Regulation (2000).

#### 3.3.1(f) Trust Proceeds

Proceeds from activities on the land received by the trust must be spent at the direction (if any) of the Minister. If no such direction is given, the proceeds must be spent on, or invested for, the care and management of the Crown Reserve.

#### 3.3.2 Local Government Act 1993

All land that is owned by Council is governed under the *Local Government Act 1993*, that specifies that all lands under Council ownership must be classified as either Operational or Community Lands. The *Local Government Act 1993* as amended 1998 requires the following to be completed in the preparation of a Plan of Management for Community Land:

- Determination of the categorisation of Community Land based on its use and/or other ecological and heritage significance criteria.
- Provide a description of the 'condition of the land' and any buildings or improvements proposed for the land.
- Provide a description of the use of the land and any such buildings or improvements, at the date of the adoption of the plan of management.
- Specify the purposes for which the land, any buildings and improvements will be, permitted to be used together with a description of the scale and intensity of such permitted use or development.
- Address and meet the 'core' objectives for each appropriate land category.
- Provide expresses conditions to ensure that the terms of all leases or licences issued will be consistent with the core objectives for the particular land category in which they occur.
- Include performance targets.
- Include actions to achieve objectives and satisfy performance targets.
- Include a means of assessing the success or otherwise of plan implementation.

The purpose of the categorisation of Community Land is to provide the parameters for the

planning and management of the land including the permissible uses for the land. Under Section 36 of the *Local Government Act 1993*, Community Land is to be categorised as one or more of the following:

- Natural Area;
- Sportsground;
- Park;
- An area of Cultural Significance; and
- General Community Use.

For all Land that is categorised as a Natural Area, further categorisation as one or more of the following is required:

- Bushland;
- Wetland;
- Escarpment;
- Watercourse;
- Foreshore; and
- A category prescribed by the regulations.

The process for the preparation of a Plan of Management for Community Land is also prescribed in this Act. Section 38 defines the requirements for the public exhibition of a draft Plan of Management, Section 40 and 41 outlines the process for adoption and making amendments respectively.

### 3.3.2(a) Land Categorisation





The Generic Plan of Management - Sportsgrounds, Parks, Natural Areas and General Community Use (November 2001) categorised the land under City of Ryde ownership within the Field of Mars Reserve with the following categories:

- Park;
- Natural Area;
  - Bushland
  - Wetland

Crown Land and the land under the ownership of the New South Wales Department of Planning does not require categorisation. For the purposes of management all Crown land will be managed according to the core objectives for natural area management under the Local Government Act (1993) The Reserve categorisations are shown in Map 7.

Each land category under the Local Government Act has core objectives that define the management objectives that must be the focus of all future planning, design and management. These objectives are listed in the following table.



KEY	
	Natural Area - Bushland
	Natural Area - Wetland
	Park
	Categorisation not required



**Table 5: Core Objective of Community Land Management**

LAND CATEGORY	CORE OBJECTIVES
Natural Area (LGA 1993 Section 36E)	<ul style="list-style-type: none"> <li>• To conserve biodiversity and maintain ecosystem function in respect of the land, or the feature or habitat in respect of which the land is categorised as a natural area, and</li> <li>• To maintain the land, or that feature or habitat, in its natural state and setting, and</li> <li>• To provide for the restoration and regeneration of the land, and</li> <li>• To provide for community use of and access to the land in such a manner as will minimise and mitigate any disturbance caused by human intrusion, and</li> <li>• To assist in and facilitate the implementation of any provisions restricting the use and management of the land that are set out in a recovery plan or threat abatement plan prepared under the <i>Threatened Species Conservation Act 1995</i> or the <i>Fisheries Management Act 1994</i>.</li> </ul>
Natural Area - Bushland (LGA 1993 Section 36J)	<ul style="list-style-type: none"> <li>• To ensure the ongoing ecological viability of the land by protecting the ecological biodiversity and habitat values of the land, the flora and fauna (including invertebrates, fungi and micro-organisms) of the land and other ecological values of the land, and</li> <li>• To protect the aesthetic, heritage, recreational, educational and scientific values of the land, and</li> <li>• To promote the management of the land in a manner that protects and enhances the values and quality of the land and facilitates public enjoyment of the land, and to implement measures directed to minimising or mitigating any disturbance caused by human intrusion, and</li> <li>• To restore degraded bushland, and</li> <li>• To protect existing landforms such as natural drainage lines, watercourses and foreshores, and</li> <li>• To retain bushland in parcels of a size and configuration that will enable the existing plant and animal communities to survive in the long term, and</li> <li>• To protect bushland as a natural stabiliser of the soil surface.</li> </ul>
Natural Area - Wetland (LGA 1993 Section 36K)	<ul style="list-style-type: none"> <li>• To protect the biodiversity and ecological values of wetlands, with particular reference to their hydrological environment (including water quality and water flow), and to the flora, fauna and habitat values of the wetlands, and</li> <li>• To restore and regenerate degraded wetlands, and</li> <li>• To facilitate community education in relation to wetlands, and the community use of wetlands, without compromising the ecological values of wetlands.</li> </ul>
Park (LGA 1993 Section 36G)	<ul style="list-style-type: none"> <li>• To encourage, promote and facilitate recreational, cultural, social and educational pastimes and activities, and</li> <li>• To provide for passive recreational activities or pastimes and for the casual playing of games, and</li> <li>• To improve the land in such a way as to promote and facilitate its use to achieve the other core objectives for its management.</li> </ul>

### 3.3.2 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EPA Act) establishes the statutory

planning framework for environmental and land use planning in NSW through State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs). The EPA Act also sets out processes for approving development applications for structures and works on public and private land as set out in the Ryde Local Environmental Plan.

#### State Environmental Planning Policy 19 – Bushland in Urban Areas

Under SEPP 19, bushland means land on which there is vegetation that is either a remainder of the natural vegetation of the land, or, if altered, is still representative of the structure and floristics of the natural vegetation. Section 8 of SEPP 19 applies to bushland zoned or reserved for public open space. The Field of Mars Reserve has remnant bushland areas.

SEPP 19 aims to protect and preserve bushland in urban areas because of its natural heritage value, aesthetic value, and value as a recreational, educational and scientific resource.

Plans of Management should be consistent with the aims of the Policy. In respect of the bushland to which it applies, a Plan of Management should describe and analyse the bushland, and specify measures to be taken to:

- Implement the specific aims of the Policy;
- Enable recreational use of the bushland;
- Reduce hazard from bushfire;
- Prevent degradation of bushland; and
- Restore and regenerate degraded areas of bushland.

SEPP 19 also sets out matters that a consent authority must consider when assessing development within areas zoned for urban bushland or in an adjoining area.

#### 3.3.3 Threatened Species Conservation Act 1995

The purpose of the Act is to:

- Conserve biological diversity and promote ecologically sustainable development,
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities,
- Protect the critical habitat of those species, populations and ecological communities that are endangered,
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities,
- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.” (DEC (NSW))

“The Act replaced earlier laws enacted in 1991, which provided for the designation of some animals as endangered and the regulation of activities affecting these animals and their habitat. The Act streamlined existing regulatory procedures under the Environmental Planning and Assessment Act 1979 (EP&A Act) and the National Parks and Wildlife Act 1974 (NP&W Act). This allowed for the integration of threatened species assessment into the State’s planning system and removed the requirement to obtain a separate threatened species licence in addition to development consent under the EP&A Act.” (DEC (NSW))



**Table 6: Conservation Status under NSW Threatened Species Conservation Act 1995**

NAME	NSW THREATENED SPECIES CONSERVATION ACT 1995
<b>VEGETATION COMMUNITY</b>	
Sydney Turpentine - Ironbark Marginal Forest	Endangered Ecological Community
Shale Sandstone Transition Forest	Endangered Ecological Community
Coastal Saltmarsh	Endangered Ecological Community
<b>FLORA</b>	
<i>Epacris purpurascens var purpurascens</i>	Vulnerable
<i>Pimelia curviflora var curviflora,</i>	Vulnerable
<b>FAUNA</b>	
<i>Ninox strenua</i> (Powerful Owl)	Vulnerable
<i>Myotis macropus</i> (Large-footed Myotis or Mouse-eared Fishing Bat)	Vulnerable

Under this legislation key threatening processes are also identified. Those processes relevant to the management of the Field of Mars include:

- Invasion and establishment of exotic vines and scramblers
- Competition and grazing by the feral European rabbit
- Competition from feral honeybees
- Predation by feral cats
- Predation by the European Red Fox
- Predation by the Plague Minnow (*Gambusia holbrooki*)
- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.
- Bushrock Removal
- Ecological consequences of high frequency fires
- Human-caused Climate Change
- Loss of Hollow-bearing Trees
- Removal of dead wood and dead trees
- Infection of native plants by *Phytophthora cinnamomi*.

#### 3.3.4 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPWA) is aimed at:

- The conservation of nature, including, but not limited to, the conservation of:
  - i) habitat, ecosystems and ecosystem processes,
  - ii) biological diversity at the community, species and genetic levels,
  - iii) landforms of significance, including geological features and processes, and
  - iv) landscapes and natural features of significance including wilderness and wild rivers,
- The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:
  - i) places, objects and features of significance to Aboriginal people, and

- ii) places of social value to the people of New South Wales, and
- iii) places of historic, architectural or scientific significance,
- Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation,
- Providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation.
- The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.

In 1975, the Field of Mars Reserve was gazette as a Wildlife Refuge under the NPWA. A Wildlife Refuge is a voluntary program that is aimed towards the protection and conservation of natural heritage, aboriginal heritage and historic heritage.

Under Section 68 of this Act, the purposes of a Wildlife Refuge are focused on:

- Preserving, conserving, propagating and studying wildlife,
- Conserving and studying natural environments, and
- Creating simulated natural environments.

The NPWA provides limited legal protection other than providing the above management objectives that should be applied to the management of the Reserve. This Plan of Management has taken into account the above purposes of a Wildlife Refuge in the definition of management values and action to be implemented in the future management of the Reserve.

With reference to the management of a Wildlife Refuge, Sections 70 and 71 of the Act defines specific guidelines for the management of fauna and native plants as outlined below.

NPWA	SPECIFIC GUIDELINES
Section 70 Fauna in wildlife refuges and other areas	<ul style="list-style-type: none"> <li>• A person shall not harm any fauna, or use any animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any fauna, being fauna within a wildlife refuge, conservation area, wilderness area or area subject to a wilderness protection agreement.</li> <li>• A person shall not carry, discharge or have in the person's possession any prohibited weapon, carry or have in the person's possession any explosive, net, trap or hunting device, or be accompanied by a dog, in a wildlife refuge, conservation area, wilderness area or area subject to a wilderness protection agreement.</li> </ul>
Section 71: Native plants in wildlife refuges, conservation areas and certain wilderness areas	<ul style="list-style-type: none"> <li>• A person shall not pick or have in the person's possession any native plant within a wildlife refuge, conservation area, wilderness area or area subject to a wilderness protection agreement..</li> </ul>

### 3.3.5 Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 superseded State Environmental Planning Policy No. 56 – Sydney Harbour Foreshores and Tributaries (SEPP 56) and Sydney Regional Environmental Plan No. 23 – Sydney and Middle Harbours

(SREP 23) in September 2005. The SREP (Sydney Harbour Catchment) consolidates the provisions of SEPP 56 and SREP 23. The Development Control Plan for Sydney Harbour Foreshores and Waterways accompanies the SREP (Sydney Harbour Catchment).

The SREP (Sydney Harbour Catchment) 2005 controls planning and development in the Sydney Harbour catchment which includes the Field of Mars Reserve. With respect to the Sydney Harbour catchment, the SREP (Sydney Harbour Catchment) 2005 aims to:

- Ensure the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained as an outstanding natural asset and as a public asset of national and heritage significance for existing and future generations;
- Ensure a healthy, sustainable environment on land and water;
- Achieve a high quality and ecologically sustainable urban environment;
- Ensure a prosperous working harbour and an effective transport corridor;
- Encourage a culturally rich and vibrant place for people;
- Ensure accessibility to and along Sydney Harbour and its foreshores; and
- Ensure the protection of, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity.

### 3.3.6 Companion Animals Act 1998

The Companion Animals Act 1998 aims to promote responsible animal ownership in NSW. Under the Act, dogs in public places must be on a lead under the effective control of a competent person, except in a declared off-leash area. Dogs are prohibited within 10 metres of children's play areas, food preparation / consumption areas, and recreation areas where dogs are prohibited by the local authority. If a dog defecates in a public place, the dog owner must remove and dispose of it in a rubbish receptacle.

Currently the nearest dog off-leash area is in Blenheim Park.

## 3.4 Local planning context

### 3.4.2 Public Utilities (refer to – Action Plan)

The core objectives for the management of utilities within Field of Mars Reserve are to facilitate the maintenance of existing utilities and reduce the impact of future utility structures affecting the natural and cultural aspects of the Reserve (this section is not a requirement under the Local Government Act 1993 but has been highlighted as an area which should be considered with the management of the Reserve).

### 3.4.3 Planning framework

City of Ryde's planning framework guides this Plan of Management as follows:

- CityVision 2022;
- Council's Management Plan, which sets overall objectives and performance targets for activities, budgets and other issues relating to open space and recreation management;

Planning instruments, particularly the Ryde Planning Scheme Ordinance, City of Ryde Development Control Plan 2006, govern uses of and development of facilities within the Reserve and

- Policy documents and documents, such as Parks on Track for People 2025, Ryde Bicycle Strategy and Masterplan (2007), Social Plan 2005; Access and Equity Policy; Tree Preservation Order and Tree Management Policy and cultural initiatives.

#### 3.4.4 City of Ryde Management Plan

Council's Management Plan contains a strategic overview of Council's proposed activities, budgets and other issues relating to the community and the environment. This Plan of Management is consistent with the vision formulated by City of Ryde in its current Management Plan for the whole of the City.

Council's vision in the current Management Plan is:

Ryde will be a dynamic and innovative city, a leader in environmental, economic and social sustainability.

Following on from the vision, Council's mission is:

*The City of Ryde will work with the community to provide essential services and promote a vibrant place to live.*

#### 3.4.5 Council policies and plans

##### ***Parks on Track for People 2025***

Council's vision for the parks and open spaces of Ryde will be:

"multi-purpose facilities providing sustainable leisure and recreational opportunities to meet the changing needs of the community."

Environmental protection and sustainability principles will be observed in relation to the management and administration of parks and open spaces, ensuring that natural resources (including water, soil, flora, fauna and scenic quality) are conserved wherever possible.

The values that the Ryde community puts on its parks and open spaces are:

- Recreation and leisure spaces should be well designed allowing multiple use or functionality of facilities;
- Assets are managed and maintained so they are safe, provided at optimum lifetime cost and meet community needs;
- Recreation and leisure facilities are available and accessible to provide an environment that facilitates play, learning and personal development;
- The natural environment, its native flora and fauna, are valued and will have priority in open space design, development and maintenance;
- Volunteers will be actively encouraged to assist in the delivery of quality parks and open spaces;
- Use of spaces by community and charitable groups will be encouraged; and
- Continuing engagement between people and parks including enhanced opportunities for all to visit, participate in, learn, respect, enjoy and conserve is a fundamental purpose of management.

##### ***Generic Plan of Management***

The Generic Plan of Management applies to the various categories of community land in Ryde. The Plan contains general principles of park use and management applying to

sportsgrounds, natural areas, parks, and general community use. This Plan of Management is consistent with the generic plan but shall override the generic Plan of Management in relation to the management of Field of Mars Reserve.

### **Social Plan**

Council's Social Plan 2005 includes specific Needs Papers for target groups of children, young people, older people, people of a culturally and linguistically diverse background, men, women and Aboriginal people. A framework for social planning for Ryde 2005-2010 is also presented.

### **Access and Equity Policy and Disability Action Plan**

Both the Access and Equity Policy (2003) and the Disability Action Plan 2006-2008 advocate provision of inclusive, equitable and accessible facilities and services in Ryde for all people with various disabilities. The Disability Action Plan states that open spaces and facilities throughout the City are intended to be accessible wherever possible and achievable within the landform. A key aim of the Plan is that people with disabilities need to be able to have full access to key parks (including Meadowbank Park), and linkage routes. Park furniture and signage in key parks needs to be accessible.

### **The City of Ryde Environment Strategy**

This strategy serves to integrate and co-ordinate Council's approach to environmental management and espouses the principles of ecologically sustainable development. The basis to the strategy is the eight environmental outcome areas extracted from the City of Ryde's Management Plan two of which are especially relevant to the management of the Field of Mars: Protected ecological systems and processes support life and the environment through actions that safeguard them and preserved natural areas which are enhanced and maintained. One of the strategy's main objectives is to ensure that the conservation of biodiversity is considered in all local area decisions.

#### **3.4.6 Ryde Local Environment Plan & Ryde Planning Scheme Ordinance (RPSO)**

Field of Mars Reserve comprises various land parcels with different zonings including Open Space, Special Uses and Residential A. The Reserve should be recognised through the development of a new, comprehensive LEP for the City of Ryde to secure it as open space and, potentially, future consolidation into a single lot.

Field of Mars Reserve is within Heritage Conservation Area No.1 as defined in Ryde LEP 105. Field of Mars Reserve is also listed as a heritage item in its own right under the LEP.

LEP 105 aims:

- (a) to conserve the heritage of the built and natural environment of the properties on the land to which this plan applies;
- (b) to integrate heritage conservation into the planning and development processes;
- (c) to provide for public involvement in matters relating to the conservation of the City of Ryde's heritage; and
- (d) to ensure that new development does not adversely affect:
  - (i) The heritage significance of heritage items and conservation areas;
  - (ii) The settings, including streetscapes and landscapes, of heritage items and conservation areas; and

- (iii) The distinctive character that heritage items and conservation areas impart to the City of Ryde's heritage.

The LEP 105 and RPSO place restrictions on the level of use and requires planning approval for undertaking works within the area identified.

#### 3.4.7 2008 Draft Ryde Local Environment Plan

The current draft Local Environment Plan (LEP) guides development control within the Field of Mars and defines categories for development as either permissible or prohibited. This Plan of Management does not override provisions in the LEP. Natural areas at the Field of Mars is proposed to be zoned E2 - Environmental Conservation under the draft 2008 LEP and the objectives of Zone E2 are as follows:

#### **Zone E2 Environmental Conservation**

##### **1 Objectives of zone**

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

##### **2 Permitted without consent**

Environmental protection works

##### **3 Permitted with consent**

Drainage; earthworks; environmental facilities; utility installations

##### **4 Prohibited**

Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Recreation facilities (major); Residential flat buildings; Retail premises; Seniors housing; Service stations; Warehouse or distribution centre; Any other development not specific in item 2 or 3

All other land will be zoned RE1 Recreation Existing

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## 4 - BASIS FOR MANAGEMENT

Field of Mars Reserve is subject to many and various issues for management. Discussions with stakeholder groups active in Field of Mars Reserve have established the main values for management of the Reserve.

The following section encapsulates the pressures and competition for resources that are placed upon the Reserve:

### 4.1 Natural Environment Values

The issues facing the Field of Mars Reserve are common to many urban bushland areas. However, as with all sites, there are particular issues requiring specific action to resolve;

- Weed invasion;
- Water quality and siltation of the creek system;
- Human impact within the Reserve especially within the interface of adjoining properties, particularly the Field of Mars Cemetery;
- Fire management; and
- Control of vehicles and domestic animals.

The natural environment values have also been identified by key stakeholder groups and interested parties. The key natural environment values identified are:

- The preservation of the environmental values contained within the Field of Mars Reserve;
- Representation of an intact transition of ecological communities from upper Shale areas to lower wetland areas.
- Contribution to the unique biodiversity of the local area and the Lane Cove River catchment.
- Accessibility as an educational facility and for passive recreation
- Contribution to improving water quality and fish stocks in Sydney Harbour.
- The work undertaken by regeneration groups has been important as a means of continuing the unique biodiversity of the area;
- It is an important bushland corridor linkage,
- Geology;
- Topography;
- The environment as an area for scientific research including the bush regeneration techniques; and
- Importance as part of a larger catchment leading into Sydney Harbour.

### 4.2 Cultural Heritage Values

The protection of environmental values to a large extent also provides protection of the cultural heritage values of the Reserve. Certainly the protection of the recorded Aboriginal site in the Reserve is important, as will be the case for any further recording of sites in the Reserve. Awareness of existing and potential sites is important for those working in the reserve, whether in professional or volunteer capacity.

### 4.3 Community Use Values

The attraction of a Reserve such as the Field of Mars for passive recreation is sometimes in conflict with its environmental values and protection. Clearly, such a resource should be available for recreation and enjoyment. However, some recreation uses are not in keeping with the Wildlife Refuge status of the reserve. Threats to the natural environment assets include indiscriminate access by motorbikes and bicycles.

BMX-style bike tracks constructed with corners, jumps and ramps to provide challenges for the riders, damage topography and flora each time one is built. Unfortunately, this type of activity results in the removal of native species, potential damage to rock outcrops and artefacts, increased erosion, soil compaction, destruction of habitat, making ideal conditions for proliferation of soil borne disease and weed species. Considerable issues of safety also result from such unauthorised works.

Indiscriminate traversal of the Reserve by foot or bicycle may offer to some the challenge of the terrain. However, this creates new openings into the bushland with the resultant weed impact, soil compaction, erosion and damage.

Use which conflicts with the environmental values of the reserve has proven to require more than signage to control. The installation of protective formal and informal fencing and barriers around the reserve in addition to notification and local vigilance will be considered as a control measure.

Many people enjoy walking through the bushland on the tracks to appreciate the health and spiritual benefits that this type of recreation provides. Many use the opportunity to exercise themselves and their dogs in this way. The gazettal of the Reserve as a Wildlife Refuge under the National Parks and Wildlife Act requires that dogs be prohibited in such areas (see section 3.4). Whilst this is a difficult matter to address in terms of community acceptance of what may be seen as a "right", the Act is clear in its requirements in regard to access by dogs. The promotion of this aspect and provision of alternate sites will need to be addressed.

There is opportunity for expansion of family based recreation to facilitate interpretation and enjoyment of the values of the environment as a whole and the reserve in particular. On the eastern side of Pittwater Road, Buffalo Creek Reserve in Hunters Hill LGA, is a popular place for family recreation and picnics. The existing filled grassed areas in the Field of Mars Reserve on the western side of Pittwater Road also provide for access by family groups. The Field of Mars Reserve provides the opportunity for the creation of an environmentally responsive place for family recreation and appreciation of the natural environment. To achieve this, the entrance at Pittwater Road will require improvement, parking needs to be rationalized, signage and barriers are needed to clearly define the Bushland and pathways and shelter improvements will need to be carried out.

A second creek crossing west of the Education Centre is planned to provide a loop education trail. The loop is planned as part of the boardwalk upgrade and will provide disability access through this part of the Reserve.



## 5 - ACTION PLAN

The aim of this Action Plan is to identify strategies to achieve the Management Objectives of the Field of Mars Plan of Management.

### 5.1 Objectives for Field of Mars Reserve

The unique environmental values and location of the Field of Mars Reserve and wildlife Refuge underpin all management policies, actions and decisions of this Plan. Accordingly, the Reserve will be used for low impact, environmental recreation that includes bush walking, bird watching and environmental education.

The preservation and restoration of natural features and wildlife habitat corridors will take precedence over other uses. The inclusion of low impact facilities, such as seating, picnic shelters and interpretation signage etc., which enhance enjoyment and understanding of the unique features of the Reserve will be located and maintained in appropriate locations. Carparking and entry gates will be located on the perimeter of the Reserve.

Other permitted uses within this area will include access for walking, environmental education and appreciation of natural features.

Illegal and damaging activities, such as bike riding and dog walking will be actively discouraged and Council will maintain appropriate fire breaks and fire protection zones to protect surrounding properties. Council will encourage neighbours to the Reserve to recognise their responsibility in the ongoing sustainable management of the Reserve.

Despite this, the overwhelming significance of this Reserve is as:

- A place for public recreation and promotion of the study and the preservation of native flora and fauna,
- A viable remnant of natural bushland which is rare in the region, and
- A unique area of biodiversity for both flora and fauna in Ryde.

### 5.2 Management Objectives

Because of the value of the unique qualities and location of the Field of Mars Reserve the following management objectives are recognised.

- Preservation of the environmental values contained within the Field of Mars Reserve.
- Conservation of the natural vegetation of Field of Mars Reserve especially endangered ecological communities and habitat areas for threatened species.
- Promotion of the Field of Mars for passive recreation and environmental education;
- Encouragement of community involvement in environmental and historic education, research, bush regeneration and heritage protection.
- Encouragement of cooperative management with adjacent neighbours to preserve the natural significance of the Field of Mars Reserve.
- Protection of potential and known archaeological resources.
- Ensure the need for the conservation of natural and cultural heritage assets of the Reserve underpins the actions.

Table headings are explained as follows:

**Objectives –** those core objectives for management of community land as set out in

Section 36 of the Local Government Act 1993.

- Strategies –** broad aims for the implementation of the objectives.
- Actions –** specific tasks required to implement the main objectives, consistent with the values and strategy.
- Priorities –** importance or urgency of the action required, rated as:

**Table 7: Definitions of the different Priority Listings**

<b>High</b>	<p>Safety issues in which there is a high probability of serious injury occurring.</p> <p>Work needed to ensure the essential function of the Reserve is not compromised.</p> <p>Work needed to eliminate or reduce severe environmental problems, such as loss of habitat, erosion or water pollution.</p> <p>There is a requirement under a Government Act or other legal obligation.</p>
<b>Medium</b>	<p>Ongoing preventative and remedial maintenance of existing reserve assets.</p> <p>Work required to resolve a conflict between user groups.</p> <p>Work needed to ameliorate adverse environmental conditions such as noise, or poor circulation and access.</p> <p>Works aimed at enhancing public enjoyment of the Reserve.</p>
<b>Ongoing</b>	<p>Works aimed at improving the general quality of the Reserve.</p> <p>Works aimed at reducing overall maintenance costs.</p>

- Responsibility –** who is responsible for undertaking the proposed strategies and actions.
- Performance indicators -** what will indicate that the proposed strategies and actions have been completed.

### 5.3 Licences

Licences allow multiple and non-exclusive use of an area. A licence may be required where intermittent or short- term use or control of all or part of the Reserve is proposed. A number of licences for different users can apply to the same area at the same time, provided there is no conflict of interest.

Licences can be established by the Council for public or private purposes, providing they are consistent with the major objectives of this Plan of Management, and that the residential and environmental amenity of surrounding areas is maintained.

