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# **1 Executive Summary**

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Weed control activities have been one of the primary long-term focuses of the Environmental Unit of the Lord Howe Island Board. In order to develop a plan to guide weed control activities the Lord Howe Island Board funded an extra 0.2 EFT Ranger position, for the 2001/02 financial year, to develop this Strategic Plan for Weed Management.

The development of this plan was preceded by the commissioning of Outline for a Weed Control Strategy and an Inventory of Weeds for Lord Howe Island (Hutton and LeCussan:2001). This document provides both an outline for developing a strategic approach to weed control and a checklist of all weeds known to be on the Island.

Lord Howe Island Board staff developed criteria for classification of weed incursions and developed broad scale distribution and abundance maps for noxious weeds. The Island was divided into management areas, which will be used for on-ground weed control as well as a part of planning processes. Each of these areas was assessed using a set of assessment criteria, and by analysing the level of weed infestation. This allowed for a ranked list to be developed for on-ground works.

Transit Hill, Intermediate Hill and Grey Face were identified as high priority areas for on-ground weed control activities. Other high priority recommendations included supporting volunteer activities, continuing the Noxious Weed inspection program, treatment of sites within the Settlement, developing a Bush Regeneration training package for LHIB staff and the community and ensuring that actions in threatened species recovery plans are implemented.

A summary table of recommendations has been included in the plan to ensure that the outcomes are both clear and measurable. This plan will provide a framework for the management of weed species on Lord Howe Island for the next 5 years.

# **1 Introduction**

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## **1.1 Aims and Objectives of the Plan**

This plan will be a working document providing a framework for the management of weed species on Lord Howe Island. It identifies and locates existing and potential weed incursions and proposes appropriate regeneration and control strategies for their management.

Priorities are assigned for weed control work on an area basis, but will also allow for the flexibility to undertake control programs for specific weeds across the whole Island when the threat posed by a species justifies a targeted approach.

## **1.2 Methods**

The development of this plan was preceded by the production of Outline for a Weed Control Strategy and an Inventory of Weeds for Lord Howe Island (Hutton and LeCussan:2001) commissioned by the Lord Howe Island Board. This document provides both an outline for developing a strategic approach to weed control and a checklist of all introduced plant species known to be on the Island. This checklist is a very valuable tool as it provides not only a list of all weed species known to be on the Island, but also the date that the species was first recorded and the general area where the weed is known to occur. For the purpose of this plan, a weed is defined as ‘a plant which is not native to the Island and has the potential to impact upon native species or vegetation communities’.

LHIB Environmental Section staff conducted an audit of weed species and produced distribution and abundance maps for 10 significant weed species.

The Island was divided up into areas that could be assessed as a main unit in terms of weed control activities. These areas were delineated using natural features and existing infrastructure where possible, and provide a boundary for on-ground works.

Each area was considered in detail and assessed using a set of criteria (see section 4.3). Weed invasion was also analysed according to the impacts upon each distinct vegetation community. These methods combined together to allow for the production of a ranked list of areas for priority weed control works. A summary table of recommendations was then produced to guide weed control activities.

## **1.3 Regeneration Philosophy**

The strategies proposed in this report are firmly based on the principle that effective and sustainable rehabilitation and restoration of native plant communities requires an integrated approach which takes into account a range of factors and utilises a variety of practical measures.

Regeneration and restoration of native plant communities is a complex long-term process and is more than just weed control or tree planting exercises. While weed control is of paramount importance, all weeds must be seen as part of a dynamic, interacting ecosystem. By exploiting the natural resilience of the native vegetation, weed species can be controlled in such a way that they are replaced by native species rather than by other weeds. This approach utilises the process of natural regeneration and succession to ensure the long-term viability of the native floral and faunal communities. The success of this integrated approach has been demonstrated in many reserve areas across NSW.

There are also situations where target weeding is used. Target weeding is appropriate in areas where the resilience of the bushland is high, with only a few weeds being present. In this case the bushland has the capacity to fill the niche previously used by the weed species. Target weeding is also appropriate for the control of a particular species throughout a wide area, where comprehensive bush regeneration techniques are not appropriate.

Notwithstanding the above, in the case of areas such as Lord Howe Island, which are large in size and contain many inaccessible areas, there are many practical difficulties in controlling all the weeds present throughout the area. This situation requires a management decision to prioritise and concentrate on those areas which contain weeds that are considered to be particularly invasive and damaging to the native vegetation. This approach is recommended for Lord Howe Island.

## **2 Profile of Lord Howe Island**

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### **2.1 General Description**

Lord Howe Island is located in the south-west Pacific Ocean, approximately 760km north-east of Sydney at 31° 30' S, 159° 05' E. The island is 11 kilometers long and 2.8 kilometers wide at its widest point.

The Lord Howe Island Group, which includes Lord Howe Island, The Admiralty Islands, Muttonbird Island, Blackburn Island, Gower Island and Ball's Pyramid was inscribed on the World Heritage List in 1982. The listing of Lord Howe Island as a World Heritage Property was based on its superlative natural phenomena, exceptional natural beauty and aesthetic importance and the importance and significance of its natural habitats for in-situ conservation of biological diversity.

### **2.2 Geology of Lord Howe Island**

Lord Howe Island is the eroded remnant of a large shield volcano. A series of eruptions followed by erosional processes began about 6.9 million years ago. This was followed by another period of volcanic activity 6.3 million years ago<sup>1</sup>. The Island sits atop a large undersea shelf which is many times larger than the Island itself.

Volcanic basalt and sedimentary calcarenite landforms dominate the Island geology, with some areas of volcanic tuff and breccia. The more erosion resistant basalt units make up the most spectacular landscape features on the Island, Mt Gower (875m) and Mt Lidgbird (777m) in the south and the rugged sea cliffs (Malabar 208m) in the Northern Hills. All of the offshore Islands in the Lord Howe Island group are basalt.

The central lowlands of the Island, where the settlement is located, differ greatly to the rugged mountainous terrain. This area is mainly sedimentary calcarenite of Pleistocene and Holocene age.

### **2.3 Vegetation of Lord Howe Island**

Lord Howe Island supports 240 species of indigenous vascular plants, 103 of which are endemic<sup>2</sup>. Additionally there are at least 218 species of introduced plants on the Island<sup>3</sup>, a list of weed species known to be on this Island is included in Appendix 1.

The vegetation of the Island has affinities with the flora of northern New South Wales, southern Queensland, New Zealand, Norfolk Island and New Caledonia<sup>4</sup>. This geographical relationship reflects the processes which contributed to the evolution of life on Lord Howe Island. Organisms travelled to Lord Howe Island using the wind, sea or birds, this movement of organisms would have been assisted by 'stepping stones' formed by coral reefs which were present in the last ice age when sea levels were lower<sup>5</sup>.

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<sup>1</sup> Pickard 1983:136

<sup>2</sup> Manidis Roberts 2000:13

<sup>3</sup> Hutton, 1998:90

<sup>4</sup> Manidis Roberts 2000:1

<sup>5</sup> Manidis Roberts 2000:1

A study of the vegetation of Lord Howe Island undertaken by the Royal Botanic Gardens, Sydney and published in 1983 identified 26 vegetation associations. In this instance a >vegetation association= refers to Acommunities of separate species which, because of common environmental (and inter-specific) requirements, occur together. They are usually described by reference to the dominant upper storey (or canopy) species<sup>6</sup>@

The endemic Kentia Palm (*Howea forsteriana*) is of particular economic importance to the Island as there is world-wide demand for it as an indoor plant. Approximately 1.7 million seedlings were exported from the Lord Howe Island Board Palm Nursery in 2000-2001 to distributors in The Netherlands, USA and mainland Australia. This species is found throughout the lowlands and Little and Big Slopes, up to an altitude of 360m and occupies a total of approximately 170 hectares. The Kentia Palm forms an evergreen closed forest association. This vegetation association has shown a particular resilience to weed invasion which may be attributed to the thick layer of thatch which is present as a ground cover in this association and acts to suppress weed germination and/or growth.

The Northern Hills are dominated by the *Drypetes australasica* (Greybark) B *Cryptocarya triplinervis* (Blackbutt) association. This vegetation association, including its exposed area and calcarenite variations occupies 419 hectares or some 28% of the Island=s total area. The cliff habitats of the northern sea cliffs dominated by *Cassinia tenuifolia* (Bullybush) shows a particular susceptibility to weed invasion.

In the Southern Mountains the Greybark B Blackbutt, Lowland Mixed Forest and *Cleistocalyx fullagerii* associations dominate the vegetation up to approximately 400m altitude. Above this *Hedyscepe canterburyana* Broad Sclerophyll Forest and *Bubbia howeana* B *Dracophyllum fitzgeraldii* Gnarled Mossy Forest dominate.

Each of these vegetation associations has characteristic features which contribute to their susceptibility to weed invasion. Disturbance of a vegetation association may alter its dynamics and change the ability of an association to resist weed invasions.

## **2.4 Land Tenure**

The Lord Howe Island Board is responsible for the care, control and management of Lord Howe Island in accordance with the NSW *Lord Howe Island Act 1953*. All land is vested in the Crown; there is no freehold title.

Perpetual leases are granted for the purpose of settlement and special leases for other purposes, usually agriculture. The Permanent Park Preserve (PPP) covers approximately 75% of the Island, and includes all offshore islands and Ball=s Pyramid. The PPP is managed in accordance with a Plan of Management, which is currently under review.

Leaseholders have responsibility for weed control on their leases, in accordance with both the *Noxious Weeds Act 1993* and the conditions of their lease.

## **2.5 Past and Current Landuse**

The original settlement on Lord Howe Island, settled in 1834, was located in the area behind what is now known as Old Settlement Beach. This area was partly cleared and used for the production of commodities.

Less than 20% of the Island has been disturbed by settlement, with under 10% being cleared of vegetation. The majority of the cleared area is within the settlement, most being used for the construction of dwellings and associated infrastructure. The majority of the other cleared areas are used for grazing cattle on Kikuyu *Pennisetium clandestinum* pasture.

Worthy of note are a number of areas within bushland which were previously cleared for agriculture, but have since been abandoned. Examples of these include the Valley Garden (south of Middle Beach) and the abandoned garden behind the Golf Course. These areas remain important anomalies within the bushland context, and may be seed sources for some weed species.