Licences and leases for the use of the subject land for activities need to be permissible under the *Crown Lands Act 1989*, *Local Government Act 1993*, the Ryde Planning Scheme Ordinance, this Plan of Management, and pursuant to Development Consent if required.

#### 5.3.1 Field of Mars Visitors Centre

The purpose of the Visitor Centre is to support the overall objectives of the Reserve and promote the natural and cultural heritage of the Reserve. In accordance with this, the Centre will be associate with the following activities:

- Preservation of the environmental values contained in the Reserve;

- Conserving the natural vegetation of the Reserve;
- Promoting greater community awareness and appreciation of the features and values of the Reserve and the need to protect remnant native species and vegetation communities within the Sydney Region; and
- Encouraging community involvement in environmental and historic education, research, bush regeneration and heritage protection.

Council will take all steps necessary to ensure the Centre is maintained in good condition. This will include planning and budgeting for expenditure necessary to provide a secure and safe building for community use.

The RHHFFPS's use of the Visitors Centre will continue to include the following purposes:

- Society meetings;
- Voluntarily staffing of the Centre;
- Providing environmental information and education materials to the community, via organising on a voluntary basis open days, guided bushwalks, talks and seminars;
- Storage of bush regeneration tools and equipment;
- Storage of community education displays and stalls; and
- Storage of Society documents.

#### 5.3.2 Agreement for Use

A non-exclusive arrangement with RHHFFPS for the use of the Visitors Centre is appropriate for agreed purposes. This Plan of Management recognises the use of the Visitors Centre by the Ryde-Hunter's Hill Flora and Fauna Preservation Society however a more formal arrangement is required in alignment with Council Policy and the Crown Lands Act.

#### 5.3.3 Authorisation of Future Licences

##### **Crown Lands**

Licensing will be in accordance with the objectives and principles for leasing Crown land, and with Council's Community Facilities Plan and Community Facilities Licensing Policy.

All tenures over part or all of a Crown reserve are made between the Reserve Trust and the licensee, and are subject to the provisions of the *Crown Lands Act 1989*. Licence agreements are modelled on the standard Crown conditions applying to the leasing of Crown land under Section 34 of the *Crown Lands Act 1989*.

A licence over a Crown public reserve must be consistent with the purpose of the land's reservation or dedication. As such, any licence granted over Crown land within the Field of Mars Reserve must be consistent with the definition of Public Recreation, and guidelines for use of Crown reserves. Otherwise, the Minister cannot approve any licences granted by the Reserve Trust.

The Trust Manager has a responsibility to notify the Department of Lands of any licences. Consent must be obtained from the Minister for Lands before any long term licence on Crown land is granted. Licence agreements of less than 1 year (temporary licences) do not require the consent of the Minister and may be approved and issued by the Trust.

Other licences may be considered during the life of this Plan and will be assessed against the reserve purpose, other legislation and planning documents, The Department of Lands

Food and Beverage Policy and other applicable policies, Council's Community Facilities Licensing Policy and this Plan. Any proposed use of the Reserve that requires consent from Council will be subject to a Development Application or Activity Approval with appropriate conditions imposed.

### **Council Lands**

Any licence granted must comply with the core objectives of the relevant community land categorisation though existing agreements remain unaffected by the provisions of the Act until their expiry date. Nonetheless, the all licences must be consistent with the core objectives for land categorised.

### **Council Requirements**

City of Ryde Council as Trust manager can issue temporary licences to groups for temporary use of open space for events and functions. Council has requirements for waste management, insurance, hours, and possible service of alcohol associated with events and functions. If the proposal complies with Council requirements and the Plan of Management, permission is granted. Fees for short term, casual bookings will be in accordance with City of Ryde's adopted Fees and Charges that are applicable at the time as published in Council's annual Management Plan.

#### 5.3.5 Guidelines for Assessing Proposed Uses Under Licence

In considering whether to grant any licence in the Reserve, Council will take into account the consistency of the proposal with the values and objectives of this Plan of Management, particularly regarding:

- Whether the use/activity is in the public interest.
- Whether the use / activity is consistent with the public purpose of Crown land and / or the categorisation of community land.
- Whether the use/activity would not cause any significant detrimental impact on the reserve or on the local community.
- The impact of the licence on the public/private space of the reserve.
- The impact on maintaining the reserve as one cohesive open space.
- Compatibility with zoning and other Council requirements.
- Provision of benefits and services or facilities for the users of the land.
- Responsibility of the licensee for ensuring the area is maintained to a standard which is acceptable to Council.
- The need to define the times the land or facility will be available for use by the lessee/ licensee.
- Any fixed or temporary outdoor lighting of areas to be allowed only between the hours identified in the lease/licence.

Further considerations that may affect licences are:

- Fees can be charged as part of a licence and can be commercially based.
- The licensee must take out public risk insurance and produce notices of the policy as required on renewal.

- Use of the premises by the licensee is restricted to only those activities and times authorised in the licence.
- Any alteration, transfer or sub-letting etc. will not be permitted.
- Ownership of improvements should be dealt with in the licence.
- A licence can be terminated by either party where specified by the licence.

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
5.4.1 – Natural Area					
To conserve biodiversity and maintain ecosystem function in respect of the land, or the feature or habitat in respect of which the land is categorised as a natural area.	Identify Environmental Protection Zone (those areas to be categorized as a natural area)	Survey the boundaries of the Field of Mars Reserve. Identify incursions into the Reserve and take appropriate action.	High	COR	Survey completed and alienation identified.
		Identify and document the boundaries of the Environmental Protection Zone.	High	COR	EPZ identified and recorded in Council's data management systems and Environmental Plans.
	Identify and record biodiversity to maintain a diversity of habitats for native animals and plants	Review the flora and fauna assessment of the Reserve in line with the original assessment.	High	COR	Flora and fauna assessment reviewed and reported.
		Identify the location and map any rare and threatened species and develop/follow recovery plans where required or specified.	High	COR	Locations identified and mapped. Develop/follow recovery plans where required
	Control of Noxious weeds	Continue to identify any noxious weed species present, record areas of infestation and implement appropriate control measures.	Medium	COR	Reduction in amount of weed present
		Monitor and review weed control programs.	Ongoing	COR	Reduction in amount of weed present
	Control of Feral animals	Continue to implement the Fox baiting program.	Ongoing	COR	Program run on a regular basis
		Monitor other feral animals (such as rabbits) and develop control programs where necessary.	Ongoing	COR	Number of complaints received, programs run
		Implement and uphold the National Parks and Wildlife Act 1974 and the Field of Mars Reserves status as a "wildlife refuge" through signage and enforcement (where appropriate).	Ongoing	COR	Display and enforce S632 Signage with dog exclusion.
	Fire Management	Liaise with the NSW Fire Brigade regarding fire management.	Ongoing	COR	Continue to liaise with NSW Fire Brigade

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
		Review the need for a fire trail around the cemetery. Create a walking trail and regenerate if the fire protection zone is no longer required.	Medium	COR	Discuss with Bushcare groups, cemetery and NSW Fire Brigade.
To maintain the land, or that feature or habitat, in its natural state and setting.	Record any major works undertaken within these areas	Compile an inventory of all stabilisation structures and their condition. Place on the assets register. Include access/restoration action plans.	High	COR	Inventory developed and placed on Asset register
	No major earthworks to be undertaken within the Reserve that will change the natural lay of the land	Any major works proposed should provide means for protecting the existing landforms and vegetation and where possible works minimised. Comply with appropriate legislation.	High	COR	Minimal erosion when works undertaken by erosion and sedimentation plans being in place and enforced. Works to comply with legislative requirements
		Any works undertaken should observe best bush regeneration principles and standards of practice	High	COR	All works approved
To provide for the restoration and regeneration of the land.	Use established bush regeneration techniques	Educate people working within bushland areas or undertaking maintenance and infrastructure works programs of best bush regeneration principles and standards.	High	COR	Develop site inductions and materials that highlight the natural and historic values of the parks.
		All bush regeneration works be approved and supervised by the City of Ryde.	High	COR	All works approved and supervised.
		Use only plant species locally indigenous (ecosourced where possible) to the Field of Mars Reserve in regeneration/revegetation work.	Ongoing	COR	Only locally endemic species used for regeneration and revegetation sourced.
		Work from the upper catchment downstream.	Ongoing	COR	Continue Program
		Continue the integrated rehabilitation works within and around the disused Wellington Road Depot Site.	Ongoing	COR	Continue Program
To provide for community use of and access to the land in such a manner as will minimise and mitigate any disturbance caused by human intrusion.	Support and encourage community groups	Continued to support and provide funding for the Volunteer Bushcare Program.	Ongoing	COR	Continue Program

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
	Provide information for general public to disseminate and form appreciation of Reserve's significance.	Develop an arts/interpretive sign strategy describing local species and the importance of the Field of Mars Reserve for installation on existing tracks through the reserve.	Medium	COR	Instillation of interpretative signage.
		Inform visitors of the importance of staying on the designated track and the problems caused with introduced fauna and flora.	Ongoing	COR	Instillation of pathway signage.
		Maintain and improve existing walking tracks currently identified on the City Of Ryde database.	Ongoing	COR	Tracks maintained and recorded.
		Encourage the local community and neighbours to continue to support and assist in the conservation of native vegetation within and around the reserve.	Ongoing	COR	Community education program initiated
To assist in and facilitate the implementation of any provisions restricting the use and management of the land that are set out in a recovery plan or threat abatement plan prepared under the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994.	Facilitate the integrated management of the five vegetation communities as a Wildlife Refuge: <ul style="list-style-type: none"> <li>• Sydney Sandstone Ridgetop Woodland</li> <li>• Shale Sandstone Transition Forest:</li> <li>• Sydney Sandstone Gully Forest:</li> <li>• Estuarine Complex: and</li> <li>• Turpentine-Ironbark Marginal Forest.</li> </ul>	Liaise with other land managers who have similar vegetation communities to encourage best practice management.	Ongoing	COR	Attend appropriate meetings and discussions
		Consider and prioritise for implementation any actions listed in an approved recovery plan for the Turpentine-Ironbark Forest and Estuarine Complex when released.	Medium	COR	If a recovery plan is developed it is adopted by Council and any actions approved and funded.
		Continue to implement and manage the reserve as a Wildlife Refuge under the National Parks and Wildlife Act.	Ongoing	COR	Display and enforce S632 Signage.



Objective	Strategy	Action	Priority	Responsibility	Performance indicator
5.4.1(a) - Bushland					
To ensure the ongoing ecological viability of the land by protecting the ecological biodiversity and habitat values of the land, the flora and fauna (including invertebrates, fungi and micro-organisms) of the land and other ecological values of the land.	Ensure that all works undertaken in and around watercourses use established bush regeneration techniques to minimise potential erosion	Educate people working within bushland areas or undertaking maintenance and infrastructure works programs of best bush regeneration principles and standards.	Ongoing	COR	Develop site inductions and materials that highlight the natural and historic values of the parks.
		All bush regeneration works be approved and supervised by the City of Ryde.	Ongoing	COR	All works approved
		Coordinate maintenance and infrastructure works with the City of Ryde to ensure compliance with bush regeneration techniques.	Ongoing	COR	All works approved
	Develop a research /educational strategy	Identify potential areas of interest for research /educational projects.	Ongoing	COR	Incorporated into Landscape Masterplan
		Create buffer zones (where appropriate) to help reduce weed seed from entering bushland areas.	Medium	COR	Incorporated into Landscape Masterplan
		Protect (block off) areas containing sensitive plant species from human impacts and weed invasion.	High	COR	No inappropriate tracks or desire paths.
		Investigate and trial different methods of green waste disposal that promote habitat creation for small ground animals.	Ongoing	COR	Different methods trialed.
To promote the management of the land in a manner that protects and enhances the values and quality of the land and facilitates public enjoyment of the land, and to implement measures directed to minimising or mitigating any disturbance caused by human intrusion.	Develop a landscape strategy	All new landscaping undertaken within Field of Mars Reserve be sympathetic towards the natural environment and should incorporate local endemic species only.	High	COR	Develop a values based Landscape Masterplan.

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
		Provide landscape master plan detail to promote the management of the land in a manner that protects and enhances its values and quality, facilitates public enjoyment, and implements measures directed to minimising or mitigating any disturbance caused by human intrusion.	High	COR	Develop a values based Landscape Masterplan.
To restore degraded bushland.	Actively undertake bush regeneration activities taking into account habitat values	Continue to allocate funding for the continuing regeneration of degraded bushland areas within the Reserve.	Ongoing	COR	Continue Bush Regeneration Program
		Support and strengthen the Bushcare Groups	Ongoing	COR	Continue Program
		Undertake discussions with Cemetery Management regarding maintenance practices around the perimeter of the site to be more environmentally friendly.	Medium	COR	Discussions held with the Cemetery Trust.
To protect existing landforms such as natural drainage lines, watercourses and foreshores.	Monitor these areas and undertake regulatory action if required	Ensure erosion control measures are in place for any disturbance works undertaken within the Reserve.	High	COR	Guidelines to be developed and noted in the Landscape Masterplan
To retain bushland in parcels of a size and configuration that will enable the existing plant and animal communities to survive in the long term.	Ensure that all parcels of plant communities are of a size that they can survive in the long term	Assess trails throughout the Reserve to determine if the natural areas are too dissected or sensitive areas are being negatively impacted upon. Redirect or close those tracks that are not warranted.	High	COR	Tracks mapped and reviewed, unnecessary tracks closed.
		Close unnecessary/seldom used tracks to ensure that all parcels of plant communities are of a size that they can survive in the long term.	High	COR	Tracks mapped and reviewed, unnecessary tracks closed
		Continue to implement the State Environment Planning Policy No. 19 (SEPP 19).	High	COR	SEPP 19 implemented
To protect bushland as a natural stabiliser of the soil surface.	Retain natural vegetation cover where possible.	Prevent the removal of natural vegetation.	High	COR	Minimal cover disturbance

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
<b>5.4.1(b) - Wetland</b>					
To protect the biodiversity and ecological values of wetlands, with particular reference to their hydrological environment (including water quality and water flow), and to the flora, fauna and habitat values of the wetlands,	Ensure that all works undertaken in and around wetland and saltmarsh areas use established bush regeneration techniques	Educate people working within bushland areas or undertaking maintenance and infrastructure works programs of best bush regeneration principles and standards	High	COR	Develop site inductions and materials that highlight the natural and historic values of the parks.
To restore and regenerate degraded wetlands,	Remediation of saltmarsh areas	Accurately determine and map the extent of both the wetland and coastal saltmarsh areas.	High	COR	Areas accurately determine and map.
	Continue to allocate funding for remediation and maintenance of degraded areas.	Ongoing	COR	Continue Program	
To facilitate community education in relation to wetlands, and the community use of wetlands, without compromising the ecological values of wetlands.	Develop a research /educational strategy	Maintain and promote community education of the saltmarsh area.	Medium	COR	Signage maintained
<b>5.4.1(c) - Watercourse</b>					
To manage watercourses so as to protect the biodiversity and ecological values of the in stream environment, particularly in relation to water quality and water flows.	Improve water quality to increase the biodiversity and ecological values of the in stream environment	Investigate sedimentation and review options for control	Medium	COR	Review completed
	All work planned and undertaken on a catchment basis.	High	COR	Programs integrated	
		Control weed growth (especially exotic vines) and promote natural regeneration.	Ongoing	COR	Continue Program
		Prepare a floodplain management plan	Medium	COR	Plan developed
		Install stormwater quality improvement devices on piped drainage systems	Medium	COR	Devices installed
		Maintain a long-term water quality monitoring program.	Ongoing	COR	Continue Program

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
To manage watercourses so as to protect the riparian environment, particularly in relation to riparian vegetation and habitats and bank stability.	Ensure that all works undertake in and around watercourses use established best bush regeneration techniques	People working within bushland areas or undertaking maintenance and infrastructure works programs should be aware of established best bush regeneration techniques principles and practices.	High	COR	Develop site inductions and materials that highlight the natural and historic values of the parks.
		All bush regeneration works be approved by the City of Ryde	High	COR	All works approved
		Develop standards for the rehabilitation of disturbance to riparian areas.	Medium	COR	Standards developed
To restore degraded watercourses.		Maintenance sediment ponds	Ongoing	COR	Incorporated into annual maintenance program
		Undertake creek rehabilitation and bank restoration as required	Ongoing	COR	Works undertaken as required
	Remediation of degraded areas	Evaluate options for the remediation of the low-lying wet areas along both creek lines; <ul style="list-style-type: none"> <li>work from the upper reaches down,</li> <li>confine water flow, and</li> <li>research funding options for different projects.</li> </ul>	Medium	COR	Options evaluated and works undertaken as funding allows
To promote community education, and community access to and use of the watercourse, without compromising the other core objectives of the category.	Actively encourage research projects into the flora and fauna of the Reserve	Undertake research into: <ul style="list-style-type: none"> <li>fauna and flora monitoring;</li> <li>soils, drainage and nutrient levels in the reserve and their impacts on vegetation communities;</li> <li>appropriate use of fire and fire regimes for conserving the vegetation of the reserve;</li> <li>the value of the reserve as wildlife habitat in a regional context;</li> <li>long term monitoring of the stormwater trap device objectives.</li> <li>habitat/food requirements for fauna within the reserve;</li> <li>archaeological investigations related to former uses and occupation, including Indigenous inhabitants.</li> </ul>	Medium	COR	Actively assist and partner with other authorities and bodies to achieve appropriate scientific outcomes.

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
5.4.2 - Park					
Consolidate land parcels under one title to ensure the integrity of the reserve and its values	Consolidate land tenure	Enter into discussions with Department of Lands to consolidate land tenure.	Medium	COR	Discussions held with Department of Lands, conclusions reported to Council for consideration.
	Include Field of Mars Cemetery into the established values of the Reserve	Enter into discussions with the Cemetery Trust to promote the established values of the Reserve.	Medium	COR	Discussions held with the Cemetery Trust.

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
To encourage, promote and facilitate recreational, cultural, social and educational pastimes and activities.	Continue to implement the way finding strategy (Arts strategy)	<p>Review existing walking tracks to consolidate all parcels of plant communities and ensure that they are of a size that can survive in the long term. Rehabilitate informal or unnecessary tracks within the reserve and discourage their use through interpretation and education.</p> <p>Identify:</p> <ul style="list-style-type: none"> <li>• points of interest, both environmental and historical</li> <li>• entry and exit point to the park</li> <li>• regulatory requirements ie. no dogs, no fires, no camping, etc.</li> <li>• Ensure signage is in line with the City of Ryde standards for signage in natural areas.</li> <li>• entry signs to show walking tracks</li> <li>• regulatory information</li> <li>• Interpretation should include: <ul style="list-style-type: none"> <li>• the value of the remnant bushland</li> <li>• historical/cultural attributes of the Reserve</li> <li>• maps of tracks, trails, links and distances</li> <li>• flora and fauna attributes</li> </ul> </li> <li>• appropriate behaviour in regards to dealing with native fauna (i.e. procedures for dealing with problem animals, the need to discourage feeding native birds and animals)</li> <li>• disabled access opportunities</li> <li>• links to regional systems (E.g. Great North Walk)</li> </ul>	High	COR	<p>Tracks mapped and reviewed, unnecessary tracks closed.</p> <p>Incorporated into Landscape Masterplan</p>

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
To improve the land in such a way as to promote and facilitate its use to achieve the other core objectives for its management.	Provide for disabled access	Install paths and signage to major facilities such as the Environmental Education Centre and Visitors Centres which, where possible, comply with the Disability Discrimination Legislation.  Provide, where possible, some walking tracks that can accommodate people with Disabilities and comply with the Disability Discrimination Legislation.	High	COR	Paths and signage upgraded
5.4.3 - Areas of cultural significance					
To retain and enhance the cultural significance of the area (namely its Aboriginal, aesthetic, archaeological, historical, technical or research or social significance) for past, present or future generations by the active use of conservation methods.	Identify, retain and conserve significant surviving isolated relics and landscape features	Establish protection guidelines for the preservation of identified archaeological relics. This should take into account surrounding bush regeneration works.	Medium	COR	Incorporated into Landscape Masterplan
	Continue to identify any Aboriginal sites found on the reserve and consult with the Metropolitan Aboriginal Land Council and the National Parks and Wildlife Services	Include in archaeological survey any Aboriginal historic cultural sites and establish protection criteria to prevent their disturbance.	Medium	COR	Incorporated into Landscape Masterplan
5.4.4 - General Community Use					
In relation to public recreation and the physical, cultural, social and intellectual welfare or development of individual members of the public.	Develop suitably designed and located facilities which meet the recreation needs of the community without impacting negatively on the intrinsic values of the Reserve.	Provide Safe Access that meets Australian Standards. Include disabled access requirements where practical.  Have toilet facilities that are accessible by the general public during the day on weekdays and weekends.	Medium	COR	Incorporated into Landscape Masterplan
	Ensure passive recreation is compatible with Natural and Cultural Heritage status.	Provide a landscape plan locating structures and passive recreation uses. Such facilities may include - picnic shelters, barbeques, seats.  Do not allow camping, fires, bicycles, horses and dogs within the Reserve.	Medium	COR	Incorporated into Landscape Masterplan

Objective	Strategy	Action	Priority	Responsibility	Performance indicator
	Establish an educational strategy for Reserve visitors	Develop a signage strategy to convey the natural and cultural significance of the area. Ensure all signage is sensitively located and designed.	Medium	COR	Incorporated into Landscape Masterplan
In relation to purposes for which a lease, licence or other estate may be granted in respect of the land (other than the provision of public utilities and works associated with or ancillary to public utilities).	A formal agreement established for the Visitors Centre.	An agreement with Ryde-Hunter's Hill Flora and Fauna Preservation Society for the use of the Visitors' Centre is finalised	High	COR RHHFFPS	Agreement finalised
	Assess existing infrastructures and facilities and devise strategies for their maintenance and protection of surrounding features.	Any additional facilities constructed within the reserve shall incorporate the protection of surrounding features.	High	COR	Incorporated into Landscape Masterplan
5.4.5 - Utilities					
To facilitate the maintenance of existing utilities and reduce the impact of future utility structures affecting the natural and cultural aspects of the Reserve.	Review existing parking within the Reserve	Investigate the parking requirements for the Environmental Education Centre. Install bike racks Review car parking requirements at Pittwater Road entry to Reserve.	Medium	COR	Incorporated into Landscape Masterplan
		Consult the EEC on a traffic circulation and parking strategy.	Medium	COR	Incorporated into Landscape Masterplan
		Upgrade / repair the existing road.	Medium	COR	Incorporated into Landscape Masterplan
		Upgrade all gates to prevent unauthorised access.	Medium	COR	Incorporated into Landscape Masterplan
		Review keyed access to gates.	Medium	COR	Incorporated into Landscape Masterplan
	Review current structures and facilities owned or controlled by other agencies.	Accurately map locations of sewer lines, telephone lines, water pipes and powerlines.	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan



Objective	Strategy	Action	Priority	Responsibility	Performance indicator
	Set strategy for public utility works to be carried out within the Reserve	Provide reporting guidelines for any works that need to be undertaken within the reserve on these assets.	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan
		Work with Sydney Water to indicate any areas where there could be a maintenance problem and how they would repair that section. Develop an access plan for these areas.	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan
		Investigate alternative locations for power lines that currently run within the park	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan
		Review power line locations around and within the Park with the view of options regarding power line locations and maintenance programs.	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan
		Develop standards for erosion control, stabilisation and remediation/rehabilitation works for public infrastructure groups to follow.	Medium	COR	Guidelines and easements to be developed and noted in the Landscape Masterplan
	Assess boundary fencing around the Reserve	Provide adequate fencing around the Reserve where required.	Medium	COR	Fencing assessed and installed where required
Protection of surrounding residents and property from fire	Maintain appropriate fire breaks in partnership with neighbours to protect houses	Maintain firebreaks and Asset protection Zones on a regular basis.  Communicate to the neighbouring community their responsibility in reducing risk in the event of fire.	High	COR	Firebreaks maintained, education undertaken
(a) Minimise the risk of foreign material introductions' such as mulch.	Develop a policy	Develop a policy to prevent/minimise the introduction of foreign pathogens, diseases and other material from entering the Reserve, eg, mulch, soils and plant material. Minimise the risk of noxious weed spread/introduction, introduction of pathogens such as Phytophthora.	High	COR	Policy implemented

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## SECTION 6 - IMPLEMENTATION AND REVIEW

Once the Council and the Lands Minister adopt this Plan of Management, it is incumbent on the Council to “carry out and give effect to it” (Section 114 of the Crown Lands Act 1989). The Trust must only allow operations or development that is in accordance with the Plan of Management.

Implementation of the Plan will be monitored annually with the preparation of annual performance standards and capital works programs. Performance standards and works programs for administration, maintenance and upgrading works are revised each year to meet allocated budgets and works priorities determined in Council’s Management Plan.

### 6.1 Review of this Plan of Management

Alteration of the adopted Plan of Management may be undertaken under Section 115 of the *Crown Lands Act*, and may be required after a period of five years to keep abreast of government legislation and policy, Ministerial directions, to cater for the changing expectations and requirements of the community, to recognise completed actions, and to ensure the Plan of Management remains useful and relevant. Review of this Plan of Management should also take into account the outcomes of periodic reviews of Council’s strategic and operational plans. The Action Plan tables have a shorter life and therefore require more frequent reviews and updating. The Action Plan tables should be reviewed and revised yearly in accordance with Council’s budgets, Capital Works Program and changing priorities.

Funding for management of the Reserve will be sought from a range of Government, Council and community sources.

### 6.2 Funding Sources and Opportunities

There are a number of approaches that Council and Crown Reserve Trusts can take in funding the implementation of this Plan of Management. City of Ryde, as Trust Manager and Owner, is likely to fund most of the proposed improvements to the Reserve.

#### ***Reserve Trust Proceeds***

Under Section 106 of the *Crown Lands Act* 1989, the Minister may direct that proceeds from a sale, lease, easement or licence (including a temporary licence) of a Crown reserve be paid to:

- Another Reserve Trust to be used for care, control and management of the other Trust’s reserve.
- The Consolidated Fund or to a Public Reserves Management Fund under the *Public Reserves Management Fund Act 1987*.

The Public Reserves Management Fund provides loans or grants that assist Crown Reserve Trusts in the management, planning and development of Crown reserves. The fund principally relies on levies on coastal caravan parks, and repayments of loan principal and interest. A 15% levy on the proceeds from leases and licenses that can then be applied for the care and maintenance of reserves also contributes to the Public Reserves Management Fund. Funds are distributed on a merit basis to Trusts that apply for grant funds for specific projects.

### **Council Funding**

The implementation of this Plan of Management is achieved through its linkage with Council's Management Plan, Operational Budget, and Capital Works Program. Funding is integral to implementing the Plan. Council currently funds management and maintenance costs through its annual budget allocation, and uses capital funds and Section 94 funding for capital and non-recurrent works.

Funding for construction of new facilities is generally through the annual budgeting process, but special projects may be partly funded through State Government grant allocations, which may involve matching funding from Council.

Staging of works will need to occur because Council cannot meet the cost of every single item of work proposed at one time, due to other financial commitments throughout the City. Actions listed in the Action Plans have been prioritised, which will assist in preparing forward open space work programs and annual budgets. This Plan will therefore provide direction for future works in the Reserve.

- Section 94A contributions - Council currently enters into planning agreements, or levies contributions or works in kind from developers towards the cost of upgrading facilities, including parks, to meet the needs of new development.
- Partnerships - Local residents and corporate groups participate in bushcare activities. There is an opportunity to develop further partnerships with residents and interested people in relation to Reserve improvements and ongoing management.
- Rental income - Income from the Reserve is generated by licence fees, and from applicants for approved functions and events.
- Rationalisation and disposal - Revenue for Reserve projects and improvements may be raised from the sale of assets, such as surplus or inappropriate land.

### **Grants**

A number of Commonwealth and State government grants are available to assist with capital works within the Reserve.

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National Parks:

<http://www.nationalparks.nsw.gov.au>

New South Wales legislation:

[www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au) and

[www.austlii.edu.au](http://www.austlii.edu.au).

City of Ryde website:

[www.ryde.nsw.gov.au](http://www.ryde.nsw.gov.au).

## ACKNOWLEDGEMENTS

Bev Debrincat and Pamela Ward

Field of Mars Environmental Education Centre

Powe Partnership

Ryde-Hunters Hill Flora and Fauna Preservation Society

## DEFINITIONS

**Community land** means land that is classified as community land under Division 1 of Part 2 of Chapter 6

**Common**, as defined in the Commons Management Act 1989, means:

(a) a parcel of land which, on or before 1 February 1909, had, by any instrument made by the Governor, been set aside as a common for the use of the inhabitants of any specified locality or the cultivators or farmers of any locality in which the parcel of land is situated, or

(b) any parcel of land which, after that date, has been set aside by the Governor or the Minister as a common or for pasturage for the use of the inhabitants of a specified locality,

but does not include such a parcel where the setting aside of the common has been revoked or otherwise terminated.

**Crown land**, as defined in the Crown Lands Act 1989, means land that is vested in the Crown or was acquired under the Closer Settlement Acts as in force before their repeal, not in either case being:

(a) land dedicated for a public purpose, or

(b) land that has been sold or lawfully contracted to be sold and in respect of which the purchase price or other consideration for the sale has been received by the Crown.

**Public land** - all land owned by councils, and all land, other than Crown land and commons, which has been placed, or falls, under their care and control, is defined as public land. councils must keep a register of their land and make it available to the general public. All public land has to be classified as either community or operational land and anybody can obtain a certificate of classification from a council. The general position is that there are no

special restrictions on councils powers to manage, develop or dispose of operational land, subject to the provisions of relevant environmental planning instruments. Community land on the other hand, cannot be sold or otherwise disposed of by councils. There are also restrictions on community land use and on the grant of leases and licences.

Those Crown land reserves which have not been vested in a council, but fall or are placed under councils care and control are excluded from the definition of public land and fail to be assessed and managed under the provisions of the Crown Lands Act 1989. (Farrier, D. Lyster, R. and Pearson L. 3rd ed. 1999 Environmental Law Handbook Redfern, Australia. page 157)

**Public Reserve** means:

- (a) a public park, or
- (b) any land conveyed or transferred to the council under section 340A of the Local Government Act 1919, or
- (c) any land dedicated or taken to be dedicated as a public reserve under section 340C or 340D of the Local Government Act 1919, or
- (d) any land dedicated or taken to be dedicated under section 49 or 50, or
- (e) any land vested in the council, and declared to be a public reserve, under section 37AAA of the Crown Lands Consolidation Act 1913, or
- (f) any land vested in the council, and declared to be a public reserve, under section 76 of the Crown Lands Act 1989, or
- (g) a Crown reserve that is dedicated or reserved:
  - (i) for public recreation or for a public cemetery, or
  - (ii) for a purpose that is declared to be a purpose that falls within the scope of this definition by means of an order published in the Gazette by the Minister administering the Crown Lands Act 1989,
- being a Crown reserve in respect of which a council has been appointed as manager of a reserve trust for the reserve or for which no reserve trust has been established, or
- (h) land declared to be a public reserve and placed under the control of a council under section 52 of the State Roads Act 1986, or
- (i) land dedicated as a public reserve and placed under the control of a council under section 159 of the Roads Act 1993,

and includes a public reserve of which a council has the control under section 344 of the Local Government Act 1919 or section 48, but does not include a common.

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## APPENDIX A - Plant Species Listing for the Field of Mars Reserve

The species list below has been adapted from Biosphere Environmental Consultants Pty Ltd. 2006, Ryde Flora And Fauna Study 2006, City of Ryde. The species list is compiled from a draft report Native Plants of the Ryde District - The Conservation Significance of Ryde's Bushland Plants (PJ Kubiak, 2005) for Ryde City Council and comprises observations from 1979-2005. The species contained in this list are given a conservation status (CS) by Kubiak and are those that are common (C) and scattered (S) generally in Ryde's bushland. Others are apparently uncommon in bushland of the Ryde district (U), rare in Ryde's bushland (R), or apparently uncommon to rare (U-R).

The study only involved observations over several days in the autumn (March-May) and spring (September-November) 2006 so is likely that some species are missed due to lack of observation time.

Plants listed on the Threatened Species Act 1995 are marked with a + sign. Several orchids have been observed in previous years by Bev Debrincat and are marked with a BD.

**Table 8: Plant species listing for the Field of Mars Reserve (adapted from Biosphere Environmental Consultants Pty Ltd. 2006, Ryde Flora And Fauna Study 2006, City of Ryde.)**

FAMILY	SPECIES NAME	CS	
<b>Pteridiophytes</b>			
ADIANTACEAE	Adiantum aethiopicum	C	√
ASPLENIACEAE	Asplenium australasicum	U	√
	Asplenium flabellifolium	S	√
BLECHNACEAE	Blechnum cartilagineum	C	√
	Doodia caudata var caudata	S	√
CYATHEACEAE	Cyathea australis	C	√
DENNSTAEDTIACEAE	Histiopteris incisa	S	√
	Hypolepis muelleri	S	√
	Pteridium esculentum	C	√
DICKSONIACEAE	Calochlaena dubia	C	√
DRYOPTERIDACEAE	Lastreopsis decomposita	C	√
GLEICHENIACEAE	Gleichenia dicarpa	C	√
	Gleichenia microphylla	S	√
	Sticherus flabellatus	S	√
LINDSAEACEAE	Lindsaea microphylla	C	√
POLYPODIACEAE	Platyterium bifurcatum ssp bifurcatum	S	√
	Pyrrosia rupestris	U	√
PTERIDIACEAE	Pteris umbrosa		√
SINIPTERIDACEAE	Cheilanthes distans	R	√
	Cheilanthes sieberi	C	√
	Pellaea falcata var falcata	S	√
THELYPTERIDACEAE	Christella dentata	S	√
<b>Gymnosperms</b>			
PODOCARPACEAE	Podocarpus spinulosus	S	√
<b>Angiosperms-Dicotyledons</b>			
ACANTHACEAE	Pseuderantherum variabile	C	√
	Brunoniella australis		
	Brunoniella pumilio		
AIZOACEAE	Tetragonia tetragonioides	S	√

FAMILY	SPECIES NAME	CS	
AMARANTHACEAE	Alternanthera denticulata	C	√
APIACEAE	Actinotus helianthi	C	√
	Actinotus minor	C	√
	Centella asiatica	S	√
	Hydrocotyle peduncularis	C	√
	Hydrocotyle tripartita	R	√
	Platysace lanceolata	C	√
	Platysace linearifolia	C	√
	Xanthosia pilosa	C	√
	Xanthosia tridentata	C	√
ARACEAE	Alocasia brisbanensis		√
ARALIACEAE	Polyscias sambucifolia	C	√
ASCLEPIADACEAE	Marsdenia suaveolens	S	√
	Tylophora barbata	S	√
ASTERACEAE	Cassinia aculeata	U	√
	Epaltes australis	R	√
	Olearia microphylla	S	√
	Ozothamnus diosmifolius	C	√
	Senecio hispidulus var. hispidulus		√
	Sigesbeckia orientalis ssp orientalis	S	√
BAUERACEAE	Bauera rubioides	S	√
BIGNONIACEAE	Pandorea pandorana	C	√
CAMPANULACEAE	Wahlenbergia gracilis	C	√
CASSYTHACEAE	Cassytha glabella		√
	Cassytha pubescens		√
CASUARINACEAE	Allocasuarina littoralis	C	√
	Allocasuarina torulosa	C	√
	Casuarina glauca	C	√
CHENOPODIACEAE	Einadia hastata	S	√
	Sarcocornia quinqueflora ssp quinqueflora	S	√
CLUSIACEAE	Hypericum gramineum	S	√
CONVOLVULACEAE	Dichondra repens (s.lat.)	S	√
CUNONIACEAE	Callicoma serratifolia	C	√
	Ceratopetalum apetalum	S	√
	Ceratopetalum gummiferum	C	√
DILLENACEAE	Hibbertia aspera	C	√
	Hibbertia dentata	S	√
	Hibbertia empetrifolia		
	Hibbertia fasciculata	S	√
	Hibbertia linearis	C	√
	Hibbertia riparia (s.lat.)	U	√
DROSERACEAE	Drosera auriculata	C	√
ELAEOCARPACEAE	Elaeocarpus reticulatus	C	√
EPACRIDACEAE	Epacris microphylla	S	√
	Epacris pulchella	C	√
	+ Epacris purpurascens var. purpurascens	S	√
	Leucopogon ericoides	S	√
	Leucopogon juniperinus	S	√
	Styphelia longifolia	U-R	√
	Styphelia triflora	U	√

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FAMILY	SPECIES NAME	CS	
	Woolsia pungens	C	√
EUPHORBIACEAE	Amperea xiphoclada var papillata	C	√
	Breynia oblongifolia	C	√
	Glochidion ferdinandi	C	√
	Micrantheum ericoides	C	√
	Omalanthus nutans	S	√
	Phyllanthus hirtellus (ex P thymoides)	C	√
	Poranthera microphylla		
	Ricinocarpos pinifolius	S	√
FABACEAE	Acacia brownii	U	√
	Acacia falcata	S	√
	Acacia floribunda		√
	Acacia linifolia	C	√
	Acacia longifolia	C	√
	Acacia myrtifolia	C	√
	Acacia parramattensis	C	√
	Acacia stricta	U	√
	Acacia suaveolens	C	√
	Acacia terminalis	C	√
	Acacia ulicifolia	C	√
	Bossiaea heterophylla	C	√
	Bossiaea obcordata	C	√
	Bossiaea scolopendria	S	√
	Daviesia ulicifolia	S	√
	Dillwynia retorta	C	√
	Glycine clandestina	C	√
	Glycine microphylla		√
	Gompholobium glabratum	S	√
	Gompholobium latifolium	S	√
	Gompholobium pinnatum	R	√
	Hardenbergia violacea	C	√
	Hovea linearis (s.str.)	S	√
	Kennedia rubicunda	C	√
	Mirbelia rubiifolia	S	√
	Phyllota phylicoides	C	√
	Platylobium formosum ssp formosum	C	√
	Pultenaea daphnoides	C	√
	Pultenaea elliptica		
	Pultenaea flexilis	C	√
	Pultenaea paleacea	R	√
	Pultenaea retusa		√
	Pultenaea villosa	U	√
	Sphaerolobium vimineum		√
	Viminaria juncea	S	√
GERANIACEAE	Geranium homeanum	S	√
GOODENIACEAE	Dampiera stricta	C	√
	Goodenia hederacea ssp hederacea	C	√
	Goodenia heterophylla ssp heterophylla	S	√
HALORAGACEAE	Gonocarpus teucroides	C	√
LAMIACEAE	Plectranthus parviflorus	U	√

FAMILY	SPECIES NAME	CS	
LOBELIACEAE	Lobelia alata	S	√
	Lobelia dentata	C	√
	Lobelia gracilis	C	√
	Pratia purpurascens	C	√
LOGANIACEAE	Logania albiflora	S	√
	Mitrasacme polymorpha	C	√
MORACEAE	Ficus rubiginosa	S	√
MYRSINACEAE	Aegiceras corniculatum		√
MYRTACEAE			
	Acmena smithii	U	√
	Angophora bakeri	S	√
	Angophora costata	C	√
	Austromyrtus tenuifolia	U	√
	Baeckea linifolia	S	√
	Callistemon citrinus	U	√
	Callistemon linearis	S	√
	Callistemon salignus	U	√
	Corymbia gummifera	C	√
	Eucalyptus acmenoides	R	√
	Eucalyptus haemastoma		√
	Eucalyptus oblonga		√
	Eucalyptus pilularis	S	√
	Eucalyptus piperita	C	√
	Eucalyptus punctata	U	√
	Eucalyptus racemosa	S	√
	Eucalyptus resinifera	S	√
	Eucalyptus saligna	S	√
	Kunzea ambigua	C	√
	Leptospermum arachnoides	S	√
	Leptospermum parvifolium	U	√
	Leptospermum polygalifolium ssp polygalifolium	C	√
	Leptospermum trinervium	C	√
	Melaleuca decora	R	√
	Melaleuca ericifolia	R	√
	Melaleuca linariifolia	S	√
	Melaleuca nodosa		√
	Melaleuca stypheloides	U	√
	Syncarpia glomulifera	S	√
	Tristaniopsis laurina	C	√
OLEACEAE	Notelaea longifolia	C	√
PITTOSPORACEAE	Billardiera scandens	C	√
	Bursaria spinosa	C	√
	Pittosporum revolutum	C	√
	Pittosporum undulatum		
POLYGONACEAE	Persicaria decipiens		√
	Persicaria hydropiper		√
	Persicaria lapathifolia		√
	Persicaria strigosa		√
	Rumex brownii	S	√
PRIMULACEAE	Samolus repens	C	√

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FAMILY	SPECIES NAME	CS	
PROTEACEAE	Banksia ericifolia var ericifolia	C	√
	Banksia marginata		√
	Banksia oblongifolia	C	√
	Banksia serrata	C	√
	Banksia spinulosa var spinulosa	C	√
	Grevillea buxifolia	C	√
	Grevillea mucronulata		√
	Grevillea sericea	C	√
	Hakea dactyloides (s.str.)	S	√
	Hakea salicifolia ssp salicifolia	S	√
	Hakea sericea	C	√
	Isopogon anemonifolius	S	√
	Lambertia formosa	C	√
	Lomatia silaifolia	C	√
	Persoonia lanceolata	C	√
	Persoonia laurina spp laurina		
	Persoonia levis	C	√
	Persoonia linearis	C	√
	Persoonia pinifolia	S	√
	Petrophile pulchella		
Telopea speciosissima	R	√	
Xylomelum pyriforme	S	√	
RANUNCULACEAE	Clematis aristata	C	√
	Clematis glycinoides	C	√
RHAMNACEAE	Pomaderris discolor		√
	Pomaderris elliptica		√
	Pomaderris lanigera	U	√
RUBIACEAE	Opercularia aspera	C	√
	Opercularia varia	S	√
	Pomax umbellata	C	√
RUTACEAE	Boronia ledifolia	S	√
	Correa reflexa var reflexa (pale yellow flowered)	S	√
	Zieria laevigata	R	√
	Zieria pilosa	C	√
	Zieria smithii	C	√
SANTALACEAE	Exocarpos cupressiformis	S	√
SAPINDACEAE	Dodonaea triquetra	C	√
SCROPHULARIACEAE	Veronica plebeia	C	√
STERCULIACEAE	Lasiopetalum ferrugineum var. ferrugineum	C	√
STYLIDIACEAE	Stylidium graminifolium	S	√
THYMELAEACEAE	+Pimelea curviflora var curviflora		√
	Pimelea linifolia	C	√
VERBENACEAE	Avicennia marina var australasica	C	√
VITACEAE	Cayratia clematidea		√
<b>Angiosperms-Monocotyledons</b>			
ARECACEAE	Livistona australis	R	√
COMMELINACEAE	Commelina cyanea	S	√
CYPERACEAE	Baumea juncea	S	√
	Carex inversa	S	√
	Caustis flexuosa	C	√

FAMILY	SPECIES NAME	CS	
	<i>Cyperus gracilis</i>		√
	<i>Cyperus imbecillis</i>		√
	<i>Cyperus polystachyos</i>		?
	<i>Cyperus sphaeroides</i>		√
	<i>Gahnia clarkei</i>	S	√
	<i>Gahnia erythrocarpa</i>	C	√
	<i>Gahnia sieberiana</i>		√
	<i>Isolepis cernua</i>	R	√
	<i>Isolepis inundata</i>	R	√
	<i>Lepidosperma gunni</i>	S	√
	<i>Lepidosperma laterale</i>	C	√
	<i>Schoenus apogon</i>	S	√
	<i>Schoenus melanostachys</i>	C	√
	<i>Tetraria capillaris</i>	C	√
HAEMODORACEAE	<i>Haemodorum planifolium</i>	C	√
IRIDACEAE	<i>Patersonia sericea</i>	C	√
JUNCACEAE	<i>Juncus continuous</i>		√
	<i>Juncus kraussii</i>	S	√
	<i>Juncus usitatus</i>		√
LILIACEAE	<i>Burchardia umbellata</i>	C	√
	<i>Dianella caerulea</i>	C	√
	<i>Dianella revoluta</i>	S	√
	<i>Laxmannia gracilis (s.str.)</i>	C	√
	<i>Tricoryne simplex</i>	C	√
LOMANDRACEAE	<i>Lomandra cylindrica</i>	S	√
	<i>Lomandra filiformis ssp. correacea</i>		√
	<i>Lomandra filiformis ssp. filiformis</i>	S	√
	<i>Lomandra gracilis</i>	S	√
	<i>Lomandra longifolia</i>	C	√
	<i>Lomandra multiflora ssp multiflora</i>	C	√
	<i>Lomandra obliqua</i>	C	√
ORCHIDACEAE	<i>Acianthus fornicatus</i>	C	√
	<i>Caladenia catenata</i>	C	√
	<i>Calochilus sp</i>		BD
	<i>Calochilus paludosus</i>	S	√
	<i>Calochilus robertsonii</i>		
	<i>Cryptostylis erecta</i>	C	√
	<i>Cryptostylis subulata</i>	S	√
	<i>Dipodium variegatum</i>	C	BD
	<i>Prasophyllum sp</i>		BD
	<i>Pterostylis concinna</i>	S	√
OXALIDACEAE	<i>Oxalis perennans</i>		
PHILESIACEAE	<i>Eustrephus latifolius</i>		√
POACEAE	<i>Anisopogon avenaceus</i>	C	√
	<i>Aristida ramosa var ramosa</i>		√
	<i>Aristida vagans</i>	C	√
	<i>Austrodanthonia pilosa</i>		√
	<i>Austrostipa pubescens</i>	C	√
	<i>Austrostipa ramossissima</i>		√
	<i>Bothriochloa macra</i>		√

<b>FAMILY</b>	<b>SPECIES NAME</b>	<b>CS</b>	
	<i>Deyeuxia quadriseta</i>	S	√
	<i>Dichelachne micrantha</i>		√
	<i>Dichelachne rara</i>		√
	<i>Digitaria parviflora</i>		√
	<i>Echinopogon caespitosus</i>	C	√
	<i>Echinopogon ovata</i>		√
	<i>Entolasia marginata</i>	S	√
	<i>Entolasia stricta</i>	C	√
	<i>Eragrostis brownii</i>		√
	<i>Imperata cylindrica</i> var major	C	√
	<i>Lachnagrostis filiformis</i>	S	√
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	C	√
	<i>Oplismenus aemulus</i>	S	√
	<i>Oplismenus imbecillis</i>	S	√
	<i>Panicum simile</i>	S	√
	<i>Phragmites australis</i>		√
	<i>Poa affinis</i>		√
	<i>Poa labillardieri</i>		√
	<i>Sporobolus virginicus</i> var <i>virginicus</i>	S	√
	<i>Tetrarrhena juncea</i>		√
	<i>Themeda australis</i>	C	√
RESTIONACEAE	<i>Lepyrodia scariosa</i>	C	√
	<i>Leptocarpus tenax</i>		√
SMILACACEAE	<i>Smilax glyciophylla</i>	C	√
SPARGANIACEAE	<i>Sparganium subglobosum</i>		√
TYPHACEAE	<i>Typha orientalis</i>		√
XANTHORRHOEACEAE	<i>Xanthorrhoea arborea</i>	C	√
	<i>Xanthorrhoea media</i> ssp. <i>media</i>	C	√
	<i>Xanthorrhoea minor</i>		√

## APPENDIX B - Fauna Listing for the Field of Mars Reserve

The species list below has been adapted from Biosphere Environmental Consultants Pty Ltd. 2006, Ryde Flora And Fauna Study 2006, City of Ryde.

**Table 9: Mammal Fauna of Field of Mars Reserve**

Species	Common Name	Relative Abundance	How Detected
Trichosurus vulpecula	Brush-tail Possum	Low	Spotlighting Hair Tubes
Pseudecheirus peregrinus	Ring-tail Possum	Low	Spotlighting
Petaurus breviceps	Sugar Glider	Low	Spotlighting
Ornithorhynchus anatinus	Echidna	Low	Opportunistic Hair Tubes
Rattus rattus	Black Rat	High in some areas	Spotlighting
Mus musculus	House Mouse	Low	Hair Tubes
Canis lupus familiaris	Dog	Low	Spotlighting
Vulpes vulpes	Red Fox	Low	Spotlighting Scat Tracks
Felis catus	Cat	Low	Spotlighting
Oryctolagus cuniculus	Rabbit	Low	Spotlighting
Pteropus poliocephalus	Grey-headed Flying Fox	Common	Spotlighting
Chalinolobus gouldii	Goulds Wattled Bat	Low	Anabat
Nyctophilus geoffroyi	Lesser Long-eared Bat	Low	Anabat
Nyctinomus australis	White-striped Freetail Bat	Low	Anabat
Myotis adversus	Mouse-eared Fishing Bat	Low	Anabat

**Table 10: Native Bird Fauna of Field of Mars Reserve**

Species	Common Name
Acanthiza lineata	Striated Thornbill
Acanthiza nana	Yellow Thornbill
Acanthiza pusilla	Brown Thornbill
Acanthorhynchus tenuirostris	Eastern Spinebill
Accipiter fasciatus	Brown Goshawk
Accipiter novaehollandiae	Grey Goshawk
Aegotheles cristatus	Australian Owlet-Nightjar
Anas superciliosa	Pacific Black Duck
Anhinga melanogaster	Darter
Anthochaera carunculata	Red Wattlebird
Anthochaera lunulata	Little Wattlebird
Ardea novaehollandiae	White-faced Heron
Artamus cyanopterus	Dusky Woodswallow
Cacatua galerita	Sulphur-crested Cockatoo
Cacatua roseicapilla	Galah



<b>Species</b>	<b>Common Name</b>
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
<i>Calyptorhynchus funereus</i>	Yellow-tail Black Cockatoo
<i>Chrysococcyx basalis</i>	Horsfield Bronze Cuckoo
<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo
<i>Cisticola exilis</i>	Golden-headed Cisticola
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo Shrike
<i>Corvus coronoides</i>	Australian Raven
<i>Cracticus torquatus</i>	Grey Butcherbird
<i>Cuculus flabelliformis</i>	Fan-tail Cuckoo
<i>Cuculus pallidus</i>	Pallid Cuckoo
<i>Dacelo novaeguinea</i>	Kookaburra
<i>Egretta intermedia</i>	Intermediate Egret
<i>Elanus notatus</i>	Black-shouldered Kite
<i>Eudynamys scolopacea</i>	Koel
<i>Falco cenchroides</i>	Nankeen Kestrel Brown
<i>Falcunculus frontatus</i>	Crested Shrike-tit
<i>Geophaps lophotes</i>	Crested Pigeon
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Grallina cyanoleuca</i>	Magpie Lark
<i>Gymnorhina tibicen</i>	Australian Magpie
<i>Halycon sancta</i>	Sacred Kingfisher
<i>Hirundapus caudicatus</i>	White-throated Needletail
<i>Hirundo ariel</i>	Fairy Martin
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Larus novaehollandiae</i>	Silver Gull
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
<i>Macropygia amboinensis</i>	Brown Cuckoo-Dove
<i>Malurus cyaneus</i>	Superb Blue Fairy Wren
<i>Manorina melanocephalus</i>	Noisy Miner
<i>Meliphaga lewinii</i>	Lewins Honeyeater
<i>Microeca fascinans</i>	Jacky Winter
<i>Monarcha melanopsis</i>	Black-faced Monarch
<i>Nechmia temporalis</i>	Red-browed Firetail
<i>Ninox novaeseelandiae</i>	Southern Boobook Owl
<i>Ninox strenua</i>	Powerful owl
<i>Nycticorax caledonicus</i>	Nankeen Night heron
<i>Oriolus sagittatus</i>	Olive-backed oriole
<i>Pachycephala pectoralis</i>	Golden Whistler
<i>Pachycephala rufiventris</i>	Rufous Whistler
<i>Pardalotus punctata</i>	Spotted Pardalote
<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant
<i>Philemon corniculatus</i>	Noisy Friarbird
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater
<i>Platycercus elegans</i>	Crimson Rosella

Species	Common Name
Platycercus eximia	Eastern Rosella
Podargus strigoides	Tawny Frogmouth
Rhipidura fuliginosa	Grey Fantail
Rhipidura leucophrys	Willie Wagtail
Scythrops novaehollandiae	Channel-billed Cuckoo
Sericornis frontalis	White-browed Scrub-wren
Sphecotheres viridis	Fig Bird
Strepera graculina	Pied Currawong
Threskiornis aethiopica	White Ibis
Trichoglossus haematodus	Rainbow Lorikeet
Vanellus miles	Masked Lapwing
Zosterops lateralis familiaris	Silver-eye
Zosterops lateralis lateralis	Tasmanian Silver-eye