## **2.6 Threatened Species and Threatened Species Habitat**

The Lord Howe Island Board has a statutory obligation for the management of Threatened species. One of the primary tools for management of a Threatened Species is the Recovery Plan. A final plan for the Large Land Snail (*Placostylus bivaicus*) and a draft for the Woodhen (*Gallirallus sylvestris*) has been prepared. Weeds have been identified as a potential threat to both these species. It is likely that similar recommendations will be made in plans for other species. The Species listed in the schedules of the TSC Act are listed below in table 1.

In addition to the species currently listed under the Act there are a number of plant species currently undergoing an assessment of conservation status. These species may be listed under the TSC Act in the future (some have been nominated for listing and are currently being assessed). It is likely that more plants will be added to this list. The species which have been investigated to date are listed in table 2.

**Table 1 - Threatened Species Listings for Lord Howe Island**

Common Name	Species Name	Classification	Act	Habitat
Perennial Herb	<i>Chamaesyce psammogeton</i>	Endangered	NSW Threatened Species Conservation Act 1995	Blinky Beach Dune
Lord Howe Island Gecko	<i>Christinus guentheri</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Rare on main Island, also found on Blackburn Island.
Lord Howe Island Phasmid	<i>Dryococelus australis</i>	Endangered	NSW Threatened Species Conservation Act 1995	Population known on Ball's Pyramid.
White Bellied Storm Petrel	<i>Fregetta grallaria</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Offshore Islands.
Woodhen	<i>Gallirallus sylvestris</i>	Endangered	NSW Threatened Species Conservation Act 1995	Territories throughout the Island except for the Northern Hills.
		Vulnerable	Commonwealth Environment Protection and Biodiversity Conservation Act 1999	
White Tern	<i>Gygis alba</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Large trees in lowlands.
Lord Howe Island Golden Whistler	<i>Pachycephala pectoralis contempta</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Lowland forest and mountains.
Earthworm	<i>Pericryptodrilus nanus</i>	Endangered	NSW Threatened Species Conservation Act 1995	Mt Gower summit
Red-tailed Tropicbird	<i>Phaethon rubricauda</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Cliffs in Northern Hills and Southern Mountains.
Lord Howe Island Land Snail	<i>Placostylus bivaricosus</i>	Endangered	NSW Threatened Species Conservation Act 1995	Throughout settlement and southern mountains.
Lord Howe Island Skink	<i>Pseudomioa lichenigerum</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Rare on main Island, also found on Blackburn Island.
Kermadec Petrel	<i>Pterodroma neglecta</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Ball's Pyramid
Black Winged Petrel	<i>Pterodroma nigripennis</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Top of Middle Beach Road and from Clear Place to Blinky Beach.

Providence Petrel	<i>Pterodroma solandri</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Mount Gower summit and slopes, Mt Lidgbird slopes
Little Shearwater	<i>Puffinus assimilis</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Offshore islands, Blinky Beach Headland.
Flesh Footed Shearwater	<i>Puffinus carneipes</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Eastern seaboard of Island from Ned's Beach to Blinky Beach.
Sooty Tern	<i>Sterna fuscata</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Offshore Islands, Ned's Common, Mt Eliza, Hell's Gates.
Lord Howe Island Currawong	<i>Strepera graculina crissallis</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Entire Island, more common in southern mountains
		Vulnerable	Commonwealth Environment Protection and Biodiversity Conservation Act 1999	
Masked Booby	<i>Sula dactylatra</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Offshore Islands, Muttonbird Point, King Point.
Lord Howe Island Silveryeye	<i>Zosterops lateralis tephroleura</i>	Vulnerable	NSW Threatened Species Conservation Act 1995	Entire Island, more common in lowlands.

**Table 2 - Rare Plant Species**

Species	Habitat	Status	Comment
<i>Caesalpinia bonduc</i>	Neds Beach and Old Settlement Beach	Widely distributed in the tropics	
<i>Calystegia affinis</i>	2 sites only; start of Max Nicholls Track and 200m south of Grey Face (Mt Lidgbird)	Endemic to Lord Howe and Norfolk Islands	Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002
<i>Carmichaelia exsul</i>	Limited sites in the southern Mountains, 300-500m elevation	Endemic to Lord Howe Island	Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002
<i>Coprosma inopinata</i>	2 sites only; Mt Gower summit, SE Mt Lidgbird	Endemic to Lord Howe Island	Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002
<i>Corybas barbarae</i>	1 site only; on Malabar walking track	Recorded from Woy Woy to the North Coast on the mainland	
<i>Geniostoma huttoni</i>	2 sites only; Razorback and SE Mt Lidgbird	Endemic to Lord Howe Island	Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002
<i>Plectorrhiza erecta</i>	Widespread; Malabar spur, Goat House, the Saddle, Razorback	Endemic to Lord Howe Island	
<i>Polystichium moorei</i>	Cliffs on Mt Lidgbird, mouth of Soldiers Creek		Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002
<i>Sticherus lobatus</i>	1 site; Mt Gower summit	Also found from southern Queensland, NSW to Victoria	
<i>Xylosma parvifolium</i>	SE Mt Lidgbird and some individuals at Get-up-place and Razorback	Endemic to Lord Howe Island	Preliminary determination as Endangered Species under Threatened Species Conservation Act 1995. May 2002

Source: Hutton, I., (2001) Rare Plant Surveys - Lord Howe Island, A report to the NSW National Parks and Wildlife Service

## **2.7 History of Weed Management on Lord Howe Island**

The following is an account of the main weed management activities undertaken by the LHIB from 1994. Adequate records for control efforts before this time do not exist. The following table provides information about both the emergence of new weed species and gives an indication of previous weed control efforts.

**Table 3 - Previous Weed Control Activities**

Species	Year	Area	Treatment
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Ochna	1994-1996	Southern fence of PPP and behind golf course.	Cut stump 1:40 Garlon 480:Diesel
Cherry Guava	1994-1996	Smoking tree ridge, Grey Face, Boat Harbour, Ray Shicks	Cut stump 1:40 Garlon 480:Diesel
Pittosporum	1994-1996	Transit Hill to Blinky Beach	Cut stump 1:40 Garlon 480:Diesel
Bamboo	1994-1996	Valley Garden	Manual removal and spray with 1:40 Garlon 480:Diesel
Maderia vine	1994-1998	Settlement	Spray Glyphosate
African Boxthorn	1994-1997	Middle Beach, Clear Place, Ned's Beach	Spray Glyphosate
	1994-1996	Northern Hills	Manual Removal
Ground Asparagus	1997	Foreshore	Manual Removal
	1998	Northern Hills	Manual Removal
	1999	Foreshore	Spray with Asparagus mix
	2001 - 2002	Northern Hills	Manual Removal
	1994-1996	Settlement	Manual Removal
Climbing Asparagus	1997	Settlement	Trial brush cutting method.
	1998	Settlement	Brush cut & spray using Asparagus mix
	1999-2001	Settlement and Transit Hill	Brush cut & spray using Asparagus mix
Bitou Bush	1994-1997	Malabar / Kims abseil, the Nobbin, South Blinky, Neds to Blinky.	Manual removal. Cut stump with 100% Glyphosate
	1998-2001	South Blinky, Neds to Blinky.	
Glory Lily	1997-1998	Foreshore, Salmon Beach	
Bridal Creeper	1997	Curio Point	Spray Brush-off.
	1998	Curio Point	Manual removal.
Coastal Tea Tree	1998	Foreshore	Trialed spraying
Casuarina	1999	Mulley Drive	Cut stump 1:40 Garlon 600:Diesel

Significant gains have been made by these projects, and maintenance of most sites is essential on both ecological and financial grounds.

## **2.8 Patterns of Weed Spread**

Virtually weed species on Lord Howe Island can be traced back to introduction as garden plants. Hence the settlement area has historically been, and remains, the major source of both new weed species and a seed source for existing weed species.

The major weed species currently found in bushland on Lord Howe Island produce seeds which are dispersed either by wind or birds. For example Asparagus species, Sweet Pittosporum and Cherry Guava produce seed which are easily transported by Silver Eyes, Golden Whistlers and Currawongs, while species such as Crofton Weed and Tiger Lily effectively disperse their seeds via wind.

Additional to these, the walking track network may be an important transport vector for some weed species such as Tiger Lily, Cherry Guava (people may consume the fruit and spit the seeds out further along the track), and plants which produce seed which sticks to passers-by such as Farmers Friend (*Bidens pilosa*).

Landslips, which are a feature of the ecosystem of the Southern Mountains, represent a large-scale disturbance in the landscape and weeds are often the primary colonisers of these areas.

In contrast to many other areas, watercourses do not appear to function as a major seed transport vector on Lord Howe Island. This can probably be attributed to the unique hydrography of Lord Howe Island; from the airstrip in the south and Old Settlement Beach in the north there is no surface flow of water to the lagoon. The other water sources on the Island are primarily intermittent and in

the main do not flow through major weed infestations, although Crofton Weed is present in most waterfalls in the Southern Mountains.

Of concern is the current situation where special leaseholders are unable to undertake Noxious weed control due to a lack of resources. Because perpetual leases are generally smaller they are more manageable. This is not the case with special leases which, proportionally, have the greatest degree of weed invasion of all land tenure on the Island. Future grant funding applications should investigate the possibility of co-operative programs between the LHIB and special lease holders. Highest priority special leases are those neighbouring the PPP.

## **2.9 Potential Threats From Exotic Species**

Exotic species threaten native vegetation communities as they may be predisposed to environmental conditions, but have no pests or diseases to curb their growth. In addition to this there may be new transport vectors available in this new environment to facilitate rapid expansion of a species range.

It is important to note that not all exotic species represent a threat to native vegetation communities, the weeds which are of concern are those which >naturalise= (are able to reproduce in the wild) in a new environment. These species may have the ability to transform the native forest by competing more vigorously for light, water and nutrients and they can transform the natural species composition.

Weeds may change natural environments in one or a combination of ways. Some species, such as Bitou Bush (*Chrysanthemoides monilifera*) and Lantana (*Lantana camara*) can outcompete and limit colonisation by native species. Others such as Norfolk Island Pine may be able to change the chemistry of the surrounding soil to the extent that native species are no longer able to grow in the prevailing conditions. Other weeds, such as Maderia Vine (*Anredera cordifolia*) and Climbing Asparagus (*Protosparagus plumosus*) alter the structure of bushland. They are able to climb into the canopy altering light availability and sometimes even causing collapse of the canopy due to the biomass of the weed.

### **2.10 Weed Distribution and Abundance**

Knowing the location and density of weed infestations is key baseline information for the development of weed control strategies. Additional advantages of weed mapping include the efficient provision of information to the public, a visual method for assessing weed control programs or weed species spread and the development of a system for objectively assessing the long term outcomes of weed control programs.

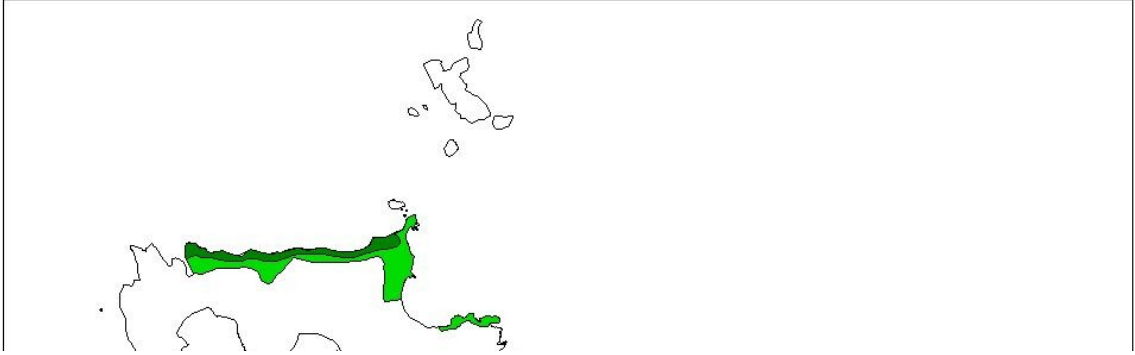
In order to gain a general picture of the distribution of selected weed species over the entire Island a program of occurrence and abundance mapping was undertaken. Staff with significant local

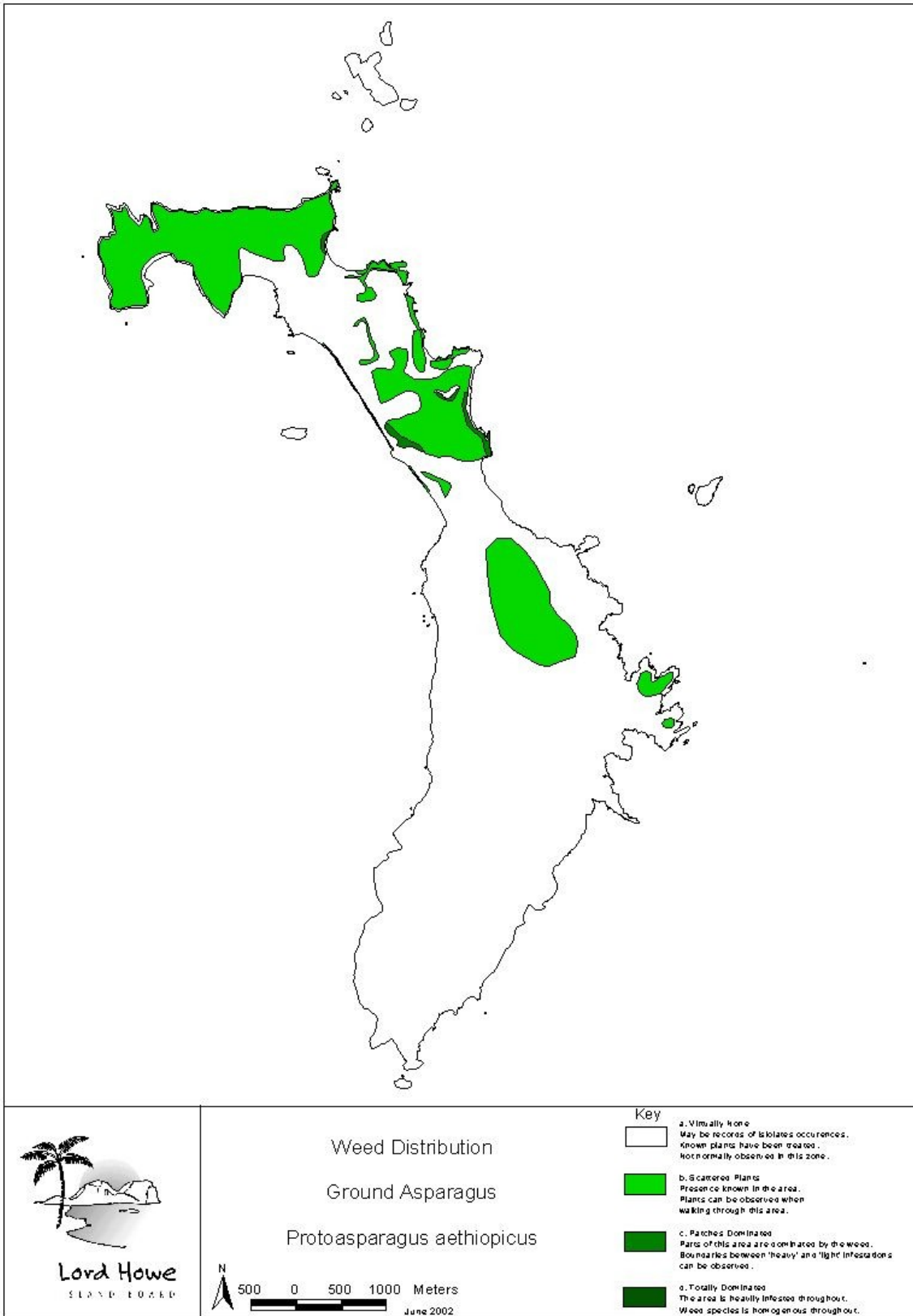
knowledge developed these maps. The maps have not been ground truthed.

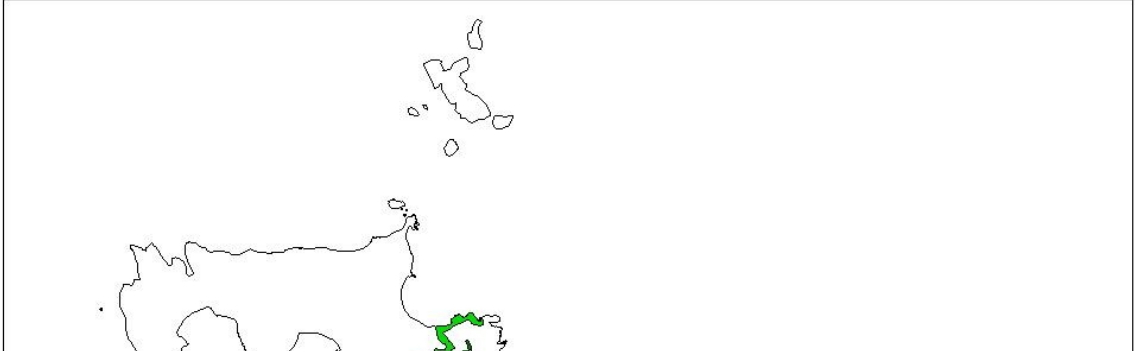
Weeds of particular concern, those which are already a problem in bushland, were mapped using the criteria below.

**Table 4 - Key for Weed Mapping**

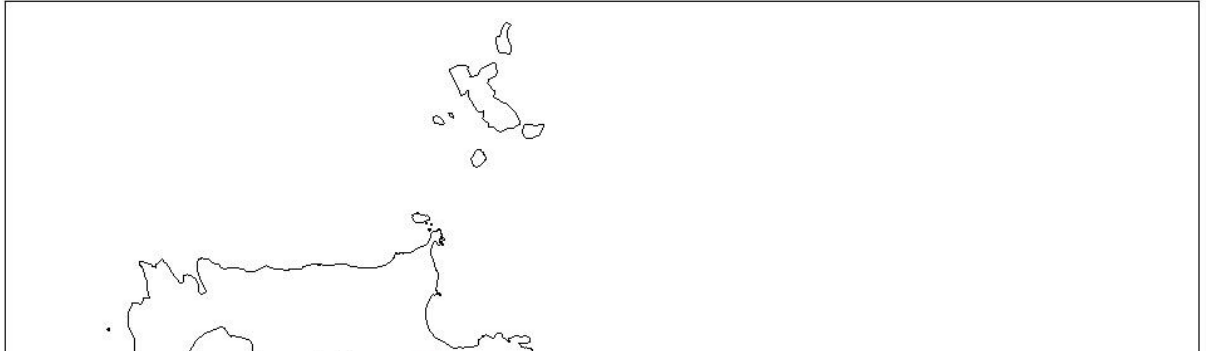
Rating	Code	Definition
None		No plants ever recorded in sub zone
Virtually none	A	Records of isolated occurrences. Known plants have been treated. Not normally observed in this zone.
Scattered plants	B	Presence known in sub-zone. Plants regularly observed when walking through the area.
Patches dominated	C	Parts of the sub-zone or vegetation type are dominated by the weed, but boundaries between >heavy= infestations and >lighter= infestations can be observed.
Totally dominated	D	The sub zone or vegetation type is >heavily= infested by the weed species and its occurrence is >homogenous= throughout.