**Table 11: Exotic Bird Fauna of Field of Mars Reserve**

Species	Common Name
Pycnotus jocosus	Red-whiskered Bulbul
Sturnus vulgaris	Common Starling
Acidotheres tristis	Common Myna
Passer domestica	House Sparrow
Columba livia	Feral Pigeon
Streptopelia chinensis	Spotted Turtle-dove

**Table 12: Reptile Fauna of Field of Mars Reserve**

Species	Common Name	Abundance
Lampropholis delicata	Garden Skink	Common
Lampropholis guichenoti	Grass Skink	Common
Saproscincus mustelinus	Weasel Skink	Common
Eulamprus quoyii	Eastern Water Skink	Very Common
Cryptoblepharus virgata	Wall Skink	Uncommon
Physignathus lesueurii	Eastern Water Dragon	Uncommon
Pseudechis porphyriacus	Red-bellied Black Snake	Uncommon
Cacophis squamulosus	Golden-crowned Snake	Uncommon
Hemiaspsi signata	Black-bellied Marsh Snake	Uncommon

**Table 13: Frog Fauna of Field of Mars Reserve**

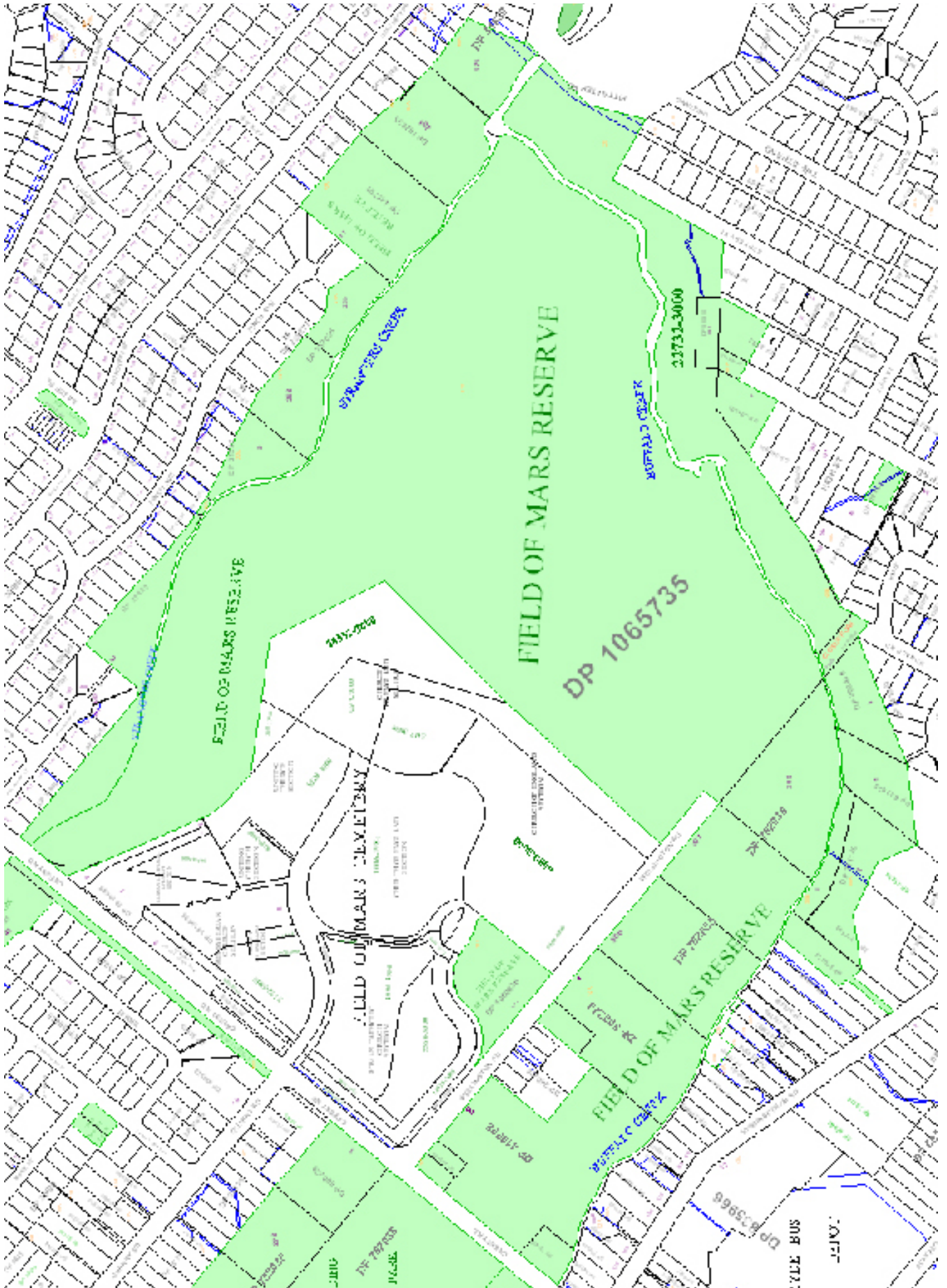
Species	Common Name	Abundance
Limnodynastes peronii	Striped Marsh frog	Common
Crinia signifera	Common Eastern Froglet	Common
Litoria phyllochroa	Leaf-green Tree Frog	Uncommon
Litoria peronii	Perons Tree Frog	Common

**Table 14: Invertebrate Fauna of Field of Mars Reserve**

Major Group	Order or Family	Lower Taxon (if possible)	Common Names		
Insecta	Collembola		Springtails		
	Ephemeroptera		May Flies		
	Odonata	Zygoptera	Damselflies		
		Anisoptera	Dragonflies		
	Plecoptera		Stone Flies		
	Blattodea		Cockroaches		
	Isoptera		Termites		
	Mantodea		Prayer Mantis		
	Dermaptera		Earwigs		
	Orthoptera	Gryllacridae	Gryllacridae	Tree Crickets	
			Tettigoniidae	Katydid	
			Gryllotalpidae	Mole Crickets	
		Gryllidae	Gryllidae	Crickets	
			Acrididae	Grasshoppers	
			Hemiptera	Notonectidae	Backswimmers
				Gerridae	Water Striders
				Lygaeidae	Ground Bugs
				Pentatomidae	Stink Bugs
			Homoptera	Reduviidae	Assassin Bugs
	Cicadidae	Reduviidae		Cicadas	
		Cicadidae		Leaf Hoppers	
		Cicadellidae		Aphids	
	Aphididae	Scale Bugs			
	Coleoptera	Cerambycidae	Weevils		
		Cincindelidae	Tiger Beetles		
		Carabidae	Ground Beetles		
		Dytiscidae	Diving Beetles		
		Gyrinidae	Whirligig Beetles		
		Staphlinidae	Rove Beetles		
		Scarabaeidae	Scarab Beetles		
		Buprestidae	Jewel Beetles		
		Elateridae	Click Beetles		
		Coccinellidae	Ladybirds		
		Cerambycidae	Long-horned Beetles		
		Chrysomelidae	Leaf Blister		
		Silphidae	Carrion Beetles		
		Zophoridae	Ironbark Beetles		
		Lepidoptera	Hesperidae	Skippers	
			Papilionidae	Swallowtail Butterflies	
			Danaidae	Milkweed Butterflies	
			Lycaenidae	Ant Blue Butterflies	
			Sphingidae	Hawk Moths	
			Arctidae	Tiger Moths	
Sesiidae	Clearwing Moths				
Geometridae	Geometer Moths				
Diptera		Crane Flies			
	Chironomidae	Midges			

Major Group	Order or Family	Lower Taxon (if possible)	Common Names
		Tipulidae	Mosquitos
		Culicidae	March Flies
		Tabanidae	Robber Flies
		Assilidae	Hover Flies
		Syrphidae	House Flies
		Muscidae	Blow Flies
	Hymenoptera	Calliphoridae	Parasitic Wasps
		Ichneumonidae	Vespid Wasps
		Vespidae	Sphecoid Wasps
		Sphecidae	Ants
		Formicidae	Bees
	Neuroptera	Apoidea	Lace Wings
Arachnids	Ararina		Mites, Ticks
		Tetragnathidae	Long-jawed Spiders
		Lycosidae	Wolf Spiders
		Nephilidae	Orb-Weavers
Chelicerates	Chilopoda		Centipedes
	Myriopoda		Millipedes
Molluscs	Gastropoda		Snails
			Slugs
Annelida	Oligochaeta		Earthworms
	Hirunidae		Leeches

**APPENDIX C - Detailed Land Ownership**



**APPENDIX D - Endangered Ecological Community Listing**

# threatened species

species, populations & ecological communities of NSW

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- Find by geographic region
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## Shale Sandstone Transition Forest in the Sydney Basin Bioregion

**Species profile**

Regional information:

- [Hawkesbury/Nepean](#)
- [Sydney Metro](#)

Related information

[Shale sandstone transition forest - endangered ecological community profile \(PDF - 132KB\)](#)

[Shale/sandstone transition forest - Scientific Committee determination](#)



## Shale Sandstone Transition Forest in the Sydney Basin Bioregion - profile

**Conservation status in NSW:** [Endangered Ecological Community](#)

### Description

Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. The main tree species include Forest Red Gum *Eucalyptus tereticornis*, Grey Gum *E. punctata*, stringybarks (*E. globoidea*, *E. eugenioides*) and ironbarks (*E. fibrosa* and *E. crebra*). Areas of low sandstone influence have an understorey that is closer to Cumberland Plain Woodland. Contains many more species and other references should be consulted to identify these.

### Location and habitat

#### Distribution

Before European settlement, was extensive around the edges of the Cumberland Plain, western Sydney, particularly the southern half. Today, only 9,950 ha remains intact (22.6% of its original extent) and the bulk of this occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Good examples can be seen at Gulguer Nature Reserve.

#### Habitat and ecology

- Well adapted to fire, being often close to sandstone areas.
- Some species in shale areas regenerate from profuse annual seeding and underground tubers.
- High sandstone influence sites have poor rocky soils, some of the shrubs of which rely on nitrogen-fixing root nodules and soil/root fungi to obtain nutrients.

#### Regional information

This species is found in the following catchment management authority regions. Click on a region name to see more details about the distribution, vegetation types and habitat preference of the species in that region.

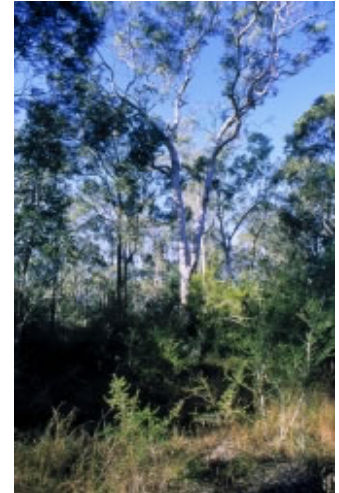
- [Hawkesbury/Nepean](#)
- [Sydney Metro](#)

#### Threats

- The main threat is further clearing for urban/rural development, and the subsequent impacts from fragmentation.
- Inappropriate water run-off, which leads to increased nutrients and sedimentation.
- Weed invasion.
- Inappropriate fire regimes, which have altered the appropriate floristic and structural diversity.

#### Recovery strategies

Priority actions are the specific, practical things that must be done to recover a threatened species, population or ecological community. The



Shale/Sandstone Transition Forest  
Image: M. Cufer  
© DEC

Department of Environment and Conservation has identified **16 priority actions** to help recover the Shale Sandstone Transition Forest in the Sydney Basin Bioregion in New South Wales.

### What needs to be done to recover this species?

- Promote public involvement in restoration activities.
- Apply necessary fire regimes to maintain appropriate floristic and structural diversity.
- Protect habitat by minimising further clearing. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning.
- Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion.
- Weed control.
- Undertake restoration including bush regeneration and revegetation.

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## Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions

### Species profile

#### Regional information:

- [Hawkesbury/Nepean](#)
- [Hunter/Central Rivers](#)
- [Northern Rivers](#)
- [Southern Rivers](#)
- [Sydney Metro](#)

#### Related information

Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions - [Scientific Committee determination](#)

I.D. Guidelines Coastal saltmarsh (A3 version) (PDF - 4MB)

I.D. Guidelines Coastal saltmarsh (high resolution) (PDF - 7MB)

I.D. Guidelines Coastal saltmarsh (low resolution) (PDF - 675KB)

[Threatened Species and Endangered Ecological Communities of the Eurobodalla](#)

## Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions - profile

**Conservation status in NSW:** [Endangered Ecological Community](#)

### Description

Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include *Baumea juncea*, *Juncus kraussii*, *Sarcocornia quinqueflora*, *Sporobolus virginicus*, *Triglochin striata*, *Isolepis nodosa*, *Samolus repens*, *Selliera radicans*, *Suaeda australis* and *Zoysia macrantha*. Occasionally mangroves are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans.

### Location and habitat

#### Distribution

This community occurs in the intertidal zone along the NSW coast.

#### Habitat and ecology

- Species composition varies with elevation and latitude, with Saltmarsh in southern NSW being generally more species-rich than further north.
- The sediment surface may support a diversity of seaweed species.
- Species restricted to coastal saltmarshes include *Distichlis distichophylla* (endangered), *Halosarcia pergranulata* subsp. *pergranulata*, *Wilsonia backhousei* (vulnerable) and *Wilsonia rotundifolia* (endangered).

#### Regional information

This species is found in the following catchment management authority regions. Click on a region name to see more details about the distribution, vegetation types and habitat preference of the species in that region.

- [Hawkesbury/Nepean](#)
- [Hunter/Central Rivers](#)
- [Northern Rivers](#)
- [Southern Rivers](#)
- [Sydney Metro](#)

### Threats

- In-filling for development, including roads, residential, industrial, recreational, waste disposal and agricultural purposes.
- Modification of tidal flows as a consequence of artificial structures being erected.
- Alteration of salinity and increasing nutrient levels resulting from the discharge of stormwater into saltmarshes.
- Weed invasion, particularly by *Juncus acutus*.
- Physical damage from human disturbance, domestic and feral animals.
- Dumping of rubbish and pollution from oil or chemical spills from shipping or road accidents; catchment runoff of nutrients and



Coastal Saltmarsh in the NSW North Coast  
Image: Shane Ruming  
© Shane Ruming



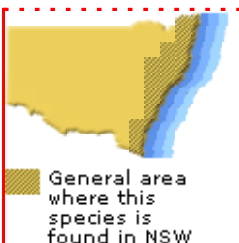
Coastal Saltmarsh in the NSW North Coast  
Image: Shane Ruming  
© Shane Ruming



Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions  
Image: Michael Murphy  
© Michael Murphy



Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions  
Image: Michael Murphy  
© Michael Murphy



- agricultural chemicals.
- Invasion by mangroves.
- Inappropriate fire regimes.

## Recovery strategies

Priority actions are the specific, practical things that must be done to recover a threatened species, population or ecological community. The Department of Environment and Conservation has identified **12 priority actions** to help recover the Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions in New South Wales.

### What needs to be done to recover this species?

- Protect areas of saltmarsh from runoff that contains high levels of nutrients or pollutants.
- Reduce the amount of sediment reaching the estuary to reduce migration of mangroves.
- Maintain buffer zones of terrestrial vegetation adjacent to saltmarsh to allow for expansion of saltmarsh and to minimise nutrient flow.
- Allow areas of saltmarsh to regenerate naturally where possible.
- Protect from clearing and development through fencing, signage and active management.
- Minimise human disturbance by preventing access from recreational vehicles, including four wheel drives.
- Erect educational signs to provide information to visitors and residents of the importance of coastal saltmarsh.
- Undertake weed control programs.
- Prohibit grazing and burning.
- Restore natural hydrological regime by removing stormwater drains or artificial structures that restrict tidal flows.
- Consult with Department of Primary Industries (formerly NSW Fisheries) to determine an appropriate mangrove management program.












Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions  
Image: Michael Murphy  
© Michael Murphy



Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions  
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## Detailed References

Below is a list of references relating to this ecological community. You can filter the list by the features or publication type you require.

Features	Publication Type
 Management Guidelines	All Types
 Vegetation Classification	 Books
 Plant I.D./Field guide	 Journals
 GIS Data	 Unpublished Reports
 TEC information	 Internet Articles

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**APPENDIX E - Threatened Species Listings**

# threatened species

species, populations & ecological communities of NSW

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## Invasion and establishment of exotic vines and scramblers - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

A large number of exotic vines and scramblers have become established in New South Wales. Many are now widespread, and locally abundant, especially in the eastern part of the state. The majority of these vines and scramblers were originally introduced for horticultural purposes and have now escaped. A number are currently recognised as significant environmental weeds in particular regions (eg The NSW North Coast Weeds Advisory Committee, undated). The main species include:

*Abrus precatorius* Crabs-eye Creeper, *Acetosa sagittata* Potato Vine, *Anredera cordifolia* Madeira Vine, *Araujia sericifera* Moth vine, *Aristolochia elegans* Dutchman's Pipe, *Aristolochia littoralis* Dutchman's Pipe, *Asparagus aethiopicus* Ground Asparagus, *Asparagus africanus* Asparagus Fern, *Asparagus asparagoides* Bridal Creeper, *Asparagus plumosus* Climbing Asparagus, *Asparagus scandens* Climbing Asparagus, *Asystasia gangetica* var. *micrantha*, *Caesalpinia decapetala* Mysore Thorn, *Cardiospermum grandiflorum* Balloon Vine, *Clematis vitalba* Old Man's Beard, *Delairea odorata* Cape Ivy, *Dioscorea bulbifera* Aerial Yam, *Dipogon lignosus*, *Hedera helix* English Ivy, *Ipomoea alba* Moon Flower, *Ipomoea cairica* Coastal Morning Glory, *Ipomoea indica* Morning Glory, *Ipomoea purpurea* Morning Glory, *Lathyrus tingitanus*, *Lonicera japonica* Japanese Honeysuckle, *Macfadyena unguis-cati* Cat's Claw Creeper, *Passiflora suberosa* Corky Passion Flower, *Passiflora subpeltata* Passion Flower, *Passiflora toriminiana*, *Puearia lobata* Kudzu, *Senecio angulatus*, *Senecio macroglossus*, *Solanum jasminoides* Potato Vine, *Solanum seaforthianum*

Climbing Nightshade, *Sollya heterophylla*,  
*Thunbergia alata* Black-eyed Susan, *Thunbergia*  
*grandiflora* Blue Trumpet Vine, *Tradescantia*  
*fluminensis*, *Vinca major* Periwinkle.

Exotic vines and scramblers have significant adverse effects on biodiversity. They typically smother native vegetation and seedlings as well as prevent recruitment, especially in riparian areas. In addition, some vine species are capable of killing mature trees (eg Cat's Claw Creeper). Many of these vines and scramblers co-occur in the same locations and thus compound their impact to biodiversity. The speed at which many of these species have spread in New South Wales has contributed to their potential impact to biodiversity.

In New South Wales, exotic vines and scramblers have been identified as a threat to the following native plant species listed on Schedule 1 and Schedule 2 of the Act:

*Acacia pubescens*, *Acronychia littoralis*,  
*Daphnandra* sp 'C' Illawarra, *Davidsonia jerseyana*,  
*Davidsonia johnsonii*, *Desmodium acanthocladum*,  
*Diploglottis campbelli*, *Endiandra floydii*, *Epacris*  
*hamiltonii*, *Fontainea oraria*, *Gossia (Austromyrtus)*  
*fragrantissima*, *Hicksbeachia pinnatifolia*,  
*Ireneppharus trypherus*, *Isoglossa eranthemoides*,  
*Pimelea spicata*, *Rapanea* sp. A Richmond River,  
*Tinospora tinosporides*

Exotic vines and scramblers have been identified as a threat to at least three animal species listed as Endangered on Schedule 1 of the Act:

*Kerivoula paupuensis* Golden-tipped bat, *Potorous tridactylus* Long-nosed potoroo, and *Turnix melanogaster* Black-breasted button quail.

Exotic vines and scramblers have also been identified as a threat to the following Endangered Ecological Communities:

Coastal Saltmarsh in the NSW North Coast; Sydney Basin and South East Corner bioregions; Cumberland Plain Woodland; Elderslie Banksia Scrub Forest; Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions; Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion; Illawarra Subtropical Rainforest in the Sydney Basin Bioregion; Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions; Lowland Rainforest on Floodplain in the NSW North Coast Bioregion; Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion; Moist Shale Woodland in the Sydney Basin Bioregion; Mount Gibraltar Forest in the Sydney Basin Bioregion; Pittwater Spotted Gum Forest; Robertson Basalt Tall Open-

forest in the Sydney Basin Bioregion; Shale-sandstone Transition Forest; Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion; Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions; Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and Western Sydney Dry Rainforest in the Sydney Basin Bioregion.

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### Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 8 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Invasion and establishment of exotic vines and scramblers

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## Invasion and establishment of exotic vines and scramblers - Priority actions

A total of 8 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Raise awareness of vine impacts on biodiversity with general public and nursery industry.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a> Develop and implement vine monitoring programs at priority sites.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Develop statement of intent by 2007 explaining how exotic vines and scramblers will be managed.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a> Prioritise control actions based on vine impacts.	Medium
Threat abatement strategy: <a href="#">Research</a> Investigate effective control methods.	Medium
Threat abatement strategy: <a href="#">Review evidence of impacts</a> Determine the relative threat of vine impacts on biodiversity.	Medium
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a> Collate baseline information on the distribution of vines in NSW in order to determine priority sites for control.	Low
Threat abatement strategy: <a href="#">Undertake control actions</a> Continue existing control programs until evidence of impacts is reviewed.	High

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## Predation by feral cats - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Predation by the Feral Cat *Felis catus* (Linnaeus, 1758) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [24 March 2000].

The Cat *Felis catus* (Linnaeus, 1758) is a common but elusive predator that occurs throughout Australia and on many offshore islands. Cats occur in virtually all terrestrial habitats in Australia, and the main determinants of local population size appear to be the availability of food and shelters. Cats may be categorised as domestic, stray or feral. Feral cats are free-living, have minimal or no reliance on humans for their ecological requirements, and survive and reproduce in self-perpetuating populations.

Several Endangered and Vulnerable species in New South Wales are currently threatened from feral cats, including the Hastings River Mouse *Pseudomys oralis*, Sandy Inland Mouse *Pseudomys hermannsburgensis*, Pilliga Mouse *Pseudomys pilligaensis*, Bolam's Mouse *Pseudomys bolami*, Forrest's Mouse *Leggadina forresti*, Mountain Pygmy-possum *Burramys parvus*, Little Tern *Sterna albifrons*, Grey Grasswren *Amytornis barbatus*, Striated Grasswren *Amytornis striatus* and the lizard *Aprasia aurita*. Larger species such as Southern Brown Bandicoots *Isodon obesulus* and Brush-tailed Rock Wallabies *Petrogale penicillata* may also be at risk locally or when other prey is scarce.

Many other native species are potentially at risk of becoming threatened as a result of feral cat predation. Small mammals such as rodents, dasyurids, burramyids and ground-nesting birds are at particular risk.

Predation by feral Cats is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999* and a national threat abatement plan has been prepared by the Department of Environment and Heritage.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 8 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.



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## Predation by feral cats - Priority actions

A total of 9 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Undertake a community education and awareness program to increase understanding of the environmental impacts of feral cats and the need for their control.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop best practice guidelines for managing feral cats.	Low
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare statement of intent in 2007 explaining how feral cats will be managed.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Prepare a NSW TAP.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a>	
Prioritise feral cat control based on a review of the evidence of cat impacts.	High
Threat abatement strategy: <a href="#">Research</a>	
Develop and trial a cat-specific bait that will ensure non-target species are not impacted.	High
Develop cost-effective methods for broad-scale control of feral cats.	High
Undertake research in regard to better understanding predator interactions.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
List predation by the feral cat as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Identify the biodiversity most at risk from predation by feral cats.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Trial Western Australian cat bait at selected priority sites.	High

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# Loss of Hollow-bearing Trees - key threatening process - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Tree hollows are cavities formed in the trunk or branches of a living or dead tree. Hollows are usually more characteristic of older, mature to over mature trees. Hollows may develop in the trunk and branches of trees as a result of wind breakage, lightning strikes, fire and/or following the consumption and decay of internal heartwood by fungi and invertebrates, primarily termites. Hollow entrances are more common in larger trunks and branches because damage is less likely to be covered by growth of external sapwood.

Hollows occur primarily in old eucalypts trees, and are uncommon in many other native and introduced species such as wattle (*Acacia*), cypress pine (*Callitris*), she-oak (*Allocasuarina*) and pine (*Pinus*). The presence, abundance and size of hollows is positively correlated with tree trunk diameter, which is an index of age. Hollows with large internal dimensions are the rarest and occur predominantly in large old trees, which are rarely less than 220 years old. Larger, older trees also provide a greater density of hollows per tree. As such, large old hollow-bearing trees are relatively more valuable to hollow-using fauna than younger hollow-bearing trees. The latter are important as a future resource.

Mature and old hollow-bearing trees offer other valuable resources. Mature trees provide more flowers, nectar, fruit and seeds than younger trees, and a complex substrate that supplies diverse habitats for invertebrate populations. When hollow-bearing trees collapse or shed limbs they also provide hollow logs that serve as important

foraging substrates and shelter sites.

The distribution of hollow-bearing trees depends on tree species composition, site conditions, competition, tree health and past management activities. Hollows occur at varying densities; undisturbed woodlands typically contain 7–17 hollow-bearing trees per hectare, undisturbed temperate forests 13–27 per hectare and old-growth wet and dry sclerophyll forest of south-east Queensland typically contains 35 and 37 hollow-bearing trees per hectare. On a landscape basis, dead trees often account for 20–50% of the total number of hollow-bearing trees. However they are far more prone to collapse or incineration than live trees and are selectively harvested for firewood.

Occupancy of hollow-bearing trees is also related to their position in the landscape. Some species prefer hollows near riparian habitat or foraging areas, although more mobile species may travel long distances from roost. Breeding behaviour can also govern the suitability of hollows, with birds that nest colonially (e.g. Superb Parrot) or in clusters across the landscape (e.g. Glossy Black-cockatoo) requiring a local abundance of hollow-bearing trees. Conversely, strongly territorial species that prevent other individuals from nesting nearby require an even distribution of hollow-bearing trees if all pairs are to breed.

Many vertebrates are known to select hollows with specific characteristics, indicating that suitable hollows represent a fraction of the total hollow resource. Preference is typically shown for entrance dimensions that approximate body size, presumably to exclude larger competitors and predators. Small animals that roost communally or raise large litters require hollows with small entrances but large internal dimensions. The use of hollows with suboptimal characteristics can adversely affect survival and reproductive success.