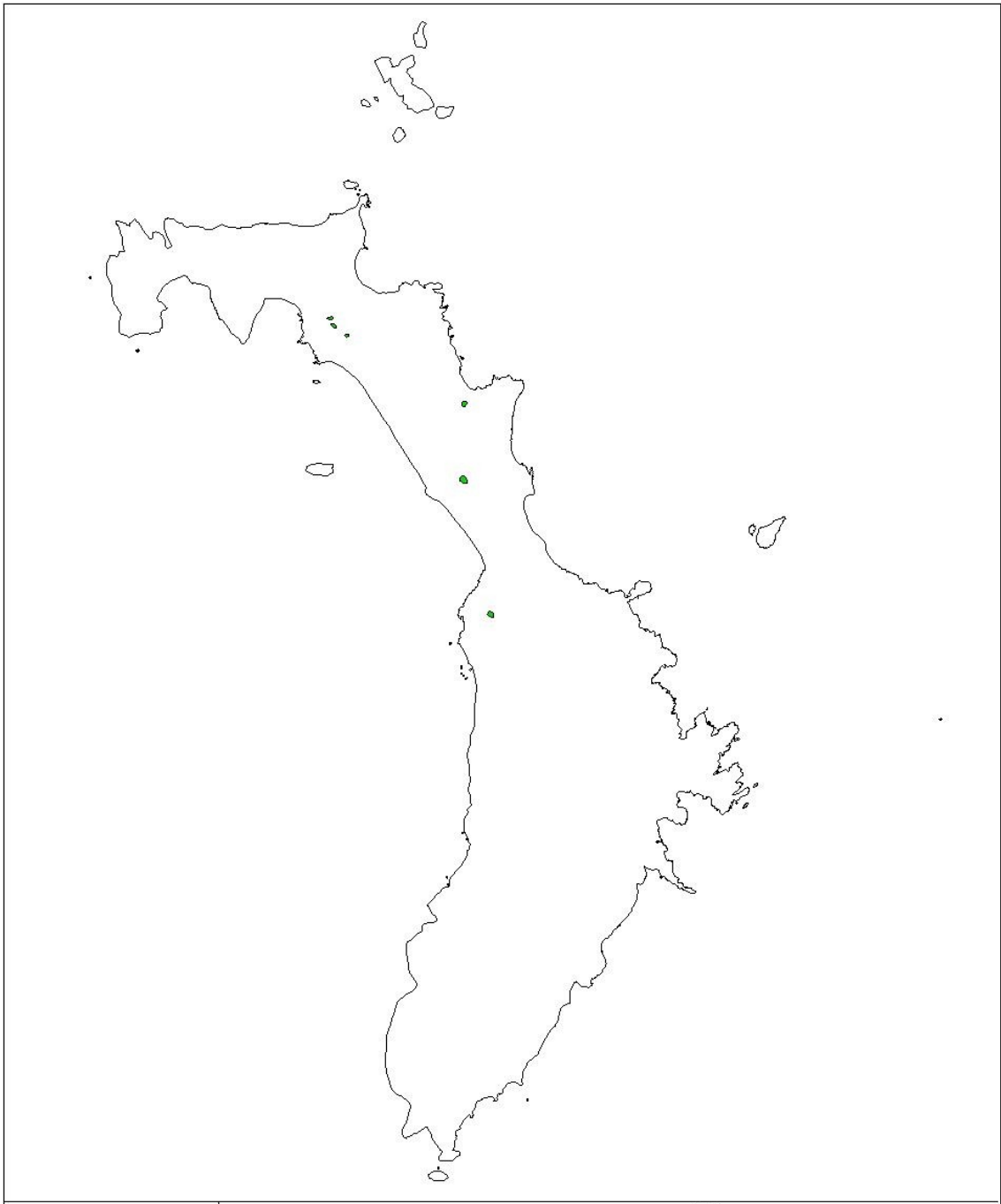
















**Weed Distribution**

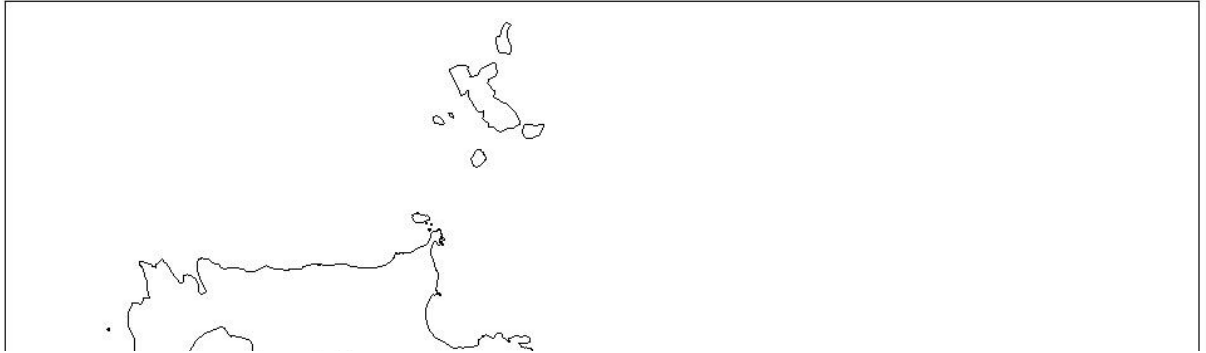
**Lantana**

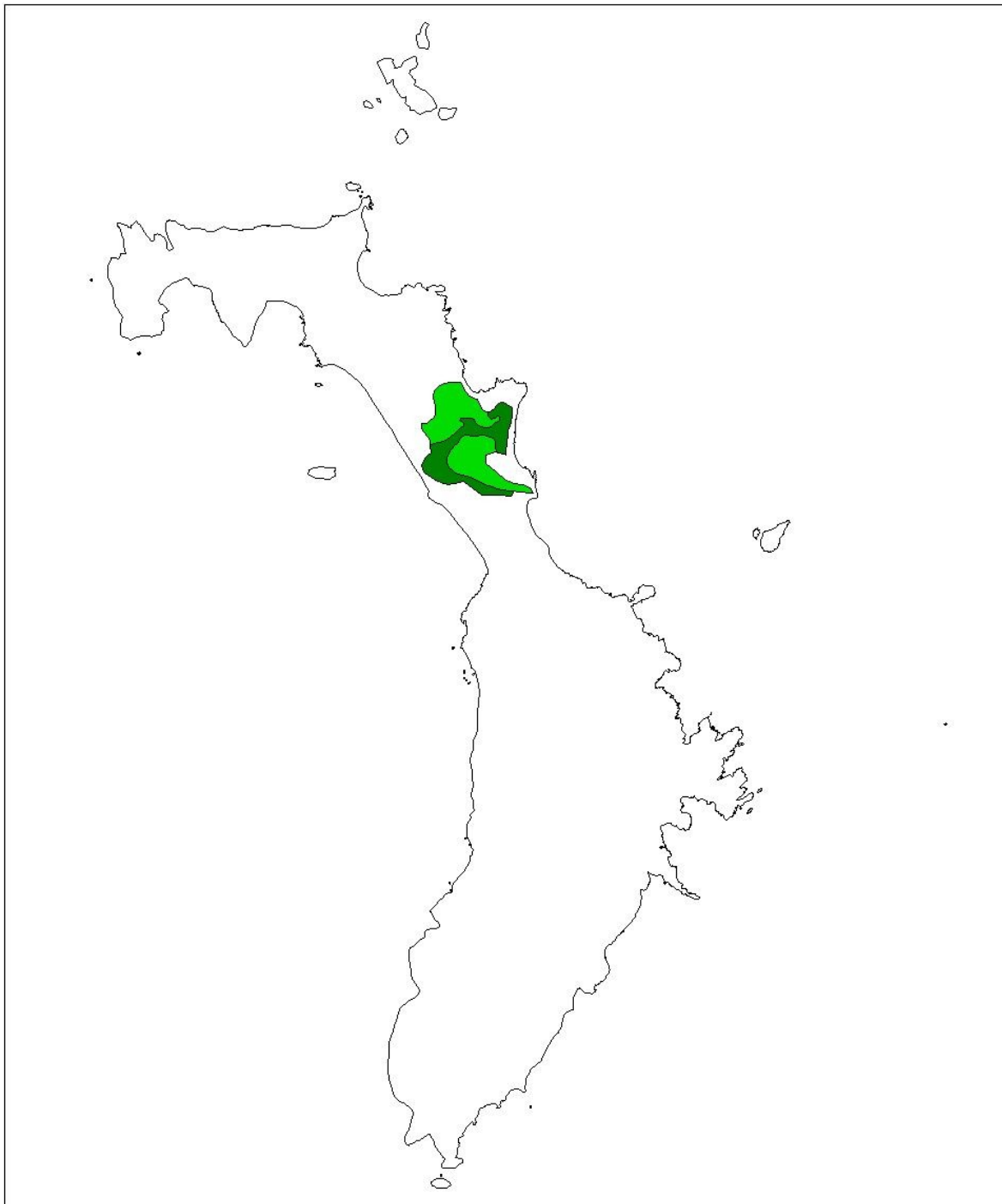
**Lantana camara**



**Key**

-  a. Virtually None  
May be records of isolated occurrences.  
Known plants have been treated.  
Not normally observed in this zone.
-  b. Scattered Plants  
Presence known in the area.  
Plants can be observed when  
walking through this area.
-  c. Patches Dominated  
Parts of this area are dominated by the weed.  
Boundaries between 'heavy' and 'light' infestations  
can be observed.
-  d. Totally Dominated  
The area is heavily infested throughout.  
Weed species is homogenous throughout.





**Lord Howe**  
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500 0 500 1000 Meters

June 2002

**Weed Distribution**  
**Sweet Pittosporum**  
***Pittosporum undulatum***

**Key**



a. Virtually None  
May be records of isolated occurrences.  
Known plants have been treated.  
Not normally observed in this zone.



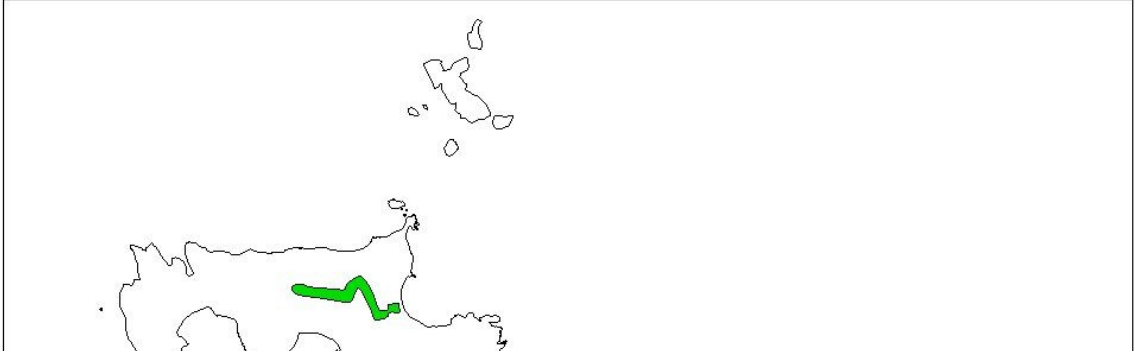
b. Scattered Plants  
Presence known in the area.  
Plants can be observed when  
walking through this area.