The density of hollow-bearing trees required to sustain viable populations of vertebrates is controlled by the diversity of competing fauna species at a site, population densities, number of hollows required by each individual over the long-term, and the number of hollows with suitable characteristics occurring in each tree. The presence, abundance and species richness of hollow-using fauna are correlated with the density of hollow-bearing trees; suggesting that the availability of hollows is often a limiting environmental factor. In some instances it is the prey species of a threatened predator that is limited by hollow availability. In habitats with dense mid-storey the Common Ringtail Possum (*Pseudocheirus peregrinus*) builds stick nests, but in dry open forest it is dependent on large hollows and only abundant in areas with large trees. As

this species is an important prey item of the Powerful Owl (*Ninox strenua*), loss of hollows indirectly hinders recovery efforts for the predator.

Experimental supplementation of hollows using nest boxes demonstrates that hollow availability can limit the density of bats, arboreal mammals and breeding birds. Box occupancy is greatest at sites of low natural hollow densities and a higher proportion of bird populations breed when nest boxes are provided. Conversely, experimental reductions in hollow density can lead to a decline in the number of nesting birds.

The distribution and abundance of hollow-bearing trees in NSW has been reduced and fragmented by extensive clearing of native vegetation during the past two centuries, primarily for agriculture. For example it has been estimated approximately 70% of native vegetation has been cleared from the NSW wheat-sheep belt, the tablelands of the Great Divide and the coastal plain. Clearing in NSW has continued since 1995 at an estimated rate of over 30 000 ha per annum. Clearing has occurred at a greater intensity on flatter and more fertile landscapes, which typically support the highest densities of hollow-using fauna and most remnant vegetation now exists on rugged and infertile landscapes.

A range of direct and indirect processes contribute to the ongoing loss of hollow-bearing trees, the relative importance of these processes varies according to past and current land management regimes. Owing to the slow process of hollow development, and the particular value provided by large old trees, adverse effects from the continuing loss of old hollow-bearing trees will take centuries to fix.

In agricultural landscapes hollow-bearing trees typically persist as isolated mature individuals in cleared paddocks or in small fragmented vegetation remnants. Such trees frequently suffer from poor health (e.g. 'dieback') and have a shorter lifespan than in forested landscapes. Eventual loss of current hollow-bearing trees, and a lack of recruitment of younger trees to replace them, will result in a large decrease in the hollow resource over the wide geographic area covered by agricultural landscapes in the medium term.

Road reserves and Travelling Stock Reserves (TSRs) provide hollow-bearing trees within cleared agricultural landscapes. However, their availability in road reserves and TSRs is reduced because of habitat fragmentation and competition among hollow-dependent species. In urban and rural residential landscapes hollow-bearing trees persist in parks, small reserves, yards and road corridors,

although hollow density varies greatly. Clearing of vegetation for urban expansion and other development, including the creation of asset protection zones against wildfire, contributes significantly to the ongoing loss of hollow-bearing trees. Concern over the risk to humans from falling branches, and the potential for litigation, has increasingly led to removal or pruning of hollow-bearing trees.

In forests managed for timber and firewood production, silvicultural practices have greatly reduced the density of hollow-bearing trees, especially where repeated harvesting events have occurred. In some forest types there has been a gradual shift in the relative composition of tree species toward those desired for timber. Among trees grown for silvicultural purposes, current rotation intervals between harvesting events – typically 30 to 90 years – are insufficient to allow for hollow development. There have previously been limited requirements for retention of hollow-bearing trees on private property managed for silviculture, although prescriptions are currently being developed.

Even when trees are retained during harvest they are susceptible to damage from logging operations and post-harvest burning, or can suffer poor health owing to changes in abiotic conditions. Consequently, retained trees are prone to early mortality, especially with repeated exposure to harvesting events over their lifespan. In addition, the average age of hollow-bearing trees in harvested areas will continue to decrease as the few remaining very old trees die. Trees are also retained in areas excluded from harvesting, such as along drainage lines, with the aim of creating a matrix of harvested and non-harvested areas.

The density of hollow-bearing trees in conservation reserves that have previously been logged should gradually increase until reaching an equilibrium of recruitment and loss, albeit with a long time lag in some areas. Wildfire may temporarily disrupt the age structure of these forests but in the long term can also promote hollow formation in standing trees. Wildfire is a particular threat at sites where the hollow resource is restricted to large, senescent hollow-bearing trees that are susceptible to incineration. Where feral species and unusually abundant native species (e.g. Galah) occur, competition for hollows limits their availability to other species. This is more common in smaller reserves. One widespread competitor is the introduced Honeybee *Apis mellifera*, which typically builds hives in large cavities with small entrances.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 6 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Loss of Hollow-bearing Trees - key threatening process - Priority actions

A total of 6 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Encourage community adoption of hollow boxes.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Adopt appropriate policies for recruitment tree ratios with a stipulated minimum retention density in areas of forestry operations.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAs and land managers/owners</a> Work with CMAs to prioritise protection of hollow bearing trees when doing incentive PVP's and management agreements.	Medium
Threat abatement strategy: <a href="#">Habitat management: Feral Control</a> Control of feral species that utilise hollows, particularly the introduced Honeybee.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a> Review effectiveness of PVP biodiversity tools and Private native forestry code of practice in the protection of hollow bearing trees.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> Establish appropriate recruitment tree ratios as part of the private native code of practice under the Native Vegetation Act 2003.	High

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## Invasion, establishment and spread of Lantana camara - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Lantana is a branching shrub that grows in clumps or dense thickets 2-4 m high, but is able to grow to 15 m tall if given support. Stems have sharp prickles, and leaves are 2-10 cm long, hairy, and ovate with toothed edges. Inflorescences are compact, dome-shaped, 2-3 cm across, and contain 20-40 sessile flowers. Hard green fruits are 5-7 mm in diameter, grow in clusters, and ripen to fleshy black or purple berries. Fruits are mainly dispersed by birds.

There are 29 variants of lantana naturalised in Australia. Native to Central and tropical South America, the earliest record of lantana in Australia is from 1841 in the old Botanic Gardens in Adelaide. There have been multiple introductions for horticultural purposes since, mainly in NSW and Queensland. Lantana has spread rapidly along the east coast of Australia, from southern NSW north to Cape York. It currently invades about 4 million hectares, mainly in NSW and Queensland. It is also naturalised in the Northern Territory, South Australia and Western Australia, and on Lord Howe and Norfolk Islands. Lantana has the potential for much denser infestation of the coast and ranges, and to expand its range west and south of the Great Divide in NSW and other eastern States, at least along creek lines.

Lantana has significant adverse effects on biodiversity. It typically forms dense thickets, suppressing native vegetation and seedlings through shading, nutrient competition, smothering and allelopathy (ie. chemically suppresses the germination and/or growth of other plant species).



Lantana readily invades disturbed sites and communities, including edges and canopy breaks in dense forest communities. In open forests and woodlands lantana often becomes a dominant understorey species. In warmer, moister areas lantana often becomes dominant in regenerating pastures.

In New South Wales, lantana has been identified as a threat to the following native plant species listed on Schedule 1 and Schedule 2 of the Threatened Species Conservation Act 1995:

- *Acacia bakeri*
- *Acacia chrysotricha*
- *Acalypha eremorum*
- *Acronychia littoralis*
- *Allocasuarina portuensis*
- *Amorphospermum whitei*.
- *Angiopteris evecta*.
- *Angophora robur*
- *Archidendron hendersonii*
- *Arthraxon hispidus*
- *Austromyrtus fragrantissima*
- *Baloghia marmorata*
- *Belvisia mucronata*
- *Boronia umbellata*
- *Bosistoa selwynii*
- *Bosistoa transversa*
- *Calophanoides hygrophiloides*
- *Cassia brewsteri* var. *marksiana*
- *Clematis fawcettii*
- *Corynocarpus rupestris* subsp. *rupestris*
- *Cryptocarya foetida*
- *Cynanchum elegans*
- *Cyperus semifertillis*
- *Daphnandra* sp. *C Illawarra*
- *Davidsonia jerseyana*
- *Davidsonia johnsonii*
- *Desmodium acanthocladum*
- *Diospyros mabacea*
- *Diospyros major* var. *ebenus*
- *Diploglottis campbellii*
- *Doryanthes palmeri*
- *Drynaria rigidula*
- *Eidothea hardeniana*
- *Elaeocarpus* sp. *Rocky Creek*
- *Elaeocarpus williamsianus*
- *Endiandra floydii*
- *Endiandra hayesii*
- *Endiandra muelleri* subsp. *bracteata*
- *Eucalyptus glaucina*
- *Eucalyptus parramattensis* subsp. *decadens*
- *Eucalyptus tetrapleura*
- *Fontainea australis*
- *Fontainea oraria*
- *Geijera paniculata*
- *Hibbertia procumbens*
- *Hicksbeachia pinnatifolia*
- *Irenepharsus trypherus*
- *Isoglossa eranthemoides*
- *Lepiderema pulchella*

- *Macadamia tetraphylla*
- *Macrozamia johnsonii*
- *Marsdenia longiloba*
- *Melichrus 'hirsutus'*
- *Melichrus sp.*
- *Melicope vitiflora*
- *Niemeyera chartacea*
- *Ochrosia moorei*
- *Owenia cepiodora*
- *Parsonsia dorrigoensis*
- *Phaius australis*
- *Phaius tankarvilleae*
- *Phyllanthus microcladus*
- *Plectranthus alloplectus*
- *Plectranthus nitidus*
- *Polygala linariifolia*
- *Pomaderris queenslandica*
- *Pterostylis gibbosa*
- *Quassia sp. Mooney Creek*
- *Randia moorei*
- *Rapanea sp. A Richmond River*
- *Rhynchosia acuminatissima*
- *Senna acclinis*
- *Solanum celatum*
- *Solanum limitare*
- *Sophora fraseri*
- *Syzygium paniculatum*
- *Tinospora smilacina*
- *Tinospora tinosporoides*
- *Triplarina imbricata*
- *Tylophora linearis*
- *Tylophora woollsii*
- *Typhonium sp. aff. brownii*
- *Zieria prostrata*

Lantana has been identified as a threat to at least two animal species listed as Endangered on Schedule 1 of the Act:

- *Dasyornis brachypterus* (Eastern Bristlebird)
- *Ocybadistes knightorum* (Black Grass-Dart Butterfly)

Lantana has also been identified as a threat to the following Endangered Ecological Communities listed on Schedule 1 Part 3 of the Act:

- Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion
- Lowland Rainforest on Floodplain in the NSW North Coast Bioregion
- Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Lower Hunter spotted gum - Ironbark forest in the Sydney Basin Bioregion
- Pittwater Spotted Gum Forest
- River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin, and South East Corner Bioregions

- Swamp-oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp sclerophyll forest on the coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Sub-tropical Coastal floodplain forest of the NSW North Coast Bioregion
- Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion
- Blue Gum High Forest
- Western Sydney Dry Rainforest in the Sydney Basin Bioregion
- Sydney Turpentine-Ironbark Forest
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion

A national management plan is being prepared which will identify the biodiversity most at risk from lantana, and priority locations for control.

### References

- NSW Scientific Committee (2006) Invasion, establishment and spread of Lantana camara - Key Threatening Process declaration - final. DEC (NSW), Sydney

### Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 9 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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- [Invasion, establishment and spread of Lantana Camara - Scientific Committee determination](#)
- [NSW Flora Online - Lantana camara](#)

## Invasion, establishment and spread of Lantana camara - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Develop and distribute educational materials e.g. Lantana Manual.	Medium
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Develop best practice guidelines for managing Lantana.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a> No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a> Develop and implement monitoring program at priority sites.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Develop statement of intent explaining how Lantana will be managed by 2007.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a> Develop and use model to rank priority sites for control of Lantana.	High
Threat abatement strategy: <a href="#">Research</a> Conduct research on the biocontrol of Lantana.	High
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> Conduct research on the use of remote sensing to survey and map Lantana distribution.	Low
Threat abatement strategy: <a href="#">Review evidence of impacts</a> List Lantana as a noxious weed under the Noxious Weeds Act 1993 and as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a> Develop and use model to rank biodiversity threatened by Lantana.	High
Threat abatement strategy: <a href="#">Undertake control actions</a> Map distribution and abundance of Lantana in NSW.	Medium
Threat abatement strategy: <a href="#">Undertake control actions</a> Continue existing control programs until site model has been developed; continue further releases of biocontrol.	High

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# Invasion of native plant communities by exotic perennial grasses - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Invasion of native plant communities by exotic perennial grasses was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [12 September 2003].

Exotic perennial grasses are those that are not native to NSW and have a life-span of more than one growing season. More than a hundred species of exotic perennial grasses occur in New South Wales. A relatively small number of these perennial grasses threaten native plant communities, and it is these species which are of concern.

Exotic perennial grasses of special concern include *Hyparrhenia hirta* (Coolatai grass), *Cortaderia* spp. (pampas grasses), *Sporobolus fertilis* (giant Parramatta grass), *Nassella neesiana* (Chilean needlegrass), *Nassella trichotoma* (serrated tussock) and *Eragrostis curvula* (African lovegrass).

The listing of "Invasion of native plant communities by exotic perennial grasses" as a key threatening process has been made in recognition of the increasing evidence that some perennial grass species have significant adverse impacts on biodiversity. A few examples follow:

- Coolatai grass grows vigorously forming an almost complete monoculture replacing native grass and wildflower species. It tolerates drought, heavy grazing and many herbicides. It has invaded large areas of grassy woodlands and native pastures in

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[NSW Flora Online - Cortaderia jubata](#)
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[NSW Flora Online - Eragrostis curvula](#)
[NSW Flora Online - Hyparrhenia hirta](#)
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north-west NSW and is spreading rapidly in other regions.

- Chilean needlegrass has several features which give it a competitive advantage over many native species, such as its ability to produce a large, long-living seed bank, high survival of seedlings, tolerance to drought and effective animal-borne and water-borne dispersal mechanisms for seeds.
- Serrated tussock infests more than a million hectares in southern Australia but has the potential to spread over a much larger area. It invades native grasslands, grassy woodlands, dry forests and rocky shrublands. Serrated tussock forms large tussocks with individual plants capable of producing more than 10,000 seeds annually. Some seeds remain viable in the soil for more than 10 years. Mature plants droop across the ground smothering other species.
- Pampas grass readily tolerates saline conditions, salt spray, drought, periodic inundation, severe frosts, strong winds and can grow on a wide range of soil conditions and light conditions (from shaded areas through to full sunlight). Pampas grass is an aggressive coloniser and can form dense stands which prevent other plants from growing. Individual flower heads produce more than 100,000 seeds and wind may disperse seed for several kilometres.
- Perennial grasses, such as perennial veldtgrass, pampas grass, Coolatai grass and buffel grass, produce large amounts of plant matter which dries quickly and causes fuel loads to increase. This fuel results in fire regimes that favour the spread of these perennial grasses. Hotter and more frequent fires may lead to changes in the structure of the vegetation and in some cases to local extinctions of some plant and animal species.

Several endangered ecological communities are threatened by exotic perennial grasses. Examples include the following:

- White Box Yellow Box Blakelys Red Gum woodland is threatened by Coolatai grass. Coolatai grass dominates large areas of pasture, roadsides, travelling stock routes and areas of remnant vegetation in the North Western Slopes, especially in the Manilla area north of Tamworth.
- Serrated tussock, African lovegrass and Chilean Needlegrass are a major threat to native grasslands, particularly the endangered communities Natural Temperate Grasslands of the Southern Tablelands of NSW and the ACT and Bega Dry Grass Forest.

- In the Sydney area, pampas grass threatens Duffys Forest Ecological Community. Threatened species at risk include *Persoonia mollis* and the orchid *Microtis angusii*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 10 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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- NSW Flora Online - [Sporobolus fertilis](#)

## Invasion of native plant communities by exotic perennial grasses - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Undertake community education and awareness program to increase understanding of the environmental impacts of perennial grasses and the need for their control.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Develop best practice guidelines for managing exotic perennial grasses.	Medium
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a> No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Measure response to control</a> No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Prepare statement of intent explaining how exotic grasses will be managed in 2007.	Low
Threat abatement strategy: <a href="#">Prioritise control actions</a> No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Research</a> Undertake research on ecology and control of Coolatai grass.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> List exotic perennial grasses as noxious weeds under the Noxious Weeds Act 1993 and as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a> Identify biodiversity most at risk from Coolatai grass.	High
Identify biodiversity at risk from exotic grasses.	Medium
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a> Map distribution and abundance of priority exotic perennial grasses.	Low
Threat abatement strategy: <a href="#">Undertake control actions</a> Continue existing control programs on DEC lands.	High



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# Human-caused Climate Change - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Anthropogenic Climate Change was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [3 November 2000].

There is evidence that modification of the environment by humans may result in future climate change. Human induced activities as a result of energy use, industrial processes, solvent and other product use, agriculture, land use change and forestry, and waste cause greenhouse gas emissions. Human-caused climate change may occur at a faster rate than has previously occurred naturally and may involve both changes in average temperature conditions and changes to the frequency of occurrence of extreme events.

Fire is an integral part of the dynamics of many Australian ecosystems and the risk of fire may increase in some areas as the climate changes and decrease in others, with consequent changes to the species composition and structure of ecological communities (Brasher & Pittock 1998; NSW Scientific Committee 2000).

The distribution of most species, populations and communities is determined by climate and many species would be adversely affected unless populations were able to move across the landscape. Species at risk include those with long generations, poor mobility, narrow ranges, specific host relationships, isolate and specialised species and those with large home ranges (Hughes & Westoby 1994).

Examples of species which would be at risk in New

South Wales include: Mammals: Mountain Pygmy-possum, Long-footed Potoroo, Broad-toothed rat, Smoky mouse. Birds: Malleefowl, Plains-wanderer, Sooty Owl, Red-tailed Black-Cockatoo, Regent Parrot, Pink Robin, Red-lored Whistler. Reptiles: Striped Legless lizard. Amphibians: Spotted Frog, Southern Bell Frog, Northern Corroboree Frog, Southern Corroboree Frog. Flora: Communities likely to become threatened include alpine vegetation communities (Busby 1988, Hughes & Westoby 1994).

Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Human-caused Climate Change - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Assist proponents assess the impacts of greenhouse gas emissions from project proposals.	Medium
Foster relationships with relevant authorities, research institutes and other States to improve understanding of impacts of climate change and potential management.	Medium
Threat abatement strategy: <a href="#">Monitoring</a>	
Design and implement indicator programs to detect changes in biodiversity.	High
Threat abatement strategy: <a href="#">Other Action</a>	
Identify and promote ways to increase landscape permeability for species range shifts.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare Statement of Intent by 2007.	High
Threat abatement strategy: <a href="#">Research</a>	
Evaluate the adequacy of the reserve system to retain biodiversity and to support changing species and ecosystems.	High
Strengthen the resilience and connectivity of existing protected areas by identifying strategic future habitats and corridors.	High
Support research into the effects of climate change on disturbance regimes (e.g.. invasives, bushfires, pathogens).	High
Review the adequacy of environmental water allocations to support inland aquatic ecosystems over the long-term.	Medium
Identify the need for ex-situ conservation of species most at risk.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Develop conservation planning tools to model scenarios and effects of climate change on biodiversity.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Improve understanding of climate change impacts on biodiversity including identification of species and ecosystem most at risk.	High

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## Ecological consequences of high frequency fires - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [24 March 2000].

Plants and animals have a range of mechanisms to survive individual fires. The long-term survival of plants and animals over repeated fires is dependent upon two key features:

- the ability of species to maintain life cycle processes; and
- the maintenance of vegetation structure over time as habitat for animal species.

Where fires occur very close together in time (high frequency fire) both these key features can be disrupted. If high frequency fire is sustained it will consequently lead to a loss of plant species, a reduction in vegetation structure and a corresponding loss of animal species. A high frequency of burning can eliminate some species if they are burnt before they seed (DEH 1994).

High frequency fire and inappropriate fire regimes have been identified as threats to a number of species and communities including:

Plants - *Acacia bynoeana*, *Acacia courtii*, *Acacia macnuttiana*, *Acacia pubifolia*, *Acacia ruppilii*, *Acrophyllum australe*, *Almaleea cambagei*, *Apatophyllum constablei*, *Asterolasia elegans*, *Boronia granitica*, *Boronia repandra*, *Calitris oblonga*, *Cynanchum elegans*, *Darwinia biflora*,

*Elaeocarpus williamsianus*, *Epacris hamiltonii*, *Eucalyptus nicholii*, *Grevillea banyabba*, *Grevillea beadleana*, *Grevillea caleyi*, *Grevillea mollis*, *Grevillea rivularis*, *Grevillea scortechinii* ssp. *sarmentose*, *Grevillea shiressii*, *Haloragodendron lucasii*, *Homaranthus lunatus*, *Lasiopetalum joyceae*, *Leptospermum thompsonii*, *Melichrus hirsutus*, *Phaius australis*, *Phaius tancarvilliae*, *Phebalium glandulosum* ssp. *eglandulosum*, *Phebalium lachnaeoides*, *Pimelea spicata*, *Pterostylis gibbosa*, *Pultenaea* sp. *Olinda*, *Styphelia perileuca*, *Swainsona plagiotropis*, *Velleia perfoliate*, *Zieria involucrate*.

Birds - Glossy Black-Cockatoo, Eastern Bristlebird, Mallee Fowl, Ground Parrot.

Mammals - Rufous Bettong, Spotted-tailed Quoll, Eastern Quoll, Southern Brown Bandicoot, Black-striped Wallaby, Parma Wallaby, Southern Ningauai, Squirrel Glider, Long-nosed Potoroo, Long-footed Potoroo.

Ecological Communities - Ben Halls Gap National Park Sphagnum Moss Cool Temperate Rainforest, Duffys Forest, Eastern Suburbs Banksia Scrub, Kurnell Dune Forest, O'Hares Creek Shale Forest, Pittwater Spotted Gum Forest, Other listed endangered ecological communities, including Cumberland Plain Woodland, Sydney Turpentine Ironbark Forest, Blue Gum High Forest, Elderslie Banksia Scrub Forest, Genowlan Point *Allocasuarina nana* heathland, Sydney Coastal River-flat Forest, Shale/Sandstone Transition Forest and Cooks River Clay Plain Scrub Forest are all likely to suffer a loss of species composition if subject to repeated high frequency fires.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Ecological consequences of high frequency fires - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Develop and implement education and awareness programs about bushfires (including how high-frequency fire can impact on biodiversity).	Medium
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Develop protocols for minimising risk to fire-sensitive species and ecosystems when undertaking fuel-reduction burning.	High
Threat abatement strategy: <a href="#">Habitat management: Fire</a> Design burning prescriptions for purposes of maintaining ecological processes.	High
Threat abatement strategy: <a href="#">Monitoring</a> Establish monitoring sites to provide basis for long-term monitoring of impacts of fire regimes and fire events.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Prepare Statement of Intent by 2009.	High
Threat abatement strategy: <a href="#">Research</a> Identify fire-sensitive species and ecological communities. Support research examining the effects of different fire regimes on biodiversity.	High Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> Support implementation of the Bush Fire Environmental Assessment Code and provide information relevant to maintaining Threatened Species Hazard Reduction List.	High

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## Competition from feral honeybees - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Competition from feral honeybees *Apis mellifera* L. was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [29 November 2002].

Feral honeybees are introduced bees, *Apis mellifera*, which originally escaped from hives and have subsequently established in the wild, usually centered on tree hollows. Feral honeybees are thought to occur patchily throughout most of the State (Paton, 1996), with the exception of alpine areas.

Honeybees impact on biodiversity in two broad ways: via competition for tree hollows and via competition for floral resources, such as pollen and nectar. The loss of tree hollows via occupation by feral honeybees reduces the number of hollows available for native animals to breed and shelter. This is of particular concern for species which are threatened. Hollows are an extremely important resource for many Australian animals, particularly birds and mammals.

Threatened species which are likely to be affected by competition from honeybees for hollows include the Brush-tailed Phascogale, Squirrel Glider, Yellow-bellied Glider, Major Mitchell's Cockatoo, Glossy Black Cockatoo, Superb Parrot, and Regent Parrot. Populations of protected species that may become threatened include the Common Brushtail Possum, Greater Glider, and Sugar Glider (Garnett 1992, Oldroyd *et al.* 1994, Paton 1996, Soderquist *et al.* 1996, Trainor 1995, Wood and Wallis 1998, Pyke 1999, Soderquist 1999).

## Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 4 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.



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## Competition from feral honeybees - Priority actions

A total of 4 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare statement of intent in 2007 explaining how feral honeybees will be managed.	Low
Threat abatement strategy: <a href="#">Research</a>	
After survey information is available, identify the threatened species likely to be affected and assess the severity of the threat from feral honeybees.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Survey selected reserves to gain a better understanding of the extent and severity of the threat from feral honeybees.	High

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## Competition and grazing by the feral European rabbit - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus* (L.) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [10 May 2001].

Rabbits, *Oryctolagus cuniculus*, have spread over most of the southern two thirds of Australia and now occupy approximately 4.5 million km<sup>2</sup> (Myers et al. 1989).

Grazing and burrowing by rabbits can cause massive erosion problems, reduce recruitment and survival of native plants, and alter entire landscapes. Rabbits also threaten the survival of a number of native animal species by altering habitat, reducing native food sources, displacing small animals from burrows and attracting introduced predators such as foxes. In addition, rabbits may have significant impacts on Aboriginal and historic cultural heritage. For example, overgrazing by rabbits has exacerbated soil erosion in Mungo and Kinchega national parks, exposing culturally significant sites such as Aboriginal burial grounds.

Threatened species that suffer in dietary competition with rabbits include the Yellow-footed Rock-wallaby, Brush-tailed Rock-wallaby and Southern Hairy-nosed Wombat (Dawson & Ellis 1979, 1984; St John 1989; Short & Milkovits 1990). The Plains Wanderer and Malleefowl are adversely affected by rabbits through competition for food and/or by alteration and reduction of suitable habitat (Baker-Gabb 1990; Garnett 1992).

Grazing by rabbits has reduced the survival and recruitment of several species of threatened plants. These include *Acacia carneorum*, *Grevillea kennedyana*, *Cynanchum elegans*, *Thesium australe* and *Lepidium hyssopifolium* (Cropper 1987; Auld 1990, 1993; Griffith 1992; Matthes & Nash 1993). Grazing by rabbits has marked effects on the structure and composition of the *Acacia loderi* Endangered Ecological Community.

Competition and land degradation by feral Rabbits is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999* and a national threat abatement plan has been prepared by the Department of Environment and Heritage.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 11 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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**Competition and grazing by the feral European rabbit**

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## Competition and grazing by the feral European rabbit - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Develop and implement an extension program for new control techniques (i.e.. RHD virus/baits).	High
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop best practice guidelines for the use of RHD virus/baits; develop best practice guidelines for monitoring the effectiveness of control programs.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAAs and land managers/owners</a>	
Liaise with Western Catchment Management Authority for inclusion of rabbit control as a priority pest.	High
Threat abatement strategy: <a href="#">Measure response to control</a>	
Develop and implement rabbit monitoring program at priority sites.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a Statement of Intent for this KTP by 2007.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Prepare a Threat Abatement Plan for this KTP.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a>	
Prioritise control actions based on rabbit impacts.	High
Threat abatement strategy: <a href="#">Research</a>	
No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Identify and prioritise biodiversity at risk from rabbit impacts.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Survey the distribution and abundance of rabbits.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Continue to implement current control programs on DEC lands until evidence of impacts is reviewed.	High

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## Clearing of native vegetation - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Clearing of native vegetation was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [21 September 2001].

Native vegetation is made up of plant communities, comprising primarily indigenous species and includes canopy trees (where present), understorey, ground cover and below ground biomass (roots, bulbs and the seed bank). For the purposes of this determination native vegetation does not include marine vegetation within the meaning of the *Fisheries Management Act 1994*.

Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts as a result of clearing native vegetation, including:

- destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes;
- fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species;
- riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities;
- disturbed habitat which may permit the establishment and spread of exotic species which may displace native species; and
- loss of leaf litter, removing habitat for a

wide variety of vertebrates and invertebrates.

There are numerous threatened species, populations and ecological communities adversely affected by the clearing of native vegetation. For a complete list of these threatened species, populations and ecological communities please see the final determination [web link].

Land Clearing is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 9 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Clearing of native vegetation

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## Clearing of native vegetation - Priority actions

A total of 9 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Prepare and implement an education and community awareness publicity campaign to increase knowledge on the impacts of clearing of native vegetation on biodiversity.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop a Biodiversity Offsets and Banking Scheme (BioBanking), a market based instrument designed to ensure that where biodiversity offsets are used they are implemented consistently and strategically.	Medium
Develop a Private Native Forestry Code of Practice for industry as a regulation under the Native Vegetation Act 2003.	Medium
Prepare guidelines to address various environmental planning initiatives, including EPI preparation for biodiversity certification.	Medium
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a>	
Work with CMA's to achieve objectives of the Native Vegetation Act 2003 and demonstrate contribution of CMA decisions to achieving the State and Catchment vegetation and biodiversity related targets.	High
Investigate opportunities for management agreements (JMA/MOUs) with Public Authorities (e.g.. Utility providers).	Medium
Threat abatement strategy: <a href="#">Measure response to control</a>	
Review and update PVP biodiversity tools to improve the protection of native vegetation.	High
Review progress of biodiversity tools which improve the protection of native vegetation.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a statement of intent by 2009 to establish links between existing regulation of clearing of native vegetation and identifying strategies for the protection of biodiversity.	Low
Threat abatement strategy: <a href="#">Research</a>	
Continue existing and facilitate new research in mapping, analysis and impacts of clearing of native vegetation in NSW, including population analysis and modelling, vegetation dynamics, vertebrate and woodland ecology.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Provide input to interagency and stakeholder discussion and review of policy settings to support the implementation Native Vegetation Act 2003.	High
Establish and maintain links between the techniques and policies implemented in vegetation management and those in NRM and strategic conservation planning.	Medium
Oversee interactions between TSC Act reforms and Native Vegetation and NRM reforms through biodiversity certification.	Medium
Provide custodianship and maintenance of databases which support the biodiversity tools in PVP developer (including undertaking periodic review of the data and databases).	Medium
Review NSW planning initiatives to encourage the protection of native vegetation in EPIs and planning documents.	Medium
Review the code and regulation of the Plantation and Reafforestation legislation in regards to biodiversity issues.	Medium
Review the Environmental Outcomes Assessment methodology for the biodiversity component.	Medium
Work with the Natural Resources Council and support CMA's to monitor implementation and effectiveness of the Minister for Environment biocertification requirements. are met.	Medium
Review, assess and implement Commonwealth and NSW threat abatement strategies identified in recovery plans, where practical.	Low
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Design and seek funding for research to improve understanding of the role of "invasive native scrub" in species persistence in landscapes with different levels of past clearing and habitat fragmentation.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Identify gaps in vegetation mapping/classification and develop priorities for future survey, assessment and mapping in these areas.	High

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands. - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [31 May 2002].

Alteration to natural flow regimes refers to reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels. Three human processes have predominantly altered flows in streams, rivers and their floodplains, and wetlands in NSW, these are: building of dams, diversion of flows by structures or extraction, and alteration of flows on floodplains with levees and structures.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems, including floodplains. These alterations could cause a large number of species, populations or ecological communities that rely on river flows for their short term and long term survival to become threatened. Impacts associated with altering natural flow regimes, include:

- extraction of water which reduces flows, leading to a lower distribution of organic matter on which invertebrates and



- vertebrates depend on;
- the permanent flooding of wetlands which kills vegetation depending on intermittent flooding, decreasing habitat for invertebrates and waterbirds as a result;
- riparian zone degradation where changes to flows increases erosion, leading to sedimentation impacts upon aquatic communities;
- deeper and more permanent standing water which permits the establishment and spread of exotic species; and
- changes to the physical, chemical and biological conditions of rivers and streams which alters biota.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands has been identified as a threat to a number of threatened species and communities. Habitat loss through altered hydrology patterns in rivers and wetlands has been identified as a threat for the endangered Spotted Tree Frog and the vulnerable birds, Blue-billed Duck and the Freckled Duck.

A related process, The installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams is listed as a key threatening process under the *Fisheries Management Act 1994*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands. - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Prepare and implement an education and community awareness publicity campaign to increase knowledge on the impacts of alteration of natural flow regimes on biodiversity.	Low
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAAs and land managers/owners</a>	
Continue to support Ramsar Managers Network.	High
Whole of government approach for the development of a threat abatement program to address impacts to marine and terrestrial biodiversity caused by altered flow regimes.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare Statement of Intent by 2009.	High
Threat abatement strategy: <a href="#">Research</a>	
To continue to research impacts of altered flow regimes on biodiversity, water quality and quantity.	High
Modelling of impacts of salinity, climate change and water resource development.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Review NSW Fisheries Scientific Committee determination for installation and operation of in stream structures that modify flow and NSW Weirs Policy for consideration of the preparation of a joint TAP for both KTPs with DPI (Fisheries).	High
Support the implementation of the NSW Water Reforms and the Water Management Act 2000.	High
Support water sharing planning programs and initiatives.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Determine impacts of altered flow regimes on marine and terrestrial biodiversity, with reference to structures affecting flow, mechanisms that affect flow and affected threatened species and communities.	High
Identify mechanisms for abatement of impacts, e.g.. Weirs removals program, causeway and culvert modification, habitat rehabilitation, instigation of ecological flows.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Identify Rivers and Wetlands of high conservation value for biodiversity.	High
Survey and map structures altering water regimes with respect to affected threatened species and communities.	Medium

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## Predation by the European Red Fox - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [20 March 1998].

Foxes are an adaptable and elusive predator common in rural and urban areas throughout southern Australia. They do not appear to favour any particular habitat and the main determinants of their population size and distribution appear to be food supply, disturbance of natural habitats and refuge availability.

Since their introduction into Australia in the 1870s, foxes have contributed to severe declines and extinctions of a suite of native fauna, particularly among medium-sized (450-5000 g) ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Recent experimental studies have shown that predation by foxes continues to threaten remnant populations of many of these species. In contrast, some studies have found that fox predation has little or no impact on some populations of native prey, including some small mammal populations in dense microhabitats.

Following their listing as a KTP under the TSC Act, the Department of Environment has prepared a Fox Threat Abatement Plan for NSW (Fox TAP). The Fox TAP establishes priorities for fox control for the conservation of biodiversity across all land tenures. In particular, the plan identifies which threatened species are at greatest risk from fox predation and at which sites fox control for these species is most critical. Thus a total of 74 priority sites for fox control have been established,

### Related information

[Approved NSW threat abatement plan for predation by the red fox \(PDF - 930\)](#)
[Approved NSW threat abatement plan for predation by the red fox \(PDF - 930\)](#)

providing recovery actions for 34 threatened species (11 mammals, 15 birds and 8 reptiles).

Undertaking high-frequency broad-area fox control across all land tenures at these priority sites is the central action of the plan. In addition, the plan establishes monitoring programs to measure the response of priority threatened species to fox control. These monitoring programs are fundamental to managing threatened species more effectively. Experiments target rufous bettong, brush-tailed rock wallaby, yellow-footed rock wallaby, black-striped rock wallaby, southern brown bandicoot, broad-toothed rat, Alberts lyrebird, plains wanderer, malleefowl, Bellinger River turtle and shore nesting birds such as the little tern and pied oystercatcher.

At present, collaborative fox control and/or monitoring programs are established on public lands at all priority sites. Works are being undertaken by the DEC, Department of Primary Industries (Forests NSW) and Department of Lands with support from various rural lands protection boards. However, works on private lands are limited such that the effectiveness of many of the control programs is likely to be compromised by the rapid immigration of foxes from untreated lands. A collaborative project with the five coastal Catchment Management Authorities has recently been funded to expand collaborative control programs on private lands surrounding Fox TAP priority sites.

Predation by the European Red Fox (*Vulpes vulpes*) is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Predation by the European Red Fox - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Liaise with landholders to expand fox control around identified priority sites.	Medium
Facilitate greater awareness of the Fox Threat Abatement Plan.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Continue to review and implement best practice guidelines for the control of foxes.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAAs and land managers/owners</a>	
Expand fox control onto private lands within identified priority sites in collaboration with Catchment Management Authorities.	Low
Threat abatement strategy: <a href="#">Measure response to control</a>	
Measure changes in Albert's Lyrebird and fox populations at the Jerusalem North priority site (non-treatment).	High
Measure changes in Broad-toothed Rat and fox populations at the Kosciuszko North priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the Martindale priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the St Albans priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the Wollondilly priority site (non-treatment).	High
Measure changes in Malleefowl and fox populations at the Wamberra priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Glenugie priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Grange priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Marengo priority site (non-treatment).	High
Measure changes in Southern Brown Bandicoot and fox populations at the Garigal priority site (non-treatment).	High
Measure changes in Southern Brown Bandicoot, Hooded Plover and fox populations at the Nadgee priority site (non-treatment).	High
Measure changes in the Brush-tailed Rock-wallaby and fox populations at the Barnard River priority site (non-treatment).	High
Measure the changes in the Plains Wanderer and fox populations at the Wanganella priority site (non-treatment).	High
Measure the response of Albert's Lyrebird and fox populations to fox control at the Jerusalem South priority site.	High
Measure the response of Bellinger River Turtle and fox populations to fox control at the Upper Bellinger priority site.	High
Measure the response of Broad-toothed Rat and fox populations to fox control at the Barrington priority site.	High
Measure the response of Broad-toothed Rat, Mountain Pygmy Possum and fox populations to fox control at the Snowy Mountains priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Broke-Milbrodale priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Kangaroo Valley priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Mount Kapatur priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Warrumbungles priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Watagans priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Wolgan River priority site.	High
Measure the response of fox populations to fox control at the Jenolan Caves priority site.	High
Measure the response of fox populations to fox control at the Taralga priority site.	High
Measure the response of Hooded Plover and Pied Oystercatcher populations to fox control at the Conjola priority site.	High
Measure the response of Hooded Plover and/or Pied Oystercatcher and/or Little Tern populations to fox control at the Mimosa Rocks priority site.	High

Measure the response of Hooded Plover and/or Pied Oystercatcher populations to fox control at the Moruya Heads priority site.	High
Measure the response of Hooded Plover and/or Pied Oystercatcher populations to fox control at the Murramarang priority site.	High
Measure the response of Little Tern and Beach Stone-curlew populations to fox control at the Manning River priority site.	High
Measure the response of Little Tern and/or Pied Oystercatcher populations to fox control at the Tathra Beach priority site.	High
Measure the response of Long-footed Potoroo and fox populations to fox control at the southeast Forest-South priority site.	High
Measure the response of Long-nosed Bandicoot and fox populations to fox control at the North Head priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Abbots Tank priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Goonoo priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Mallee Cliffs priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Nombinnie/Round Hill priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Tarawi priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Yathong priority site.	High
Measure the response of Pied Oystercatcher and Beach Stone-curlew populations to fox control at the Clarence River Entrance priority site.	High
Measure the response of Pied oystercatcher and Beach Stone-curlew populations to fox control at the Yuraygir Mid priority site.	High
Measure the response of Pied Oystercatcher and/or Little Tern populations to fox control at the Tilba-Wallaga Lake priority site.	High
Measure the response of Pied Oystercatcher and/or Little Tern populations to fox control at the Tuross-Lake Brou priority site.	High
Measure the response of Pied Oystercatcher, Beach Stone-curlew and Little Tern populations to fox control at the Yuraygir South priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Mount Royal priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Ramornie priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Tamban priority site.	High
Measure the response of Smoky Mouse and fox populations to fox control at the southeast Forest-Nullica priority site.	High
Measure the response of Southern Brown Bandicoot and fox populations to fox control at the Ku-ring-gai priority site.	High
Measure the response of Southern Brown Bandicoot and/or Hooded Plover populations to fox control at the Ben Boyd priority site.	High
Measure the response of the Plains Wanderer and fox populations to fox control at the Oolambeyan priority site.	High
Measure the response of the Black-striped Wallaby population to fox control at the Brigalow Park priority site.	High
Measure the response of the fox population to fox control at the Macquarie Marshes priority site.	High
Measure the response of the fox population to fox control at the Mungo priority site.	High
Measure the response of the fox population to fox control at the Narren Lakes priority site.	High
Measure the response of the fox population to fox control at the Nocolche priority site.	High
Measure the response of the fox population to fox control at the Peery Lake priority site.	High
Measure the response of the fox population to fox control at the Sturt priority site.	High
Measure the response of the Hooded Plover population to fox control at the Narooma-Mystery Bay priority site.	High
Measure the response of the Hooded Plover population to fox control at the Wallagoot Lake priority site.	High
Measure the response of the Little Tern population to fox control at the Lake Wollumboola priority site.	High
Measure the response of the Little Tern population to fox control at the Nambucca priority site.	High
Measure the response of the Little Tern population to fox control at the Sawtell priority site.	High
Measure the response of the Little Tern population to fox control at the Towra Point priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Bombing Range priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Broadwater priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Comerong priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the South Ballina priority site.	High
Measure the response of the Plains Wanderer and fox populations to fox control at the North Canargo priority site.	High
Measure the response of Yellow-footed Rock-wallaby and fox populations to fox control at the Coturaundee priority site.	High
Measure the response of Yellow-footed Rock-wallaby and fox populations to fox control at the Mutawinji priority site.	High
Measure the response of the Rufous Bettong and fox populations to fox control at the Yabbra priority site.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a Statement of Intent for this KTP by 2007.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Coordinate implementation of Fox TAP actions.	High
Review Fox Threat Abatement Plan in 2008.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Undertake fox control at the Abbots Tank priority site for the Malleefowl, Chestnut Quail-thrush and Southern scrub-robin.	High

Undertake fox control at the Barrington priority site for the Broad-toothed Rat.	High
Undertake fox control at the Ben Boyd priority site for the Southern Brown Bandicoot and Hooded Plover.	High
Undertake fox control at the Bombing Range priority site for Pied Oystercatchers.	High
Undertake fox control at the Brigalow Park priority site for the Black-striped Wallaby.	High
Undertake fox control at the Broadwater priority site for Pied Oystercatchers.	High
Undertake fox control at the Broke-Milbrodale priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Clarence River Entrance priority site for the Brolga, Pied Oystercatcher and Beach Stone-curlew.	High
Undertake fox control at the Comerong priority site for the Pied Oystercatcher.	High
Undertake fox control at the Conjola priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Coomonderry swamp priority site for the Australasian Bittern.	High
Undertake fox control at the Coturaundee priority site for the Yellow-footed Rock-wallaby.	High
Undertake fox control at the Goonoo priority site for the Malleefowl.	High
Undertake fox control at the Jenolan Caves priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Jerusalem South priority site for Albert's Lyrebird.	High
Undertake fox control at the Kangaroo Valley priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Ku-ring-gai priority site for the Southern Brown Bandicoot.	High
Undertake fox control at the Lake Wollumboola priority site for the Little Tern.	High
Undertake fox control at the Macquarie Marshes priority site for the Brolga and Australasian Bittern.	High
Undertake fox control at the Mallee Cliffs priority site for the Malleefowl, Chestnut Quail-thrush and Southern scrub-robin.	High
Undertake fox control at the Manning River priority site for the Little Tern and Beach Stone-curlew.	High
Undertake fox control at the Mimosa Rocks priority site for the Hooded Plover, Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Moruya Heads priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Mount Kaputar priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Mount Royal priority site for the Rufous Bettong.	High
Undertake fox control at the Mungo priority site for the Chestnut Quail-thrush, Southern Scrub-robin and Western Bluetongue Lizard.	High
Undertake fox control at the Murramarang priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Mutawinji priority site for the Yellow-footed Rock-wallaby.	High
Undertake fox control at the Nambucca priority site for the Little Tern.	High
Undertake fox control at the Narooma-Mystery Bay priority site for the Hooded Plover.	High
Undertake fox control at the Narren Lakes priority site for the Brolga.	High
Undertake fox control at the Nocoleche priority site for the Brolga.	High
Undertake fox control at the Nombinnie/ Round Hill priority site for the Malleefowl, Southern Scrub-robin and Chestnut Quail-thrush.	High
Undertake fox control at the North Canargo priority site for the Plains Wanderer.	High
Undertake fox control at the North Head priority site for the Long-nosed Bandicoot.	High
Undertake fox control at the Oolambeyan priority site for the Plains Wanderer.	High
Undertake fox control at the Peery Lake priority site for the Brolga.	High
Undertake fox control at the Ramornie priority site for the Rufous Bettong.	High
Undertake fox control at the Sawtell priority site for the Little Tern.	High
Undertake fox control at the Snowy Mountains priority site for the Broad-toothed Rat and Mountain Pygmy Possum.	High
Undertake fox control at the South Ballina priority site for Pied Oystercatchers.	High
Undertake fox control at the southeast Forest- Nullica priority site for the Smoky Mouse.	High
Undertake fox control at the southeast Forest- South priority site for the Long-footed Potoroo.	High
Undertake fox control at the Sturt priority site for the Long-haired Rat, Australian Bustard, Flock Bronzewing, Squatter Pigeon, Central Bluetongue Lizard, Collared Whip-snake, Narrow Banded Snake and Stimson's Python.	High
Undertake fox control at the Tamban priority site for the Rufous Bettong.	High
Undertake fox control at the Taralga priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Tarawi priority site for the Malleefowl, Chestnut Quail-thrush, Southern Scrub-robin and Western Bluetongue Lizard.	High
Undertake fox control at the Tathra Beach priority site for the Little Tern and Pied Oystercatcher.	High
Undertake fox control at the Tilba-Wallaga Lake priority site for the Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Towra Point priority site for the Little Tern.	High
Undertake fox control at the Tuross-Lake Brou priority site for the Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Upper Bellinger priority site for the Bellinger River Turtle.	High
Undertake fox control at the Wallagoot Lake priority site for the Hooded Plover.	High
Undertake fox control at the Warrumbungles priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Watagans priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Wolgan River priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Yathong priority site for the Malleefowl, Southern Scrub-robin and Chestnut Quail-thrush.	High
Undertake fox control at the Yuraygir Mid priority site for the Pied Oystercatcher and Beach Stone-curlew.	High
Undertake fox control at the Yuraygir South priority site for the Pied Oystercatcher, Beach Stone-curlew and Little Tern.	High

**APPENDIX F - Key Threatening Processes Profiles**



# threatened species

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## Invasion and establishment of exotic vines and scramblers - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

A large number of exotic vines and scramblers have become established in New South Wales. Many are now widespread, and locally abundant, especially in the eastern part of the state. The majority of these vines and scramblers were originally introduced for horticultural purposes and have now escaped. A number are currently recognised as significant environmental weeds in particular regions (eg The NSW North Coast Weeds Advisory Committee, undated). The main species include:

*Abrus precatorius* Crabs-eye Creeper, *Acetosa sagittata* Potato Vine, *Anredera cordifolia* Madeira Vine, *Araujia sericifera* Moth vine, *Aristolochia elegans* Dutchman's Pipe, *Aristolochia littoralis* Dutchman's Pipe, *Asparagus aethiopicus* Ground Asparagus, *Asparagus africanus* Asparagus Fern, *Asparagus asparagoides* Bridal Creeper, *Asparagus plumosus* Climbing Asparagus, *Asparagus scandens* Climbing Asparagus, *Asystasia gangetica* var. *micrantha*, *Caesalpinia decapetala* Mysore Thorn, *Cardiospermum grandiflorum* Balloon Vine, *Clematis vitalba* Old Man's Beard, *Delairea odorata* Cape Ivy, *Dioscorea bulbifera* Aerial Yam, *Dipogon lignosus*, *Hedera helix* English Ivy, *Ipomoea alba* Moon Flower, *Ipomoea cairica* Coastal Morning Glory, *Ipomoea indica* Morning Glory, *Ipomoea purpurea* Morning Glory, *Lathyrus tingitanus*, *Lonicera japonica* Japanese Honeysuckle, *Macfadyena unguis-cati* Cat's Claw Creeper, *Passiflora suberosa* Corky Passion Flower, *Passiflora subpeltata* Passion Flower, *Passiflora toriminiana*, *Puearia lobata* Kudzu, *Senecio angulatus*, *Senecio macroglossus*, *Solanum jasminoides* Potato Vine, *Solanum seforthianum*

Climbing Nightshade, *Sollya heterophylla*,  
*Thunbergia alata* Black-eyed Susan, *Thunbergia*  
*grandiflora* Blue Trumpet Vine, *Tradescantia*  
*fluminensis*, *Vinca major* Periwinkle.

Exotic vines and scramblers have significant adverse effects on biodiversity. They typically smother native vegetation and seedlings as well as prevent recruitment, especially in riparian areas. In addition, some vine species are capable of killing mature trees (eg Cat's Claw Creeper). Many of these vines and scramblers co-occur in the same locations and thus compound their impact to biodiversity. The speed at which many of these species have spread in New South Wales has contributed to their potential impact to biodiversity.

In New South Wales, exotic vines and scramblers have been identified as a threat to the following native plant species listed on Schedule 1 and Schedule 2 of the Act:

*Acacia pubescens*, *Acronychia littoralis*,  
*Daphnandra* sp 'C' Illawarra, *Davidsonia jerseyana*,  
*Davidsonia johnsonii*, *Desmodium acanthocladum*,  
*Diploglottis campbelli*, *Endiandra floydii*, *Epacris*  
*hamiltonii*, *Fontainea oraria*, *Gossia (Austromyrtus)*  
*fragrantissima*, *Hicksbeachia pinnatifolia*,  
*Ireneppharus trypherus*, *Isoglossa eranthemoides*,  
*Pimelea spicata*, *Rapanea* sp. A Richmond River,  
*Tinospora tinosporides*

Exotic vines and scramblers have been identified as a threat to at least three animal species listed as Endangered on Schedule 1 of the Act:

*Kerivoula paupuensis* Golden-tipped bat, *Potorous tridactylus* Long-nosed potoroo, and *Turnix melanogaster* Black-breasted button quail.

Exotic vines and scramblers have also been identified as a threat to the following Endangered Ecological Communities:

Coastal Saltmarsh in the NSW North Coast; Sydney Basin and South East Corner bioregions; Cumberland Plain Woodland; Elderslie Banksia Scrub Forest; Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions; Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion; Illawarra Subtropical Rainforest in the Sydney Basin Bioregion; Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions; Lowland Rainforest on Floodplain in the NSW North Coast Bioregion; Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion; Moist Shale Woodland in the Sydney Basin Bioregion; Mount Gibraltar Forest in the Sydney Basin Bioregion; Pittwater Spotted Gum Forest; Robertson Basalt Tall Open-

forest in the Sydney Basin Bioregion; Shale-sandstone Transition Forest; Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion; Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions; Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and Western Sydney Dry Rainforest in the Sydney Basin Bioregion.

### References

- NSW Scientific Committee (2006) Exotic vines and scramblers - Key Threatening Process declaration - final. DEC (NSW), Sydney.

### Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 8 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Invasion and establishment of exotic vines and scramblers

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## Invasion and establishment of exotic vines and scramblers - Priority actions

A total of 8 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Raise awareness of vine impacts on biodiversity with general public and nursery industry.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a> Develop and implement vine monitoring programs at priority sites.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Develop statement of intent by 2007 explaining how exotic vines and scramblers will be managed.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a> Prioritise control actions based on vine impacts.	Medium
Threat abatement strategy: <a href="#">Research</a> Investigate effective control methods.	Medium
Threat abatement strategy: <a href="#">Review evidence of impacts</a> Determine the relative threat of vine impacts on biodiversity.	Medium
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a> Collate baseline information on the distribution of vines in NSW in order to determine priority sites for control.	Low
Threat abatement strategy: <a href="#">Undertake control actions</a> Continue existing control programs until evidence of impacts is reviewed.	High

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## Predation by feral cats - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Predation by the Feral Cat *Felis catus* (Linnaeus, 1758) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [24 March 2000].

The Cat *Felis catus* (Linnaeus, 1758) is a common but elusive predator that occurs throughout Australia and on many offshore islands. Cats occur in virtually all terrestrial habitats in Australia, and the main determinants of local population size appear to be the availability of food and shelters. Cats may be categorised as domestic, stray or feral. Feral cats are free-living, have minimal or no reliance on humans for their ecological requirements, and survive and reproduce in self-perpetuating populations.

Several Endangered and Vulnerable species in New South Wales are currently threatened from feral cats, including the Hastings River Mouse *Pseudomys oralis*, Sandy Inland Mouse *Pseudomys hermannsburgensis*, Pilliga Mouse *Pseudomys pilligaensis*, Bolam's Mouse *Pseudomys bolami*, Forrest's Mouse *Leggadina forresti*, Mountain Pygmy-possum *Burramys parvus*, Little Tern *Sterna albifrons*, Grey Grasswren *Amytornis barbatus*, Striated Grasswren *Amytornis striatus* and the lizard *Aprasia aurita*. Larger species such as Southern Brown Bandicoots *Isodon obesulus* and Brush-tailed Rock Wallabies *Petrogale penicillata* may also be at risk locally or when other prey is scarce.