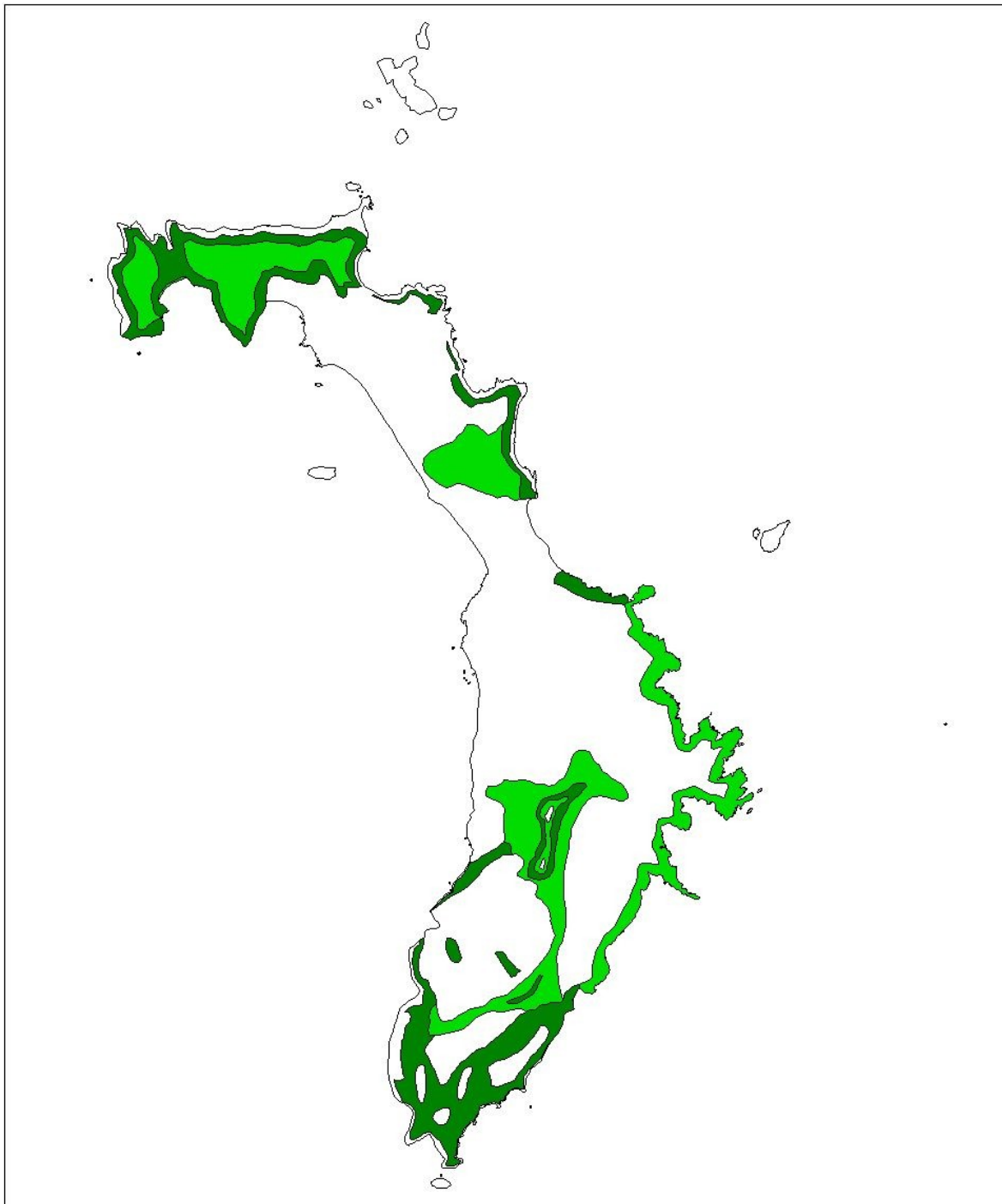


c. Patches Dominated  
Parts of this area are dominated by the weed.  
Boundaries between 'heavy' and 'light' infestations  
can be observed.



d. Totally Dominated  
The area is heavily infested throughout.  
Weed species is homogenous throughout.





Lord Howe  
ISLAND BOARD



Weed Distribution  
Tiger Lily  
*Lilium formosanum*

Key

-  a. Virtually None  
May be records of isolated occurrences.  
Known plants have been treated.  
Not normally observed in this zone.
-  b. Scattered Plants  
Presence known in the area.  
Plants can be observed when  
walking through this area.
-  c. Patches Dominated  
Parts of this area are dominated by the weed.  
Boundaries between 'heavy' and 'light' infestations  
can be observed.
-  d. Totally Dominated  
The area is heavily infested throughout.  
Weed species is homogenous throughout.

### **2.11 Relationships to Revegetation Plan**

The Revegetation Plan for Lord Howe Island has been developed in conjunction with this document. Although the two are intrinsically linked, they have been presented as separate documents. Weed control is an important component of the ecological restoration process, and hence weed control measures for revegetation sites will be addressed in the Revegetation Plan.

### **2.12 Legislative Context**

The LHIB has a number of statutory responsibilities in relation to environmental management as defined in the following legislation -

*Lord Howe Island Act 1953*

The Lord Howe Island Board is responsible for the care, control and management of Lord Howe Island in accordance with the NSW *Lord Howe Island Act 1953*. All land is vested in the Crown; there is no freehold title.

Perpetual leases are granted for the purposes of settlement and special leases for other purposes, usually agriculture.

Leaseholders have responsibility for weed control on their leases, in accordance with both the *Noxious Weeds Act 1993* and the conditions of their lease.

The PPP is identified in the Schedules of the *Lord Howe Island Act*, and is managed in accordance with a Plan of Management (which is currently under review)

#### *Threatened Species Act 1995*

The main objective of this Act is to conserve biological diversity. The Act provides for the listing of threatened species, populations and ecological communities. It makes provision for the preparation and implementation of recovery plans for threatened species and the designation of areas as critical habitat to the survival of threatened species, populations and ecological communities.

The Act also provides for the listing of key threatening processes and the preparation of threat abatement plans. Predation by the Ship Rat *Rattus rattus* on Lord Howe Island has been declared as a key threatening process. The species listed in the schedules of this Act are listed in Table 1.

#### *Noxious Weeds Act 1993*

Under this Act the Minister for Agriculture has power to make orders declaring plants as noxious weeds (listed in Schedule 1 of the Act). Noxious weeds are classified into categories with different control requirements. This Act also gives inspectorial powers to authorised LHIB officers. There are 18 species currently listed as noxious weeds for Lord Howe Island (see section 5.3).

#### *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

This Act provides for the protection of World Heritage Properties. The Lord Howe Island Board is responsible for the management of the Lord Howe Island Group to ensure that the World Heritage values are retained. The Strategic Issues Study for the Lord Howe Island Group World Heritage Property (1998) identifies weeds as a potential threat to the biodiversity of the Island.

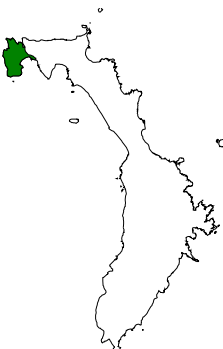
### **3 Status and Assessment of Weed Invasion**


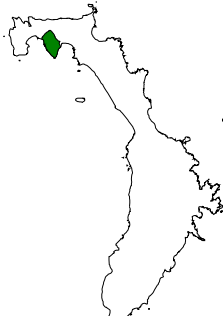

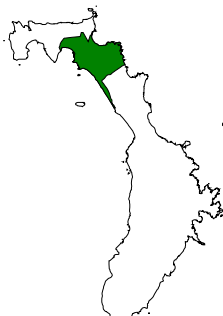
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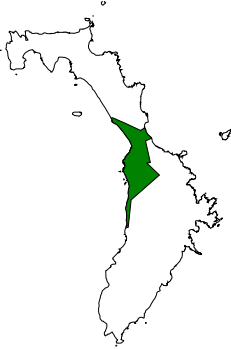
Weed invasions were assessed spatially using both control areas and vegetation communities as boundaries. Additionally a set of assessment criteria were developed and applied to enable the areas to be prioritised through the consideration of a range of criteria in addition to the two spatial methods.


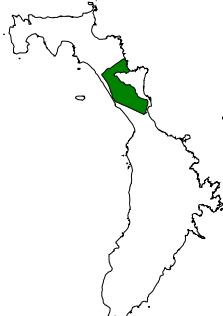
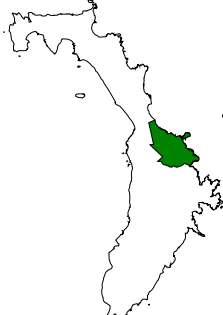
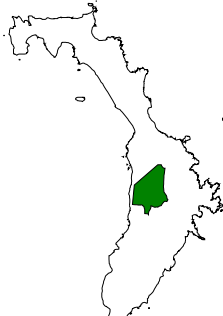
#### **3.1 Weed Invasion by Control Areas**

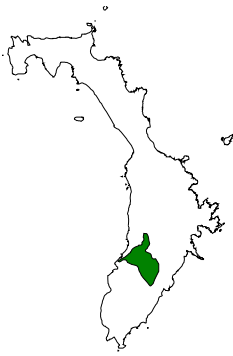
In order to assess the weed status of the Island it was divided into weed management areas, delineated using natural features where possible to provide a boundary for on-ground works. An outline of each of these areas is provided below.