Many other native species are potentially at risk of becoming threatened as a result of feral cat predation. Small mammals such as rodents, dasyurids, burramyids and ground-nesting birds are at particular risk.

Predation by feral Cats is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999* and a national threat abatement plan has been prepared by the Department of Environment and Heritage.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 8 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Predation by feral cats - Priority actions

A total of 9 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Undertake a community education and awareness program to increase understanding of the environmental impacts of feral cats and the need for their control.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop best practice guidelines for managing feral cats.	Low
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare statement of intent in 2007 explaining how feral cats will be managed.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Prepare a NSW TAP.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a>	
Prioritise feral cat control based on a review of the evidence of cat impacts.	High
Threat abatement strategy: <a href="#">Research</a>	
Develop and trial a cat-specific bait that will ensure non-target species are not impacted.	High
Develop cost-effective methods for broad-scale control of feral cats.	High
Undertake research in regard to better understanding predator interactions.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
List predation by the feral cat as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Identify the biodiversity most at risk from predation by feral cats.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Trial Western Australian cat bait at selected priority sites.	High

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# Loss of Hollow-bearing Trees - key threatening process - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Tree hollows are cavities formed in the trunk or branches of a living or dead tree. Hollows are usually more characteristic of older, mature to over mature trees. Hollows may develop in the trunk and branches of trees as a result of wind breakage, lightning strikes, fire and/or following the consumption and decay of internal heartwood by fungi and invertebrates, primarily termites. Hollow entrances are more common in larger trunks and branches because damage is less likely to be covered by growth of external sapwood.

Hollows occur primarily in old eucalypts trees, and are uncommon in many other native and introduced species such as wattle (*Acacia*), cypress pine (*Callitris*), she-oak (*Allocasuarina*) and pine (*Pinus*). The presence, abundance and size of hollows is positively correlated with tree trunk diameter, which is an index of age. Hollows with large internal dimensions are the rarest and occur predominantly in large old trees, which are rarely less than 220 years old. Larger, older trees also provide a greater density of hollows per tree. As such, large old hollow-bearing trees are relatively more valuable to hollow-using fauna than younger hollow-bearing trees. The latter are important as a future resource.

Mature and old hollow-bearing trees offer other valuable resources. Mature trees provide more flowers, nectar, fruit and seeds than younger trees, and a complex substrate that supplies diverse habitats for invertebrate populations. When hollow-bearing trees collapse or shed limbs they also provide hollow logs that serve as important



foraging substrates and shelter sites.

The distribution of hollow-bearing trees depends on tree species composition, site conditions, competition, tree health and past management activities. Hollows occur at varying densities; undisturbed woodlands typically contain 7–17 hollow-bearing trees per hectare, undisturbed temperate forests 13–27 per hectare and old-growth wet and dry sclerophyll forest of south-east Queensland typically contains 35 and 37 hollow-bearing trees per hectare. On a landscape basis, dead trees often account for 20–50% of the total number of hollow-bearing trees. However they are far more prone to collapse or incineration than live trees and are selectively harvested for firewood.

Occupancy of hollow-bearing trees is also related to their position in the landscape. Some species prefer hollows near riparian habitat or foraging areas, although more mobile species may travel long distances from roost. Breeding behaviour can also govern the suitability of hollows, with birds that nest colonially (e.g. Superb Parrot) or in clusters across the landscape (e.g. Glossy Black-cockatoo) requiring a local abundance of hollow-bearing trees. Conversely, strongly territorial species that prevent other individuals from nesting nearby require an even distribution of hollow-bearing trees if all pairs are to breed.

Many vertebrates are known to select hollows with specific characteristics, indicating that suitable hollows represent a fraction of the total hollow resource. Preference is typically shown for entrance dimensions that approximate body size, presumably to exclude larger competitors and predators. Small animals that roost communally or raise large litters require hollows with small entrances but large internal dimensions. The use of hollows with suboptimal characteristics can adversely affect survival and reproductive success.

The density of hollow-bearing trees required to sustain viable populations of vertebrates is controlled by the diversity of competing fauna species at a site, population densities, number of hollows required by each individual over the long-term, and the number of hollows with suitable characteristics occurring in each tree. The presence, abundance and species richness of hollow-using fauna are correlated with the density of hollow-bearing trees; suggesting that the availability of hollows is often a limiting environmental factor. In some instances it is the prey species of a threatened predator that is limited by hollow availability. In habitats with dense mid-storey the Common Ringtail Possum (*Pseudocheirus peregrinus*) builds stick nests, but in dry open forest it is dependent on large hollows and only abundant in areas with large trees. As

this species is an important prey item of the Powerful Owl (*Ninox strenua*), loss of hollows indirectly hinders recovery efforts for the predator.

Experimental supplementation of hollows using nest boxes demonstrates that hollow availability can limit the density of bats, arboreal mammals and breeding birds. Box occupancy is greatest at sites of low natural hollow densities and a higher proportion of bird populations breed when nest boxes are provided. Conversely, experimental reductions in hollow density can lead to a decline in the number of nesting birds.

The distribution and abundance of hollow-bearing trees in NSW has been reduced and fragmented by extensive clearing of native vegetation during the past two centuries, primarily for agriculture. For example it has been estimated approximately 70% of native vegetation has been cleared from the NSW wheat-sheep belt, the tablelands of the Great Divide and the coastal plain. Clearing in NSW has continued since 1995 at an estimated rate of over 30 000 ha per annum. Clearing has occurred at a greater intensity on flatter and more fertile landscapes, which typically support the highest densities of hollow-using fauna and most remnant vegetation now exists on rugged and infertile landscapes.

A range of direct and indirect processes contribute to the ongoing loss of hollow-bearing trees, the relative importance of these processes varies according to past and current land management regimes. Owing to the slow process of hollow development, and the particular value provided by large old trees, adverse effects from the continuing loss of old hollow-bearing trees will take centuries to fix.

In agricultural landscapes hollow-bearing trees typically persist as isolated mature individuals in cleared paddocks or in small fragmented vegetation remnants. Such trees frequently suffer from poor health (e.g. 'dieback') and have a shorter lifespan than in forested landscapes. Eventual loss of current hollow-bearing trees, and a lack of recruitment of younger trees to replace them, will result in a large decrease in the hollow resource over the wide geographic area covered by agricultural landscapes in the medium term.

Road reserves and Travelling Stock Reserves (TSRs) provide hollow-bearing trees within cleared agricultural landscapes. However, their availability in road reserves and TSRs is reduced because of habitat fragmentation and competition among hollow-dependent species. In urban and rural residential landscapes hollow-bearing trees persist in parks, small reserves, yards and road corridors,

although hollow density varies greatly. Clearing of vegetation for urban expansion and other development, including the creation of asset protection zones against wildfire, contributes significantly to the ongoing loss of hollow-bearing trees. Concern over the risk to humans from falling branches, and the potential for litigation, has increasingly led to removal or pruning of hollow-bearing trees.

In forests managed for timber and firewood production, silvicultural practices have greatly reduced the density of hollow-bearing trees, especially where repeated harvesting events have occurred. In some forest types there has been a gradual shift in the relative composition of tree species toward those desired for timber. Among trees grown for silvicultural purposes, current rotation intervals between harvesting events – typically 30 to 90 years – are insufficient to allow for hollow development. There have previously been limited requirements for retention of hollow-bearing trees on private property managed for silviculture, although prescriptions are currently being developed.

Even when trees are retained during harvest they are susceptible to damage from logging operations and post-harvest burning, or can suffer poor health owing to changes in abiotic conditions. Consequently, retained trees are prone to early mortality, especially with repeated exposure to harvesting events over their lifespan. In addition, the average age of hollow-bearing trees in harvested areas will continue to decrease as the few remaining very old trees die. Trees are also retained in areas excluded from harvesting, such as along drainage lines, with the aim of creating a matrix of harvested and non-harvested areas.

The density of hollow-bearing trees in conservation reserves that have previously been logged should gradually increase until reaching an equilibrium of recruitment and loss, albeit with a long time lag in some areas. Wildfire may temporarily disrupt the age structure of these forests but in the long term can also promote hollow formation in standing trees. Wildfire is a particular threat at sites where the hollow resource is restricted to large, senescent hollow-bearing trees that are susceptible to incineration. Where feral species and unusually abundant native species (e.g. Galah) occur, competition for hollows limits their availability to other species. This is more common in smaller reserves. One widespread competitor is the introduced Honeybee *Apis mellifera*, which typically builds hives in large cavities with small entrances.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 6 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Loss of Hollow-bearing Trees - key threatening process - Priority actions

A total of 6 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Encourage community adoption of hollow boxes.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Adopt appropriate policies for recruitment tree ratios with a stipulated minimum retention density in areas of forestry operations.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAs and land managers/owners</a> Work with CMAs to prioritise protection of hollow bearing trees when doing incentive PVP's and management agreements.	Medium
Threat abatement strategy: <a href="#">Habitat management: Feral Control</a> Control of feral species that utilise hollows, particularly the introduced Honeybee.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a> Review effectiveness of PVP biodiversity tools and Private native forestry code of practice in the protection of hollow bearing trees.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> Establish appropriate recruitment tree ratios as part of the private native code of practice under the Native Vegetation Act 2003.	High

- [Loss of Hollow-bearing Trees - key threatening process](#)
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- [Loss of Hollow-bearing Trees - key threatening process. Scientific Committee determination](#)
- [Trees with hollows \(PDF - 125KB\)](#)

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# Invasion, establishment and spread of Lantana camara - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Lantana is a branching shrub that grows in clumps or dense thickets 2-4 m high, but is able to grow to 15 m tall if given support. Stems have sharp prickles, and leaves are 2-10 cm long, hairy, and ovate with toothed edges. Inflorescences are compact, dome-shaped, 2-3 cm across, and contain 20-40 sessile flowers. Hard green fruits are 5-7 mm in diameter, grow in clusters, and ripen to fleshy black or purple berries. Fruits are mainly dispersed by birds.

There are 29 variants of lantana naturalised in Australia. Native to Central and tropical South America, the earliest record of lantana in Australia is from 1841 in the old Botanic Gardens in Adelaide. There have been multiple introductions for horticultural purposes since, mainly in NSW and Queensland. Lantana has spread rapidly along the east coast of Australia, from southern NSW north to Cape York. It currently invades about 4 million hectares, mainly in NSW and Queensland. It is also naturalised in the Northern Territory, South Australia and Western Australia, and on Lord Howe and Norfolk Islands. Lantana has the potential for much denser infestation of the coast and ranges, and to expand its range west and south of the Great Divide in NSW and other eastern States, at least along creek lines.

Lantana has significant adverse effects on biodiversity. It typically forms dense thickets, suppressing native vegetation and seedlings through shading, nutrient competition, smothering and allelopathy (ie. chemically suppresses the germination and/or growth of other plant species).

Lantana readily invades disturbed sites and communities, including edges and canopy breaks in dense forest communities. In open forests and woodlands lantana often becomes a dominant understorey species. In warmer, moister areas lantana often becomes dominant in regenerating pastures.

In New South Wales, lantana has been identified as a threat to the following native plant species listed on Schedule 1 and Schedule 2 of the Threatened Species Conservation Act 1995:

- *Acacia bakeri*
- *Acacia chrysotricha*
- *Acalypha eremorum*
- *Acronychia littoralis*
- *Allocasuarina portuensis*
- *Amorhospermum whitei*.
- *Angiopteris evecta*.
- *Angophora robur*
- *Archidendron hendersonii*
- *Arthraxon hispidus*
- *Austromyrtus fragrantissima*
- *Baloghia marmorata*
- *Belvisia mucronata*
- *Boronia umbellata*
- *Bosistoa selwynii*
- *Bosistoa transversa*
- *Calophanoides hygrophiloides*
- *Cassia brewsteri* var. *marksiana*
- *Clematis fawcettii*
- *Corynocarpus rupestris* subsp. *rupestris*
- *Cryptocarya foetida*
- *Cynanchum elegans*
- *Cyperus semifertillis*
- *Daphnandra* sp. *C Illawarra*
- *Davidsonia jerseyana*
- *Davidsonia johnsonii*
- *Desmodium acanthocladum*
- *Diospyros mabacea*
- *Diospyros major* var. *ebenus*
- *Diploglottis campbellii*
- *Doryanthes palmeri*
- *Drynaria rigidula*
- *Eidothea hardeniana*
- *Elaeocarpus* sp. *Rocky Creek*
- *Elaeocarpus williamsianus*
- *Endiandra floydii*
- *Endiandra hayesii*
- *Endiandra muelleri* subsp. *bracteata*
- *Eucalyptus glaucina*
- *Eucalyptus parramattensis* subsp. *decadens*
- *Eucalyptus tetrapleura*
- *Fontainea australis*
- *Fontainea oraria*
- *Geijera paniculata*
- *Hibbertia procumbens*
- *Hicksbeachia pinnatifolia*
- *Irenepharsus trypherus*
- *Isoglossa eranthemoides*
- *Lepiderema pulchella*

- *Macadamia tetraphylla*
- *Macrozamia johnsonii*
- *Marsdenia longiloba*
- *Melichrus 'hirsutus'*
- *Melichrus sp.*
- *Melicope vitiflora*
- *Niemeyera chartacea*
- *Ochrosia moorei*
- *Owenia cepiodora*
- *Parsonsia dorrigoensis*
- *Phaius australis*
- *Phaius tankarvilleae*
- *Phyllanthus microcladus*
- *Plectranthus alloplectus*
- *Plectranthus nitidus*
- *Polygala linariifolia*
- *Pomaderris queenslandica*
- *Pterostylis gibbosa*
- *Quassia sp. Mooney Creek*
- *Randia moorei*
- *Rapanea sp. A Richmond River*
- *Rhynchosia acuminatissima*
- *Senna acclinis*
- *Solanum celatum*
- *Solanum limitare*
- *Sophora fraseri*
- *Syzygium paniculatum*
- *Tinospora smilacina*
- *Tinospora tinosporoides*
- *Triplarina imbricata*
- *Tylophora linearis*
- *Tylophora woollsii*
- *Typhonium sp. aff. brownii*
- *Zieria prostrata*

Lantana has been identified as a threat to at least two animal species listed as Endangered on Schedule 1 of the Act:

- *Dasyornis brachypterus* (Eastern Bristlebird)
- *Ocybadistes knightorum* (Black Grass-Dart Butterfly)

Lantana has also been identified as a threat to the following Endangered Ecological Communities listed on Schedule 1 Part 3 of the Act:

- Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion
- Lowland Rainforest on Floodplain in the NSW North Coast Bioregion
- Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Lower Hunter spotted gum - Ironbark forest in the Sydney Basin Bioregion
- Pittwater Spotted Gum Forest
- River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin, and South East Corner Bioregions



- Swamp-oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp sclerophyll forest on the coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Sub-tropical Coastal floodplain forest of the NSW North Coast Bioregion
- Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion
- Blue Gum High Forest
- Western Sydney Dry Rainforest in the Sydney Basin Bioregion
- Sydney Turpentine-Ironbark Forest
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion

A national management plan is being prepared which will identify the biodiversity most at risk from lantana, and priority locations for control.

### References

- NSW Scientific Committee (2006) Invasion, establishment and spread of Lantana camara - Key Threatening Process declaration - final. DEC (NSW), Sydney

### Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 9 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Invasion, establishment and spread of Lantana camara - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Develop and distribute educational materials e.g. Lantana Manual.	Medium
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop best practice guidelines for managing Lantana.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a>	
No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Measure response to control</a>	
Develop and implement monitoring program at priority sites.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Develop statement of intent explaining how Lantana will be managed by 2007.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a>	
Develop and use model to rank priority sites for control of Lantana.	High
Threat abatement strategy: <a href="#">Research</a>	
Conduct research on the biocontrol of Lantana.	High
Conduct research on the use of remote sensing to survey and map Lantana distribution.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
List Lantana as a noxious weed under the Noxious Weeds Act 1993 and as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Develop and use model to rank biodiversity threatened by Lantana.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Map distribution and abundance of Lantana in NSW.	Medium
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Continue existing control programs until site model has been developed; continue further releases of biocontrol.	High

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# Invasion of native plant communities by exotic perennial grasses - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Invasion of native plant communities by exotic perennial grasses was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [12 September 2003].

Exotic perennial grasses are those that are not native to NSW and have a life-span of more than one growing season. More than a hundred species of exotic perennial grasses occur in New South Wales. A relatively small number of these perennial grasses threaten native plant communities, and it is these species which are of concern.

Exotic perennial grasses of special concern include *Hyparrhenia hirta* (Coolatai grass), *Cortaderia* spp. (pampas grasses), *Sporobolus fertilis* (giant Parramatta grass), *Nassella neesiana* (Chilean needlegrass), *Nassella trichotoma* (serrated tussock) and *Eragrostis curvula* (African lovegrass).

The listing of "Invasion of native plant communities by exotic perennial grasses" as a key threatening process has been made in recognition of the increasing evidence that some perennial grass species have significant adverse impacts on biodiversity. A few examples follow:

- Coolatai grass grows vigorously forming an almost complete monoculture replacing native grass and wildflower species. It tolerates drought, heavy grazing and many herbicides. It has invaded large areas of grassy woodlands and native pastures in

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[NSW Flora Online - Cortaderia jubata](#)
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[NSW Flora Online - Eragrostis curvula](#)
[NSW Flora Online - Hyparrhenia hirta](#)
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north-west NSW and is spreading rapidly in other regions.

- Chilean needlegrass has several features which give it a competitive advantage over many native species, such as its ability to produce a large, long-living seed bank, high survival of seedlings, tolerance to drought and effective animal-borne and water-borne dispersal mechanisms for seeds.
- Serrated tussock infests more than a million hectares in southern Australia but has the potential to spread over a much larger area. It invades native grasslands, grassy woodlands, dry forests and rocky shrublands. Serrated tussock forms large tussocks with individual plants capable of producing more than 10,000 seeds annually. Some seeds remain viable in the soil for more than 10 years. Mature plants droop across the ground smothering other species.
- Pampas grass readily tolerates saline conditions, salt spray, drought, periodic inundation, severe frosts, strong winds and can grow on a wide range of soil conditions and light conditions (from shaded areas through to full sunlight). Pampas grass is an aggressive coloniser and can form dense stands which prevent other plants from growing. Individual flower heads produce more than 100,000 seeds and wind may disperse seed for several kilometres.
- Perennial grasses, such as perennial veldtgrass, pampas grass, Coolatai grass and buffel grass, produce large amounts of plant matter which dries quickly and causes fuel loads to increase. This fuel results in fire regimes that favour the spread of these perennial grasses. Hotter and more frequent fires may lead to changes in the structure of the vegetation and in some cases to local extinctions of some plant and animal species.

Several endangered ecological communities are threatened by exotic perennial grasses. Examples include the following:

- White Box Yellow Box Blakelys Red Gum woodland is threatened by Coolatai grass. Coolatai grass dominates large areas of pasture, roadsides, travelling stock routes and areas of remnant vegetation in the North Western Slopes, especially in the Manilla area north of Tamworth.
- Serrated tussock, African lovegrass and Chilean Needlegrass are a major threat to native grasslands, particularly the endangered communities Natural Temperate Grasslands of the Southern Tablelands of NSW and the ACT and Bega Dry Grass Forest.

- In the Sydney area, pampas grass threatens Duffys Forest Ecological Community. Threatened species at risk include *Persoonia mollis* and the orchid *Microtis angusii*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 10 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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- NSW Flora Online - [Sporobolus fertilis](#)

## Invasion of native plant communities by exotic perennial grasses - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Undertake community education and awareness program to increase understanding of the environmental impacts of perennial grasses and the need for their control.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Develop best practice guidelines for managing exotic perennial grasses.	Medium
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAAs and land managers/owners</a> No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Measure response to control</a> No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Prepare statement of intent explaining how exotic grasses will be managed in 2007.	Low
Threat abatement strategy: <a href="#">Prioritise control actions</a> No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Research</a> Undertake research on ecology and control of Coolatai grass.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> List exotic perennial grasses as noxious weeds under the Noxious Weeds Act 1993 and as a key threatening process under the Threatened Species Conservation Act 1995.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a> Identify biodiversity most at risk from Coolatai grass.	High
Identify biodiversity at risk from exotic grasses.	Medium
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a> Map distribution and abundance of priority exotic perennial grasses.	Low
Threat abatement strategy: <a href="#">Undertake control actions</a> Continue existing control programs on DEC lands.	High

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# Human-caused Climate Change - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

## Description

Anthropogenic Climate Change was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [3 November 2000].

There is evidence that modification of the environment by humans may result in future climate change. Human induced activities as a result of energy use, industrial processes, solvent and other product use, agriculture, land use change and forestry, and waste cause greenhouse gas emissions. Human-caused climate change may occur at a faster rate than has previously occurred naturally and may involve both changes in average temperature conditions and changes to the frequency of occurrence of extreme events.

Fire is an integral part of the dynamics of many Australian ecosystems and the risk of fire may increase in some areas as the climate changes and decrease in others, with consequent changes to the species composition and structure of ecological communities (Brasher & Pittock 1998; NSW Scientific Committee 2000).

The distribution of most species, populations and communities is determined by climate and many species would be adversely affected unless populations were able to move across the landscape. Species at risk include those with long generations, poor mobility, narrow ranges, specific host relationships, isolate and specialised species and those with large home ranges (Hughes & Westoby 1994).

Examples of species which would be at risk in New

South Wales include: Mammals: Mountain Pygmy-possum, Long-footed Potoroo, Broad-toothed rat, Smoky mouse. Birds: Malleefowl, Plains-wanderer, Sooty Owl, Red-tailed Black-Cockatoo, Regent Parrot, Pink Robin, Red-lored Whistler. Reptiles: Striped Legless lizard. Amphibians: Spotted Frog, Southern Bell Frog, Northern Corroboree Frog, Southern Corroboree Frog. Flora: Communities likely to become threatened include alpine vegetation communities (Busby 1988, Hughes & Westoby 1994).

Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.



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## Human-caused Climate Change - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Assist proponents assess the impacts of greenhouse gas emissions from project proposals.	Medium
Foster relationships with relevant authorities, research institutes and other States to improve understanding of impacts of climate change and potential management.	Medium
Threat abatement strategy: <a href="#">Monitoring</a>	
Design and implement indicator programs to detect changes in biodiversity.	High
Threat abatement strategy: <a href="#">Other Action</a>	
Identify and promote ways to increase landscape permeability for species range shifts.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare Statement of Intent by 2007.	High
Threat abatement strategy: <a href="#">Research</a>	
Evaluate the adequacy of the reserve system to retain biodiversity and to support changing species and ecosystems.	High
Strengthen the resilience and connectivity of existing protected areas by identifying strategic future habitats and corridors.	High
Support research into the effects of climate change on disturbance regimes (e.g.. invasives, bushfires, pathogens).	High
Review the adequacy of environmental water allocations to support inland aquatic ecosystems over the long-term.	Medium
Identify the need for ex-situ conservation of species most at risk.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Develop conservation planning tools to model scenarios and effects of climate change on biodiversity.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Improve understanding of climate change impacts on biodiversity including identification of species and ecosystem most at risk.	High

**Human-caused Climate Change**

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## Ecological consequences of high frequency fires - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [24 March 2000].

Plants and animals have a range of mechanisms to survive individual fires. The long-term survival of plants and animals over repeated fires is dependent upon two key features:

- the ability of species to maintain life cycle processes; and
- the maintenance of vegetation structure over time as habitat for animal species.

Where fires occur very close together in time (high frequency fire) both these key features can be disrupted. If high frequency fire is sustained it will consequently lead to a loss of plant species, a reduction in vegetation structure and a corresponding loss of animal species. A high frequency of burning can eliminate some species if they are burnt before they seed (DEH 1994).

High frequency fire and inappropriate fire regimes have been identified as threats to a number of species and communities including:

Plants - *Acacia bynoeana*, *Acacia courtii*, *Acacia macnuttiana*, *Acacia pubifolia*, *Acacia ruppilii*, *Acrophyllum australe*, *Almaleea cambagei*, *Apatophyllum constablei*, *Asterolasia elegans*, *Boronia granitica*, *Boronia repandra*, *Calitris oblonga*, *Cynanchum elegans*, *Darwinia biflora*,

*Elaeocarpus williamsianus*, *Epacris hamiltonii*, *Eucalyptus nicholii*, *Grevillea banyabba*, *Grevillea beadleana*, *Grevillea caleyi*, *Grevillea mollis*, *Grevillea rivularis*, *Grevillea scortechinii* ssp. *sarmentose*, *Grevillea shiressii*, *Haloragodendron lucasii*, *Homaranthus lunatus*, *Lasiopetalum joyceae*, *Leptospermum thompsonii*, *Melichrus hirsutus*, *Phaius australis*, *Phaius tancarvilliae*, *Phebalium glandulosum* ssp. *eglandulosum*, *Phebalium lachnaeoides*, *Pimelea spicata*, *Pterostylis gibbosa*, *Pultenaea* sp. *Olinda*, *Styphelia perileuca*, *Swainsona plagiotropis*, *Velleia perfoliate*, *Zieria involucrate*.

Birds - Glossy Black-Cockatoo, Eastern Bristlebird, Mallee Fowl, Ground Parrot.

Mammals - Rufous Bettong, Spotted-tailed Quoll, Eastern Quoll, Southern Brown Bandicoot, Black-striped Wallaby, Parma Wallaby, Southern Ningauai, Squirrel Glider, Long-nosed Potoroo, Long-footed Potoroo.

Ecological Communities - Ben Halls Gap National Park Sphagnum Moss Cool Temperate Rainforest, Duffys Forest, Eastern Suburbs Banksia Scrub, Kurnell Dune Forest, O'Hares Creek Shale Forest, Pittwater Spotted Gum Forest, Other listed endangered ecological communities, including Cumberland Plain Woodland, Sydney Turpentine Ironbark Forest, Blue Gum High Forest, Elderslie Banksia Scrub Forest, Genowlan Point *Allocasuarina nana* heathland, Sydney Coastal River-flat Forest, Shale/Sandstone Transition Forest and Cooks River Clay Plain Scrub Forest are all likely to suffer a loss of species composition if subject to repeated high frequency fires.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Ecological consequences of high frequency fires - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a> Develop and implement education and awareness programs about bushfires (including how high-frequency fire can impact on biodiversity).	Medium
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a> Develop protocols for minimising risk to fire-sensitive species and ecosystems when undertaking fuel-reduction burning.	High
Threat abatement strategy: <a href="#">Habitat management: Fire</a> Design burning prescriptions for purposes of maintaining ecological processes.	High
Threat abatement strategy: <a href="#">Monitoring</a> Establish monitoring sites to provide basis for long-term monitoring of impacts of fire regimes and fire events.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a> Prepare Statement of Intent by 2009.	High
Threat abatement strategy: <a href="#">Research</a> Identify fire-sensitive species and ecological communities. Support research examining the effects of different fire regimes on biodiversity.	High Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a> Support implementation of the Bush Fire Environmental Assessment Code and provide information relevant to maintaining Threatened Species Hazard Reduction List.	High

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## Competition from feral honeybees - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Competition from feral honeybees *Apis mellifera* L. was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [29 November 2002].

Feral honeybees are introduced bees, *Apis mellifera*, which originally escaped from hives and have subsequently established in the wild, usually centered on tree hollows. Feral honeybees are thought to occur patchily throughout most of the State (Paton, 1996), with the exception of alpine areas.

Honeybees impact on biodiversity in two broad ways: via competition for tree hollows and via competition for floral resources, such as pollen and nectar. The loss of tree hollows via occupation by feral honeybees reduces the number of hollows available for native animals to breed and shelter. This is of particular concern for species which are threatened. Hollows are an extremely important resource for many Australian animals, particularly birds and mammals.

Threatened species which are likely to be affected by competition from honeybees for hollows include the Brush-tailed Phascogale, Squirrel Glider, Yellow-bellied Glider, Major Mitchell's Cockatoo, Glossy Black Cockatoo, Superb Parrot, and Regent Parrot. Populations of protected species that may become threatened include the Common Brushtail Possum, Greater Glider, and Sugar Glider (Garnett 1992, Oldroyd *et al.* 1994, Paton 1996, Soderquist *et al.* 1996, Trainor 1995, Wood and Wallis 1998, Pyke 1999, Soderquist 1999).

## Threat abatement - priority actions

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 4 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Competition from feral honeybees - Priority actions

A total of 4 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
No detailed action specified at this stage.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare statement of intent in 2007 explaining how feral honeybees will be managed.	Low
Threat abatement strategy: <a href="#">Research</a>	
After survey information is available, identify the threatened species likely to be affected and assess the severity of the threat from feral honeybees.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Survey selected reserves to gain a better understanding of the extent and severity of the threat from feral honeybees.	High

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## Competition and grazing by the feral European rabbit - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus* (L.) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [10 May 2001].

Rabbits, *Oryctolagus cuniculus*, have spread over most of the southern two thirds of Australia and now occupy approximately 4.5 million km<sup>2</sup> (Myers et al. 1989).

Grazing and burrowing by rabbits can cause massive erosion problems, reduce recruitment and survival of native plants, and alter entire landscapes. Rabbits also threaten the survival of a number of native animal species by altering habitat, reducing native food sources, displacing small animals from burrows and attracting introduced predators such as foxes. In addition, rabbits may have significant impacts on Aboriginal and historic cultural heritage. For example, overgrazing by rabbits has exacerbated soil erosion in Mungo and Kinchega national parks, exposing culturally significant sites such as Aboriginal burial grounds.

Threatened species that suffer in dietary competition with rabbits include the Yellow-footed Rock-wallaby, Brush-tailed Rock-wallaby and Southern Hairy-nosed Wombat (Dawson & Ellis 1979, 1984; St John 1989; Short & Milkovits 1990). The Plains Wanderer and Malleefowl are adversely affected by rabbits through competition for food and/or by alteration and reduction of suitable habitat (Baker-Gabb 1990; Garnett 1992).



Grazing by rabbits has reduced the survival and recruitment of several species of threatened plants. These include *Acacia carneorum*, *Grevillea kennedyana*, *Cynanchum elegans*, *Thesium australe* and *Lepidium hyssopifolium* (Cropper 1987; Auld 1990, 1993; Griffith 1992; Matthes & Nash 1993). Grazing by rabbits has marked effects on the structure and composition of the *Acacia loderi* Endangered Ecological Community.

Competition and land degradation by feral Rabbits is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999* and a national threat abatement plan has been prepared by the Department of Environment and Heritage.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 11 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Competition and grazing by the feral European rabbit - Priority actions

A total of 11 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Develop and implement an extension program for new control techniques (i.e.. RHD virus/baits).	High
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop best practice guidelines for the use of RHD virus/baits; develop best practice guidelines for monitoring the effectiveness of control programs.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a>	
Liaise with Western Catchment Management Authority for inclusion of rabbit control as a priority pest.	High
Threat abatement strategy: <a href="#">Measure response to control</a>	
Develop and implement rabbit monitoring program at priority sites.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a Statement of Intent for this KTP by 2007.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Prepare a Threat Abatement Plan for this KTP.	High
Threat abatement strategy: <a href="#">Prioritise control actions</a>	
Prioritise control actions based on rabbit impacts.	High
Threat abatement strategy: <a href="#">Research</a>	
No detailed action specified at this stage.	Low
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Identify and prioritise biodiversity at risk from rabbit impacts.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Survey the distribution and abundance of rabbits.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Continue to implement current control programs on DEC lands until evidence of impacts is reviewed.	High

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## Clearing of native vegetation - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Clearing of native vegetation was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [21 September 2001].

Native vegetation is made up of plant communities, comprising primarily indigenous species and includes canopy trees (where present), understorey, ground cover and below ground biomass (roots, bulbs and the seed bank). For the purposes of this determination native vegetation does not include marine vegetation within the meaning of the *Fisheries Management Act 1994*.

Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts as a result of clearing native vegetation, including:

- destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes;
- fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species;
- riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities;
- disturbed habitat which may permit the establishment and spread of exotic species which may displace native species; and
- loss of leaf litter, removing habitat for a

wide variety of vertebrates and invertebrates.

There are numerous threatened species, populations and ecological communities adversely affected by the clearing of native vegetation. For a complete list of these threatened species, populations and ecological communities please see the final determination [web link].

Land Clearing is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 9 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Clearing of native vegetation

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## Clearing of native vegetation - Priority actions

A total of 9 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Prepare and implement an education and community awareness publicity campaign to increase knowledge on the impacts of clearing of native vegetation on biodiversity.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Develop a Biodiversity Offsets and Banking Scheme (BioBanking), a market based instrument designed to ensure that where biodiversity offsets are used they are implemented consistently and strategically.	Medium
Develop a Private Native Forestry Code of Practice for industry as a regulation under the Native Vegetation Act 2003.	Medium
Prepare guidelines to address various environmental planning initiatives, including EPI preparation for biodiversity certification.	Medium
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a>	
Work with CMA's to achieve objectives of the Native Vegetation Act 2003 and demonstrate contribution of CMA decisions to achieving the State and Catchment vegetation and biodiversity related targets.	High
Investigate opportunities for management agreements (JMA/MOUs) with Public Authorities (e.g.. Utility providers).	Medium
Threat abatement strategy: <a href="#">Measure response to control</a>	
Review and update PVP biodiversity tools to improve the protection of native vegetation.	High
Review progress of biodiversity tools which improve the protection of native vegetation.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a statement of intent by 2009 to establish links between existing regulation of clearing of native vegetation and identifying strategies for the protection of biodiversity.	Low
Threat abatement strategy: <a href="#">Research</a>	
Continue existing and facilitate new research in mapping, analysis and impacts of clearing of native vegetation in NSW, including population analysis and modelling, vegetation dynamics, vertebrate and woodland ecology.	Medium
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Provide input to interagency and stakeholder discussion and review of policy settings to support the implementation Native Vegetation Act 2003.	High
Establish and maintain links between the techniques and policies implemented in vegetation management and those in NRM and strategic conservation planning.	Medium
Oversee interactions between TSC Act reforms and Native Vegetation and NRM reforms through biodiversity certification.	Medium
Provide custodianship and maintenance of databases which support the biodiversity tools in PVP developer (including undertaking periodic review of the data and databases).	Medium
Review NSW planning initiatives to encourage the protection of native vegetation in EPIs and planning documents.	Medium
Review the code and regulation of the Plantation and Reafforestation legislation in regards to biodiversity issues.	Medium
Review the Environmental Outcomes Assessment methodology for the biodiversity component.	Medium
Work with the Natural Resources Council and support CMA's to monitor implementation and effectiveness of the Minister for Environment biocertification requirements. are met.	Medium
Review, assess and implement Commonwealth and NSW threat abatement strategies identified in recovery plans, where practical.	Low
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Design and seek funding for research to improve understanding of the role of "invasive native scrub" in species persistence in landscapes with different levels of past clearing and habitat fragmentation.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Identify gaps in vegetation mapping/classification and develop priorities for future survey, assessment and mapping in these areas.	High

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands. - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [31 May 2002].

Alteration to natural flow regimes refers to reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels. Three human processes have predominantly altered flows in streams, rivers and their floodplains, and wetlands in NSW, these are: building of dams, diversion of flows by structures or extraction, and alteration of flows on floodplains with levees and structures.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems, including floodplains. These alterations could cause a large number of species, populations or ecological communities that rely on river flows for their short term and long term survival to become threatened. Impacts associated with altering natural flow regimes, include:

- extraction of water which reduces flows, leading to a lower distribution of organic matter on which invertebrates and

- vertebrates depend on;
- the permanent flooding of wetlands which kills vegetation depending on intermittent flooding, decreasing habitat for invertebrates and waterbirds as a result;
  - riparian zone degradation where changes to flows increases erosion, leading to sedimentation impacts upon aquatic communities;
  - deeper and more permanent standing water which permits the establishment and spread of exotic species; and
  - changes to the physical, chemical and biological conditions of rivers and streams which alters biota.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands has been identified as a threat to a number of threatened species and communities. Habitat loss through altered hydrology patterns in rivers and wetlands has been identified as a threat for the endangered Spotted Tree Frog and the vulnerable birds, Blue-billed Duck and the Freckled Duck.

A related process, The installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams is listed as a key threatening process under the *Fisheries Management Act 1994*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.

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## Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands. - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Prepare and implement an education and community awareness publicity campaign to increase knowledge on the impacts of alteration of natural flow regimes on biodiversity.	Low
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMA's and land managers/owners</a>	
Continue to support Ramsar Managers Network.	High
Whole of government approach for the development of a threat abatement program to address impacts to marine and terrestrial biodiversity caused by altered flow regimes.	High
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare Statement of Intent by 2009.	High
Threat abatement strategy: <a href="#">Research</a>	
To continue to research impacts of altered flow regimes on biodiversity, water quality and quantity.	High
Modelling of impacts of salinity, climate change and water resource development.	Low
Threat abatement strategy: <a href="#">Review and amend or adopt existing legislation and policies</a>	
Review NSW Fisheries Scientific Committee determination for installation and operation of in stream structures that modify flow and NSW Weirs Policy for consideration of the preparation of a joint TAP for both KTPs with DPI (Fisheries).	High
Support the implementation of the NSW Water Reforms and the Water Management Act 2000.	High
Support water sharing planning programs and initiatives.	High
Threat abatement strategy: <a href="#">Review evidence of impacts</a>	
Determine impacts of altered flow regimes on marine and terrestrial biodiversity, with reference to structures affecting flow, mechanisms that affect flow and affected threatened species and communities.	High
Identify mechanisms for abatement of impacts, e.g.. Weirs removals program, causeway and culvert modification, habitat rehabilitation, instigation of ecological flows.	High
Threat abatement strategy: <a href="#">Survey/Mapping and Habitat assessment</a>	
Identify Rivers and Wetlands of high conservation value for biodiversity.	High
Survey and map structures altering water regimes with respect to affected threatened species and communities.	Medium



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## Predation by the European Red Fox - key threatening process

**Conservation status in NSW:** [Key Threatening Process](#)

### Description

Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758) was listed as a KEY THREATENING PROCESS on Schedule 3 of the *Threatened Species Conservation Act 1995* [20 March 1998].

Foxes are an adaptable and elusive predator common in rural and urban areas throughout southern Australia. They do not appear to favour any particular habitat and the main determinants of their population size and distribution appear to be food supply, disturbance of natural habitats and refuge availability.

Since their introduction into Australia in the 1870s, foxes have contributed to severe declines and extinctions of a suite of native fauna, particularly among medium-sized (450-5000 g) ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Recent experimental studies have shown that predation by foxes continues to threaten remnant populations of many of these species. In contrast, some studies have found that fox predation has little or no impact on some populations of native prey, including some small mammal populations in dense microhabitats.

Following their listing as a KTP under the TSC Act, the Department of Environment has prepared a Fox Threat Abatement Plan for NSW (Fox TAP). The Fox TAP establishes priorities for fox control for the conservation of biodiversity across all land tenures. In particular, the plan identifies which threatened species are at greatest risk from fox predation and at which sites fox control for these species is most critical. Thus a total of 74 priority sites for fox control have been established,

### Related information

[Approved NSW threat abatement plan for predation by the red fox \(PDF - 930\)](#)
[Approved NSW threat abatement plan for predation by the red fox \(PDF - 930\)](#)

providing recovery actions for 34 threatened species (11 mammals, 15 birds and 8 reptiles).

Undertaking high-frequency broad-area fox control across all land tenures at these priority sites is the central action of the plan. In addition, the plan establishes monitoring programs to measure the response of priority threatened species to fox control. These monitoring programs are fundamental to managing threatened species more effectively. Experiments target rufous bettong, brush-tailed rock wallaby, yellow-footed rock wallaby, black-striped rock wallaby, southern brown bandicoot, broad-toothed rat, Alberts lyrebird, plains wanderer, malleefowl, Bellinger River turtle and shore nesting birds such as the little tern and pied oystercatcher.

At present, collaborative fox control and/or monitoring programs are established on public lands at all priority sites. Works are being undertaken by the DEC, Department of Primary Industries (Forests NSW) and Department of Lands with support from various rural lands protection boards. However, works on private lands are limited such that the effectiveness of many of the control programs is likely to be compromised by the rapid immigration of foxes from untreated lands. A collaborative project with the five coastal Catchment Management Authorities has recently been funded to expand collaborative control programs on private lands surrounding Fox TAP priority sites.

Predation by the European Red Fox (*Vulpes vulpes*) is listed as a key threatening process under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### **Threat abatement - priority actions**

A number of priority actions have been identified for this key threatening process. Priority actions are the specific, practical things that must be done to tackle a key threatening process. They have been grouped into 7 overarching threat abatement strategies.

See [all threat abatement strategies and priority actions](#) for this key threatening process.

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## Predation by the European Red Fox - Priority actions

A total of 7 threat abatement strategies have been identified to help tackle this key threatening process. Each of these strategies has a number of priority actions within it. The table below shows these strategies and priority actions. You can also see details of the [broad geographic regions each priority action applies to](#) in New South Wales.

For more general information about this key threatening process, see a [detailed threat profile](#).

Description of priority action	Priority
Threat abatement strategy: <a href="#">Community and land-holder liaison/ awareness and/or education</a>	
Liaise with landholders to expand fox control around identified priority sites.	Medium
Facilitate greater awareness of the Fox Threat Abatement Plan.	Low
Threat abatement strategy: <a href="#">Develop and implement protocols and guidelines</a>	
Continue to review and implement best practice guidelines for the control of foxes.	High
Threat abatement strategy: <a href="#">Establish management agreements with public authorities CMAAs and land managers/owners</a>	
Expand fox control onto private lands within identified priority sites in collaboration with Catchment Management Authorities.	Low
Threat abatement strategy: <a href="#">Measure response to control</a>	
Measure changes in Albert's Lyrebird and fox populations at the Jerusalem North priority site (non-treatment).	High
Measure changes in Broad-toothed Rat and fox populations at the Kosciuszko North priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the Martindale priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the St Albans priority site (non-treatment).	High
Measure changes in Brush-tailed Rock-wallaby and fox populations at the Wollondilly priority site (non-treatment).	High
Measure changes in Malleefowl and fox populations at the Wamberra priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Glenugie priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Grange priority site (non-treatment).	High
Measure changes in Rufous Bettong and fox populations at the Marengo priority site (non-treatment).	High
Measure changes in Southern Brown Bandicoot and fox populations at the Garigal priority site (non-treatment).	High
Measure changes in Southern Brown Bandicoot, Hooded Plover and fox populations at the Nadgee priority site (non-treatment).	High
Measure changes in the Brush-tailed Rock-wallaby and fox populations at the Barnard River priority site (non-treatment).	High
Measure the changes in the Plains Wanderer and fox populations at the Wanganella priority site (non-treatment).	High
Measure the response of Albert's Lyrebird and fox populations to fox control at the Jerusalem South priority site.	High
Measure the response of Bellinger River Turtle and fox populations to fox control at the Upper Bellinger priority site.	High
Measure the response of Broad-toothed Rat and fox populations to fox control at the Barrington priority site.	High
Measure the response of Broad-toothed Rat, Mountain Pygmy Possum and fox populations to fox control at the Snowy Mountains priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Broke-Milbrodale priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Kangaroo Valley priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Mount Kapatur priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Warrumbungles priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Watagans priority site.	High
Measure the response of Brush-tailed Rock-wallaby and fox populations to fox control at the Wolgan River priority site.	High
Measure the response of fox populations to fox control at the Jenolan Caves priority site.	High
Measure the response of fox populations to fox control at the Taralga priority site.	High
Measure the response of Hooded Plover and Pied Oystercatcher populations to fox control at the Conjola priority site.	High
Measure the response of Hooded Plover and/or Pied Oystercatcher and/or Little Tern populations to fox control at the Mimosa Rocks priority site.	High

Measure the response of Hooded Plover and/or Pied Oystercatcher populations to fox control at the Moruya Heads priority site.	High
Measure the response of Hooded Plover and/or Pied Oystercatcher populations to fox control at the Murramarang priority site.	High
Measure the response of Little Tern and Beach Stone-curlew populations to fox control at the Manning River priority site.	High
Measure the response of Little Tern and/or Pied Oystercatcher populations to fox control at the Tathra Beach priority site.	High
Measure the response of Long-footed Potoroo and fox populations to fox control at the southeast Forest-South priority site.	High
Measure the response of Long-nosed Bandicoot and fox populations to fox control at the North Head priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Abbots Tank priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Goonoo priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Mallee Cliffs priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Nombinnie/Round Hill priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Tarawi priority site.	High
Measure the response of Malleefowl and fox populations to fox control at the Yathong priority site.	High
Measure the response of Pied Oystercatcher and Beach Stone-curlew populations to fox control at the Clarence River Entrance priority site.	High
Measure the response of Pied oystercatcher and Beach Stone-curlew populations to fox control at the Yuraygir Mid priority site.	High
Measure the response of Pied Oystercatcher and/or Little Tern populations to fox control at the Tilba-Wallaga Lake priority site.	High
Measure the response of Pied Oystercatcher and/or Little Tern populations to fox control at the Tuross-Lake Brou priority site.	High
Measure the response of Pied Oystercatcher, Beach Stone-curlew and Little Tern populations to fox control at the Yuraygir South priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Mount Royal priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Ramornie priority site.	High
Measure the response of Rufous Bettong and fox populations to fox control at the Tamban priority site.	High
Measure the response of Smoky Mouse and fox populations to fox control at the southeast Forest-Nullica priority site.	High
Measure the response of Southern Brown Bandicoot and fox populations to fox control at the Ku-ring-gai priority site.	High
Measure the response of Southern Brown Bandicoot and/or Hooded Plover populations to fox control at the Ben Boyd priority site.	High
Measure the response of the Plains Wanderer and fox populations to fox control at the Oolambeyan priority site.	High
Measure the response of the Black-striped Wallaby population to fox control at the Brigalow Park priority site.	High
Measure the response of the fox population to fox control at the Macquarie Marshes priority site.	High
Measure the response of the fox population to fox control at the Mungo priority site.	High
Measure the response of the fox population to fox control at the Narren Lakes priority site.	High
Measure the response of the fox population to fox control at the Nocoleche priority site.	High
Measure the response of the fox population to fox control at the Peery Lake priority site.	High
Measure the response of the fox population to fox control at the Sturt priority site.	High
Measure the response of the Hooded Plover population to fox control at the Narooma-Mystery Bay priority site.	High
Measure the response of the Hooded Plover population to fox control at the Wallagoot Lake priority site.	High
Measure the response of the Little Tern population to fox control at the Lake Wollumboola priority site.	High
Measure the response of the Little Tern population to fox control at the Nambucca priority site.	High
Measure the response of the Little Tern population to fox control at the Sawtell priority site.	High
Measure the response of the Little Tern population to fox control at the Towra Point priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Bombing Range priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Broadwater priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the Comerong priority site.	High
Measure the response of the Pied Oystercatcher population to fox control at the South Ballina priority site.	High
Measure the response of the Plains Wanderer and fox populations to fox control at the North Canargo priority site.	High
Measure the response of Yellow-footed Rock-wallaby and fox populations to fox control at the Coturaundee priority site.	High
Measure the response of Yellow-footed Rock-wallaby and fox populations to fox control at the Mutawinji priority site.	High
Measure the response of the Rufous Bettong and fox populations to fox control at the Yabbra priority site.	Medium
Threat abatement strategy: <a href="#">Prepare Statement of Intent</a>	
Prepare a Statement of Intent for this KTP by 2007.	Low
Threat abatement strategy: <a href="#">Prepare TAP</a>	
Coordinate implementation of Fox TAP actions.	High
Review Fox Threat Abatement Plan in 2008.	High
Threat abatement strategy: <a href="#">Undertake control actions</a>	
Undertake fox control at the Abbots Tank priority site for the Malleefowl, Chestnut Quail-thrush and Southern scrub-robin.	High

Undertake fox control at the Barrington priority site for the Broad-toothed Rat.	High
Undertake fox control at the Ben Boyd priority site for the Southern Brown Bandicoot and Hooded Plover.	High
Undertake fox control at the Bombing Range priority site for Pied Oystercatchers.	High
Undertake fox control at the Brigalow Park priority site for the Black-striped Wallaby.	High
Undertake fox control at the Broadwater priority site for Pied Oystercatchers.	High
Undertake fox control at the Broke-Milbrodale priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Clarence River Entrance priority site for the Brolga, Pied Oystercatcher and Beach Stone-curlew.	High
Undertake fox control at the Comerong priority site for the Pied Oystercatcher.	High
Undertake fox control at the Conjola priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Coomonderry swamp priority site for the Australasian Bittern.	High
Undertake fox control at the Coturaundee priority site for the Yellow-footed Rock-wallaby.	High
Undertake fox control at the Goonoo priority site for the Malleefowl.	High
Undertake fox control at the Jenolan Caves priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Jerusalem South priority site for Albert's Lyrebird.	High
Undertake fox control at the Kangaroo Valley priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Ku-ring-gai priority site for the Southern Brown Bandicoot.	High
Undertake fox control at the Lake Wollumboola priority site for the Little Tern.	High
Undertake fox control at the Macquarie Marshes priority site for the Brolga and Australasian Bittern.	High
Undertake fox control at the Mallee Cliffs priority site for the Malleefowl, Chestnut Quail-thrush and Southern scrub-robin.	High
Undertake fox control at the Manning River priority site for the Little Tern and Beach Stone-curlew.	High
Undertake fox control at the Mimosa Rocks priority site for the Hooded Plover, Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Moruya Heads priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Mount Kaputar priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Mount Royal priority site for the Rufous Bettong.	High
Undertake fox control at the Mungo priority site for the Chestnut Quail-thrush, Southern Scrub-robin and Western Bluetongue Lizard.	High
Undertake fox control at the Murramarang priority site for the Hooded Plover and Pied Oystercatcher.	High
Undertake fox control at the Mutawinji priority site for the Yellow-footed Rock-wallaby.	High
Undertake fox control at the Nambucca priority site for the Little Tern.	High
Undertake fox control at the Narooma-Mystery Bay priority site for the Hooded Plover.	High
Undertake fox control at the Narren Lakes priority site for the Brolga.	High
Undertake fox control at the Nocoleche priority site for the Brolga.	High
Undertake fox control at the Nombinnie/ Round Hill priority site for the Malleefowl, Southern Scrub-robin and Chestnut Quail-thrush.	High
Undertake fox control at the North Canargo priority site for the Plains Wanderer.	High
Undertake fox control at the North Head priority site for the Long-nosed Bandicoot.	High
Undertake fox control at the Oolambeyan priority site for the Plains Wanderer.	High
Undertake fox control at the Peery Lake priority site for the Brolga.	High
Undertake fox control at the Ramornie priority site for the Rufous Bettong.	High
Undertake fox control at the Sawtell priority site for the Little Tern.	High
Undertake fox control at the Snowy Mountains priority site for the Broad-toothed Rat and Mountain Pygmy Possum.	High
Undertake fox control at the South Ballina priority site for Pied Oystercatchers.	High
Undertake fox control at the southeast Forest- Nullica priority site for the Smoky Mouse.	High
Undertake fox control at the southeast Forest- South priority site for the Long-footed Potoroo.	High
Undertake fox control at the Sturt priority site for the Long-haired Rat, Australian Bustard, Flock Bronzewing, Squatter Pigeon, Central Bluetongue Lizard, Collared Whip-snake, Narrow Banded Snake and Stimson's Python.	High
Undertake fox control at the Tamban priority site for the Rufous Bettong.	High
Undertake fox control at the Taralga priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Tarawi priority site for the Malleefowl, Chestnut Quail-thrush, Southern Scrub-robin and Western Bluetongue Lizard.	High
Undertake fox control at the Tathra Beach priority site for the Little Tern and Pied Oystercatcher.	High
Undertake fox control at the Tilba-Wallaga Lake priority site for the Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Towra Point priority site for the Little Tern.	High
Undertake fox control at the Tuross-Lake Brou priority site for the Pied Oystercatcher and Little Tern.	High
Undertake fox control at the Upper Bellinger priority site for the Bellinger River Turtle.	High
Undertake fox control at the Wallagoot Lake priority site for the Hooded Plover.	High
Undertake fox control at the Warrumbungles priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Watagans priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Wolgan River priority site for the Brush-tailed Rock-wallaby.	High
Undertake fox control at the Yathong priority site for the Malleefowl, Southern Scrub-robin and Chestnut Quail-thrush.	High
Undertake fox control at the Yuraygir Mid priority site for the Pied Oystercatcher and Beach Stone-curlew.	High
Undertake fox control at the Yuraygir South priority site for the Pied Oystercatcher, Beach Stone-curlew and Little Tern.	High