	<p style="text-align: center;"><b>Northern Hills - NORTH HEAD 58 ha</b></p> <p>Vegetation Associations - <i>Drypetes-Cryptocarya</i>, <i>Cassinia</i>, <i>Howea</i></p> <p>Significant Weed Species - Ground Asparagus, Bridal Creeper, Tiger Lily</p> <p>Other Species to Note -</p> <p>Disturbances - Limited . This area is not impacted upon by walking tracks. Disturbances are limited to natural processes.</p>
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	<p style="text-align: center;"><b>Northern Hills - CURIO POINT</b> 37 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Cleistocaylx-Chionanthus</i>, <i>Cliff</i></p> <p>Significant Weed Species - Bridal Creeper, Ground Asparagus, Bitou Bush (on cliffs), Tiger Lily</p> <p>Other Species to Note – Trackside annuals</p> <p>Disturbances – Max Nichols walking track along southern boundary</p>
	<p style="text-align: center;"><b>Northern Hills - DAWSONS POINT</b> 27 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i></p> <p>Significant Weed Species - Ground Asparagus, Bridal Creeper, Tiger Lily</p> <p>Other Species to Note - Pampas grass above lead markers, trackside annuals</p> <p>Disturbances – Max Nichols walking track along Northern boundary</p>
	<p style="text-align: center;"><b>Northern Hills - MALABAR</b> 56 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Howea</i>, <i>Cliff</i></p> <p>Significant Weed Species - Ground Asparagus, Bridal Creeper, Bitou Bush (on cliffs), Tiger Lily, Crofton Weed.</p> <p>Other Species to Note - Juvenile Silky Oak and Pittosporum have been seen in this area, Kikuyu grass from neighbouring grazing areas</p> <p>Rare Plants – <i>Corybas barbarae</i></p> <p>Disturbances – Malabar-Kim's Lookout walking track.</p>
	<p style="text-align: center;"><b>Settlement - NORTH</b> 163 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Howea</i></p> <p>Significant Weed Species - Climbing Asparagus, Ground Asparagus, Bridal Creeper, Madeira Vine, Cherry Guava</p> <p>Other Species to Note - Garden escapees including Cotoneaster, Umbrella Tree and Silky Oak. Kikuyu grass.</p> <p>Rare Plants - <i>Caesalpinia bonduc</i>, <i>Calystegia affinis</i></p> <p>Disturbances - Settlement, grazing, clearing</p>

	<p style="text-align: center;"><b>Settlement - SOUTH</b> 157 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Howea</i>, <i>lowland mixed forest</i>, <i>Cleistocaylx-Chionanthus</i></p> <p>Significant Weed Species - <i>Ochna</i>, Cherry Guava, Bitou Bush, Crofton Weed</p> <p>Other Species to Note - Garden escapees including <i>Cotoneaster</i>, Umbrella Tree and Silky Oak</p> <p>Disturbances - Settlement, grazing, clearing</p>
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	<p style="text-align: center;"><b>Transit Hill - UPPER</b> 51 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Howea</i>, <i>lowland mixed forest</i></p> <p>Significant Weed Species - Pittosporum, Climbing Asparagus, Ground Asparagus, Cherry Guava, Bitou Bush, Bridal Creeper, Crofton Weed</p> <p>Other Species to Note - Lantana has been seen in this area</p> <p>Disturbances - Settlement gardens, walking track, grazing</p>
	<p style="text-align: center;"><b>Transit Hill - LOWER</b> 95 ha</p> <p>Vegetation Association - <i>Drypetes-Cryptocarya</i>, <i>Howea</i>, <i>lowland mixed forest</i></p> <p>Significant Weed Species - Pittosporum, Climbing Asparagus, Ground Asparagus, Cherry Guava, Bitou Bush, Bridal Creeper, Crofton Weed</p> <p>Other Species to Note - Lantana has been seen in this area</p> <p>Disturbances - Settlement , gardens, grazing</p>
	<p style="text-align: center;"><b>Southern Mountains – INTERMEDIATE HILL</b> 110 ha</p> <p>Vegetation Association - <i>Howea</i>, <i>Drypetes-Cryptocarya</i>, <i>lowland mixed forest</i></p> <p>Significant Weed Species - Ochna, Cherry Guava, Ground Asparagus, Tiger lily, Crofton Weed</p> <p>Other Species to Note - Pittosporum,</p> <p>Disturbances - active zone of weed invasion from settlement, Muttonbird Point Track</p>
	<p style="text-align: center;"><b>Southern Mountains - GREY FACE</b> 97 ha</p> <p>Vegetation Association - <i>Howea</i>, <i>Lowland mixed forest</i></p> <p>Significant Weed Species - Cherry Guava, Ochna, Tiger Lily, Crofton Weed, Bitou Bush</p> <p>Other Species to Note - Roldana, Bitou at 'The Nobbin'</p> <p>Rare Plants - <i>Calystegia affinis</i></p> <p>Disturbances –Limited to natural processes</p>



**Southern Mountains - SOUTH LIDGBIRD 74 ha**

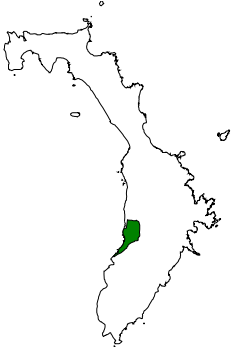
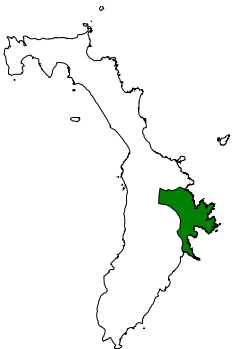
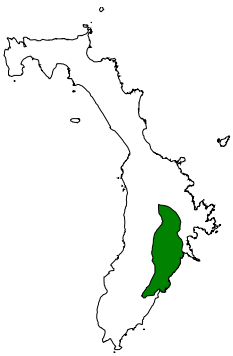
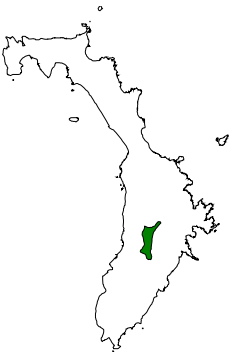
Vegetation Association - *Cleistocaylx-Chionanthus*, *Howea*, *Dracophyllum fitzgeraldii*

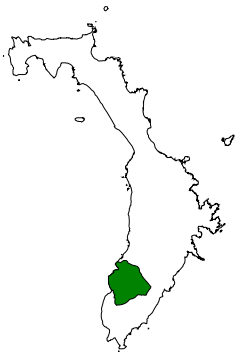
Significant Weed Species - Tiger Lily, Crofton Weed

Other Species to Note - Ochna, Cherry Guava

Rare Species – *Polystichium moorei*

Disturbances – Limited to natural processes

	<p style="text-align: center;"><b>Southern Mountains - FAR FLATS</b> 109 ha</p> <p>Vegetation Association – <i>Howea</i></p> <p>Significant Weed Species - Tiger Lily, Crofton Weed, Bitou Bush</p> <p>Other Species to Note - Tobacco Bush</p> <p>Disturbances - trackside weeds along vehicle access</p>
	<p style="text-align: center;"><b>Southern Mountains - EAST POINT</b> 151 ha</p> <p>Vegetation Association - <i>lowland mixed forest, Drypetes-Cryptocarya, Cassinia</i></p> <p>Significant Weed Species - Cherry Guava, Ground Asparagus, Tiger Lily, Crofton Weed, Bitou Bush</p> <p>Other Species to Note - <i>Ochna</i> may soon penetrate this area</p> <p>Disturbances – Boat Harbour walking track</p>
	<p style="text-align: center;"><b>Southern Mountains - BEHIND MT LIDGBIRD</b> 182 ha</p> <p>Vegetation Association - <i>lowland mixed forest, Drypetes-Cryptocarya, Cleistocaylx-Chionanthus, Cassinia</i></p> <p>Significant Weed Species - Tiger Lily, Crofton Weed</p> <p>Other Species to Note - Cherry Guava may soon penetrate this area</p> <p>Disturbances – Limited to natural processes</p>
	<p style="text-align: center;"><b>Southern Mountains - MT LIDGBIRD SUMMIT</b> 27 ha</p> <p>Vegetation Association – <i>Hedyscepe</i></p> <p>Significant Weed Species - Tiger Lily, Crofton Weed</p> <p>Rare Plants – <i>Carmichaelia exsul</i>, <i>Coprosma inopinnata</i>, <i>Geniostoma huttonii</i>, <i>Plectorrhiza erecta</i>, <i>Xylosma parvifolium</i></p> <p>Disturbances – Access very difficult, limited to natural processes</p>





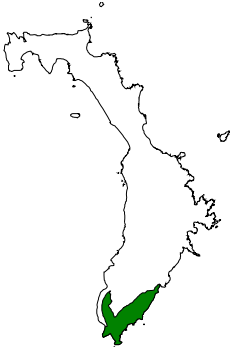
**Southern Mountains - ERSKINE VALLEY** 109 ha

Vegetation Association - *Drypetes-Cryptocarya, Cleistocaylx-Chionanthus, cliff*

Significant Weed Species - Tiger Lily, Crofton Weed

Other Species to Note – Kikuyu grass

Disturbances - Walking track

	<p style="text-align: center;"><b>Southern Mountains – MOUNT GOWER SUMMIT 31 ha</b></p> <p>Vegetation Association - <i>Bubbia</i></p> <p>Significant Weed Species - Tiger Lily</p> <p>Rare Plants - <i>Carmichaelia exsu</i>, <i>Coprosma inopinnata</i>, <i>Geniostoma huttonii</i>, <i>Plectorrhiza erecta</i>, <i>Sticherus lobatus</i>, <i>Xylosma parvifolium</i></p> <p>Disturbances – Frequently used track, high risk of new species being transported via peoples shoes</p>
	<p style="text-align: center;"><b>Southern Mountains - LITTLE SLOPE 20 ha</b></p> <p>Vegetation Association – <i>Howea</i></p> <p>Significant Weed Species – Tiger Lily, Crofton Weed</p> <p>Other Species to Note -</p> <p>Disturbances – Very limited access, disturbances limited to natural processes</p>
	<p style="text-align: center;"><b>Southern Mountains - BIG SLOPE &amp; BIG POCKET 118 ha</b></p> <p>Vegetation Association - <i>Howea</i>, <i>Hedyscebe</i></p> <p>Significant Weed Species - Tiger Lily, Crofton Weed</p> <p>Other Species to Note - Wild Tobacco in Big pocket</p> <p>Disturbances – Very limited access, disturbances limited to natural processes such as landslips</p>

### 3.2 Weed Invasion by Vegetation Type

In addition to the area assessment approach shown above an assessment of the degree of weed invasion in each vegetation community was undertaken. This process provided approximate figures on the degree of weed invasion in each of the main vegetation communities on the Island. This data is provided in appendix 1.

Note that the >Vegetation Association= category has been simplified from Pickard (1983). Similar associations, such as *Howea forsteriana* and *Howea belmoreana*, have been combined into a single unit.

The figures provide an indication of the degree of weed invasion for each vegetation type, they do not identify differences in weed density. The figures cannot be used as a cumulative figure of weed invasion as species were assessed independent of each other ie. the area invaded by Ground Asparagus may be the same area as that invaded by Cherry Guava. To add these figures together would give an over-estimate of weed cover.

When interpreting the data provided in appendix it should be noted that throughout their range many of these weeds are very scattered. For example Bitou Bush is very scattered throughout its range, so although the beach vegetation community has over 30% coverage by Bitou Bush this could in fact be a very limited number of scattered plants.

This data indicates that vegetation communities such as *Howea* have a fairly low degree of weed invasion. It also demonstrates that vegetation communities with a very limited range, such as the Grassland communities (Poa/Cyperus) which is limited to 18 hectares are affected by weeds

throughout most of their range. It should also be noted that Kikuyu grass impacts upon this community throughout most of its range, but has not been included in this analysis.

Crofton Weed and Tiger Lily are scattered throughout most of the vegetation communities on the Island.

### 3.3 Criteria for Priority Setting

The following criteria were developed to enable the objective consideration of all issues relating to weed control within each control area. To enable a clearly ranked list to be developed each of these criteria was given weighting that allowed the production of a numerically ranked list.

**Table 5 - Criteria Used for Priority Assessment**

Criteria	Score
Zone contains weeds which impact on Threatened species or communities; or actions relating to the weed are included in a recovery plan.	4
Zone contains weeds which are: W1 or W2 Noxious weeds, bird or wind dispersed, have known potential from similar environments, have limited distribution on Lord Howe Island or are vigorous growers and reproducers.	4
Zone contains weeds which threaten conservation values or zone is in or adjacent to PPP.	3
Zone has access or topography which make weed control very difficult and weeds should be kept out at all costs.	3
Zone contains weed infestations which have been previously treated, and maintenance should continue to protect effort and expenditure.	3
Zone contains forest in very good condition that will be resilient to new weeds, if current infestations are eradicated.	3
Area has heavy infestations which should be contained to prevent spread into adjoining areas or control before seeding.	2
Community perception eg. weeds which have a mixed perception are unlikely to be controlled effectively by the community.	2
Window of opportunity to control eg. Biological control agent becomes available, control after disturbance such as landslip.	1
Zone has weeds which threaten recreational values and high profile areas.	1
Zone contains weeds with a State or National Plan.	1



**Table 6 - Assessment using Matrix**

<p>contains weeds which impact on Threatened species or communities; or actions relating to the weed are included in a recovery plan.</p>
<p>contains weeds which are: W1 or W2 Noxious weeds, bird or wind dispersed, have known potential from similar environments, have limited distribution on Lord Howe Island or are vigorous growers and reproducers.</p>
<p>Zone contains weeds which threaten conservation values or zone is in or adjacent to PPP.</p>
<p>Zone has access or topography which make weed control very difficult and weeds should be kept out at all costs.</p>
<p>Zone contains weed infestations which have been previously treated, and maintenance should continue to protect effort and expenditure.</p>
<p>Zone contains forest in very good condition that will be resilient to new weeds, if current infestations are eradicated.</p>
<p>Zone has heavy infestations which should be contained to prevent spread into adjoining areas or control before seeding.</p>
<p>Zone has weeds which have a mixed perception are unlikely to be controlled effectively by the community.</p>
<p>Zone has weeds which threaten recreational values and high profile areas.</p>
<p>Zone contains weeds with a State or National Plan.</p>
<p><b>Total</b></p>

North Head		✓	✓		✓	✓				✓		14
Curio Point	✓	✓	✓		✓		✓				✓	17
Dawsons Point		✓	✓		✓	✓				✓		14
Malabar	✓	✓	✓		✓	✓	✓			✓	✓	21
Settlement – North	✓	✓	✓		✓		✓	✓		✓	✓	20
Settlement – South	✓	✓	✓		✓			✓		✓		17

Transit Hill – Upper	✓	✓	✓		✓		✓	✓		✓	✓	20
Transit Hill – Lower	✓	✓	✓		✓		✓	✓				18
Intermediate Hill		✓	✓		✓	✓	✓	✓			✓	18
Grey Face	✓	✓	✓	✓	✓	✓	✓	✓			✓	25
South Lidgbird		✓	✓	✓		✓						13
Far Flats		✓	✓			✓				✓		15
East Point		✓	✓			✓					✓	11
Behind Mt Lidgbird		✓	✓	✓		✓						13
Mt Lidgbird		✓	✓	✓		✓						13
Erskine Valley		✓	✓			✓						10
Mt Gower		✓	✓	✓		✓				✓		14
Little Slope		✓	✓	✓		✓						13
Big Slope		✓	✓	✓		✓			✓			13

## **4 Proposed Management Strategies**

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### **4.1 Quarantine**

Quarantine is the key tool for the prevention of new weed species being introduced to the Island. The majority of species which are now the focus of the Lord Howe Island Board weed control works were deliberately introduced, usually as garden plants. Stopping the flow of new species coming to the Island is just as important as controlling those that are already here.

The development of a quarantine system is essential for the protection of the Island ecosystems. As a first step in this process the following steps should be undertaken -

The LHIB Policy for the Importation of Plants currently includes a blanket approval for the importation of

Avegetable seeds and seedlings, citrus trees, Orchids, Bromeliads, Roses (except Briar rose), Hibiscus, garden flower seeds and seedlings, African violets, Philodendrons, Dracaenas, Monsterias, bulbs, Spathiphyllums and Dieffenbachias. There is much scope within the existing policy for the introduction of a large number of potential weed species.

The LHIB should amend the current policy on the importation of plants, and provide a list of >bush friendly= plants which can be used for garden plantings. No other plants should be imported without specific approval of the Board. No plants known to have weed potential in environments similar to Lord Howe Island should be permitted for importation, nor should any species from a genus which includes LHI endemics. The ban on the importation of any palm species should remain. Community education is a key component of this strategy.

This recommendation is a only first step in the adoption and implementation of a more broad scale quarantine system for Lord Howe Island.

## **4.2 Research**

The Lord Howe Island Board is currently (June 2002) circulating a discussion paper ADetermining Environmental Research Priorities on Lord Howe Island@ to relevant stakeholders. The recommendations of this paper have been adopted as interim LHIB policy. The following is an extract from the discussion paper -

Weeds are considered the largest threat to the integrity of the islands ecosystem. Of the 400 plant species on the Island, a total of 180 are introduced. Not all flora introductions become environmental weeds but the potential impact of some weeds is extremely high. Due to the remote nature of the southern mountains, weed control can be hazardous and very time consuming. There is a list of declared noxious weeds for the Island and Hutton & Le Cussan have written a Weed report identifying a list of environmental weeds. Research topics include:

- Research into weed control techniques (new herbicide applications, control methods, biological control) for weeds that are seen to pose a considerable threat to the Island ecosystem, but are relatively unknown on mainland Australia is required (ie. Tiger Lily).
- Monitoring of spread of sleeper weeds where no control is currently being undertaken, to determine more accurately (and hence efficiently) when and if weed control is needed
- Research into potential impact of existing Asparagus herbicide mix (such as residual effects in soil and rate of native regeneration compared to areas treated with other control techniques or herbicides).
- Weed surveys to assess densities of different weeds so to effectively plan weed control programs. Establish a monitoring program of weed free areas to ensure that these areas remain intact and free of weeds.
- Addressing to cause of new weeds coming to the Island and new weed infestations in the Permanent Park Preserve. The development of strategies to address these issues.

The Lord Howe Island Board should support these and any other relevant research projects that may provide information about weed management.

### **4.3 Noxious Weed Declarations and Categories**

Noxious weeds are those declared under Schedule 2 of the Noxious Weeds Act 1993. Weeds are assigned to a specific classification, which outlines the legal obligations for control of that weed species. Leaseholders are responsible for the control of noxious weeds on their leases.

The most threatening weed species are assigned a W1 classification, there is a legal requirement for these weeds to be fully and continuously suppressed and destroyed, additionally their presence must be notified to the Lord Howe Island Board. Other Noxious weeds have less restrictive classifications, which may include - the weed must be continuously suppressed and destroyed or the weed must not be sold, propagated or knowingly distributed.

The weed species listed as Noxious on Lord Howe Island are shown below in Table 7.

**Table 7 - Noxious Weed Listings for Lord Howe**

Classification	Common Name	Species Name
W1	Bitou Bush	<i>Chrysanthemoides monilifera</i>
	African Boxthorn	<i>Lycium ferocissimum</i>
	Arundinaria Reed	<i>Arundinaria sp.</i>
	Rhizomatus Bamboo	<i>Phyllostachys sp.</i>
	Giant Reed / Elephant Grass	<i>Arundo donax</i>
W2	Castor Oil Plant	<i>Ricinus communis</i>
	Glory Lily	<i>Glorisa superba</i>
	Lantana	<i>Lantana camara</i>
	Rhus Tree	<i>Toxicodendron seccedaneum</i>
	Sweet Pittosporum	<i>Pittosporum undulatum</i>
	Climbing Asparagus	<i>Asparagus plumosus</i>
	Ground Asparagus	<i>Asparagus aethiopicus</i>
W3	Bridal Creeper	<i>Asparagus asparagoides</i>
	Cherry Guava	<i>Psidium cattleianum</i>
	Tiger Lily	<i>Lilium formosanum</i>
	Crofton Weed	<i>Ageratina adenophora</i>
W4c	Ochna	<i>Ochna serrulata</i>
	Madiera vine	<i>Anredera cordifolia</i>

**Table 8 - Noxious Weed Classifications**

Weed Classification	Description
W1	The presence of the weed must be notified to the Lord Howe Island Board within 3 days and the weeds must be fully and continuously suppressed and destroyed.
W2	The weed must be fully and continuously suppressed and destroyed
W3	The weed must be prevented from spreading and its numbers and distribution reduced.
W4a	The weed must not be sold, propagated or knowingly distributed. Any part of

	the weed must be prevented from growing within 3 meters of the property boundary.
W4c	The weed must not be sold, propagated or knowingly distributed. It must be prevented from spreading to adjoining property.
W4g	The weed must not be sold, propagated or knowingly distributed.

It is proposed that the following action be undertaken with regard to the Noxious Weed listings-

Weeds requiring further investigation into their potential listing as Noxious Weeds

Cotoneaster - *Cotoneaster spp.*

Roldana - *Roldana petasitis*  
Small Leaf Privet B *Ligustrum sinense*  
Broad Leaf Privet B *Ligustrum lucidum*  
Pampas Grass - *Cortaderia spp.*  
Holly Fern B *Phanerophlebia falcatum*  
Coastal Morning Glory B *Ipomea cariaca*  
Blue Morning Glory B *Ipomea indica*  
Silky Oak B *Grevillea robusta*  
Umbrella Tree B *Schefflera actinophylla*  
Thistle species - various  
Wandering Jew B *Tradescantia fluminensis*  
Wild Tobacco B *Solanum mauritianum*  
Noxious weeds which should have their category altered

Maderia Vine B from W4 to W2

Tiger Lily B from W3 to W4g

Ochna B from W3 to W2

In addition to these alterations to the listings it is essential that the noxious weeds inspectoral program is maintained.

#### **4.4 Administration**

There are important administration and management roles associated with a work unit that undertakes a comprehensive weed control program. It is essential that adequate administrative support is provided to field based staff.

The LHIB must continue to provide administrative support to seek external funds for weed management activities. The development of co-operative agreements with special leaseholders may also be a key role of this position.

#### **4.5 Monitoring**

In order to assess the effectiveness of any weed control activity it is essential that a monitoring program be developed. The monitoring should also:

- Provide baseline environmental information about a site
- Determine whether objectives are being met and whether changes to techniques are required
- Provide information for reporting to funding bodies
- Provide data and information which can be used by other groups
- Raise awareness in the community about the condition of bushland and LHIB activities

In order to be practical and useful for the LHIB a monitoring technique must

- be repeatable
- be able to be used by a range of people with a range of skills
- be objective
- produce meaningful results
- be a rapid assessment technique

The following monitoring techniques will be used to assess weed control efforts on Lord Howe Island. Additionally, where appropriate, detailed project-based mapping will be undertaken as a means of monitoring outcomes of specific projects.

##### **4.5.1 Photo Points**

By taking a time-series of photographs, of the same area (from the same point, in the same direction) it is possible to develop a picture of changes in vegetation over time.

The following guidelines are provided for the development of photo points.

The location of the photo points should be selected so that they provide a representative indication of bushland condition. Areas close to walking tracks, for example, will not be representative of the general bushland and photo points should not be limited to such areas. The locations of the photo points will be developed. These will be recorded as waypoints in a GPS and easily found using the GoTo function.

The timing of photo points should be governed by the activities which are being undertaken. In areas being treated with primary control more frequent photos are required than in areas which are only being monitored with no actual works being undertaken. Photos should be repeated at the same time of year when ever possible.

An identifying feature should be included in all photos. If possible natural features, such as a large rock, are preferable to other options such as marked trees or stakes.

#### 4.5.2 *Bushland Condition Rapid Assessment*

Rapid assessment of bushland areas relies upon the use of a set group of characteristics, each of which is allocated a score based upon its condition. Each of these characteristics is weighted, and the score can be multiplied by the weighting resulting in the bushland area being given a condition score. This technique relies primarily upon visual assessment.

It can be used by a range of people and does not require a high degree of specialist knowledge. It is important however that over generalisations are not made, as the assessment should not be applied to an area that was not actually assessed. This risk can be minimised by completing a number of assessments within an area and reporting on minimum and maximum scores in addition to the average.

Bushland condition rapid assessment can be used in association with photo points. The assessment can be carried out at the same time and frequency as the photo points. Additionally this technique can be used to objectively assess the >before and after= state of a weed control project.

A pro-forma for rapid assessments should be clear enough to reduce any inter-observer error. Parameters to be measured should include: weed species cover and abundance, native species cover and abundance, species diversity, foliage cover and vegetation structure.

#### 4.5.3 *Detailed Mapping*

Detailed mapping will be used to assist with planning and assessing the effectiveness of weed control activities. Where large-scale on-ground works are undertaken ‘before and after’ mapping will provide important information about the effectiveness of the program. It is planned to undertake this mapping in the Transit Hill area and in Intermediate Hill and Grey Face, as these are the high priority areas for on-ground works.

### 4.6 *Education and Training*

Education and training is essential for both LHIB staff and the community.

Currently there is no training in Bush Regeneration available to Lord Howe Island Board staff. Making such training available would expose staff to the increasingly commonly used techniques of bush regeneration. By providing an exposure to this ecological approach to weed control, a more diverse and flexible weed control program can be implemented, focussing upon the restoration of natural bushland, rather than simply weed control per se.

Such a course would be approximately 15 hours and would include topics such as Plant Identification Techniques, Weed Identification, Ecology and Successional Processes, Regeneration Techniques, Bushland Management and Occupational Health and Safety in Bushland . The course should also cover an introduction to the practical application of Global Positioning Systems (GPS) and Geographical Information Systems (GIS).

This course would also fulfil the training requirements in the Pesticides Act 1999 and the Occupational Health and Safety Act 2000. The community would be encouraged to attend such a course.

There are two main options for delivery of a Bush Regeneration course, the advantages and disadvantages of each are discussed below.

**Table 9 - Options for Delivery of Bush Regeneration training package**

Course provided by Lord Howe Island Board staff	
Advantages	Disadvantages

<p>Can be offered to new staff as a part of the induction process  Knowledge of local issues, sites and work practices  Can be structured as a staged course</p>	<p>Staff may not be experienced trainers  Not external to day-to-day running of section  May not correspond with TAFE course</p>
<p><b>Course provided by external trainers</b></p>	
<p>Advantages  Opportunity already exists, as accredited TAFE</p>	<p>Disadvantages  New staff may not be able to receive training</p>

trainers co-ordinate Friends of Lord Howe Island groups External to day-to-day running of section Would be similar content to TAFE course (condensed)	upon commencement of work Would be an intensive course
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The development of an Introduction to Bush Regeneration course for relevant Lord Howe Island Board staff and interested community members will be a key issue for the implementation of this plan.

Additionally the development and delivery of a community information package will assist in the management of weeds before they become a problem in bushland. An education package could also be delivered at the Central School. The provision of regular information about LHIB weed control activities may also assist in fostering an awareness of weed management issues. The Rangers display area in the Museum may be an appropriate place of this to be displayed.

#### **4.7 On-Ground Works**

On-ground works are of course the cornerstone of any weed control effort. Key areas for weed control resources have been identified in using the criteria in section 4. The following have been identified as key areas for comprehensive on-ground works - Upper and Lower Transit Hill, Grey Face and Intermediate Hill with follow-up works recommended for the Malabar area.

Additionally the maintenance of existing treatment sites within the Settlement is important as these are most often seen by the community and they may act as seed sources for infestations in healthy bushland. The treatment of W1 weed incursions on Board land is a requirement of the *Noxious Weeds Act* and must be undertaken, as is the implementation of actions from Recovery Plans.

As a preventative measure new weed incursions in the Southern Mountains and off-shore Islands should be treated on an opportunistic basis. The terrain of the Southern Mountains warrants this approach, as control of a species once it is established will be difficult (if not impossible). To stop movement of weed species into the Permanent Park Preserve all invasive weed incursions along the boundary should be treated.

## **5 Implementation Issues**

### **5.1 Resourcing**

The majority of the funds for weed control programs on Lord Howe Island are from sources external to the Lord Howe Island Board. The majority of funding is from the Federal Government through the World Heritage Unit of Environment Australia. Over the past 5 years this has been approximately \$70 000 per annum. Additional funding, on a project basis, has been received from NSW Agriculture, Environmental Trust, World Wide Fund for Nature (Threatened Species Network), CoastCare and the Natural Heritage Trust.

Weed control is a key statutory responsibility of the Lord Howe Island Board, funds must be allocated to ensure long term consistency of weed control efforts.

It is essential that this plan takes into account these fluctuating funds sources. It is also essential that future funding applications reflect the priorities in this plan.

### **5.2 Use of Volunteers**

Volunteer groups, primarily the Friends of Lord Howe Island, play an important role in weed control on the Island, and work effectively with LHIB Environmental Section Staff. These groups undertake minimal disturbance bush regeneration focussing primarily on the Transit Hill area. The basic structure of the groups is that they travel from the mainland for one week, undertaking bush regeneration in the mornings and having the afternoons to participate in a range of environmentally focussed activities. All Friends of Lord Howe Island volunteers fund their own travel, accommodation and meals.

The Lord Howe Island Board has adopted a Volunteer Policy which provides guidelines for the management of volunteer programs on the Island. In accordance with this policy the Lord Howe Island Board currently provides the groups with equipment such as herbicide and herbicide applicator bottles, gloves and First Aid Kits. Additionally the LHIB provides co-ordination and planning assistance to the groups, and undertakes preliminary work in some areas facilitating access for the volunteer groups. Volunteers receive recognition from the Board, usually being presented with a letter of appreciation from the Board and a small gift such as a Kentia Palm seedling.

The volunteer groups provide a number of important opportunities for the LHIB. Many of the groups are made up of experienced bush regenerators, this experience and knowledge should be utilised with Board staff being exposed to this alternate, minimal disturbance, bushland management approach whenever possible.

All of the Friends volunteer groups are supervised by an experienced supervisor selected by the Friends of Lord Howe Island. Many of these supervisors are accredited trainers for the NSW TAFE Bush Regeneration course. An opportunity exists for the development of a short course in Bush Regeneration for LHIB staff, being taught by these trainers whilst they are on the Island with a volunteer group. This is further expanded in section 5.6.

Additional to the Friends of Lord Howe Island is a volunteer program currently being instigated by the LHIB. This program will see volunteers working with the LHIB Field Officers for a 2 week period. In return for their volunteer hours, volunteers costs including airfares, accommodation (in the Research Facility) and meals are met by the LHIB. This project is currently being funded through Environmental Trust and Weeds of National Significance funding. There is scope for the expansion of this project in the future utilising World Heritage funds.

### **5.3 Staff Structure and Tenure**

The Lord Howe Island Board Environment Section employs the following staff.

- Senior Ranger (seconded from NPWS).
- Ranger B Job Share. One 0.6 EFT position (extended to full time until June 2002) and one 0.4 EFT position.
- Field Supervisor.
- Four casual Field Officers, employed on a long term basis, usually four days per week.
- Up to nine casual Field Officers including one Senior Field Officer, employed on a project basis, usually two days per week.

The Environmental Section has no permanent field staff. Although funding allows for the employment of sufficient staff at this time, this funding is externally sourced. If the LHIB were to not receive this funding, maintenance of sites and follow-up weed control would not be sufficient to protect previous works.

Additionally the lack of permanent field staff restricts both the daily and long term planning of works programs in the section. The creation of permanent field officer position(s) in the Environmental section is necessary to ensure that past investments and achievements are not lost if external funding is not forthcoming.

### **5.4 Occupational Health and Safety**

The Lord Howe Island Board has adopted an Occupational Health and Safety Strategy. This strategy applies to all work sites of the Lord Howe Island Board and any other sites under management of the Board, along with any project or facility involving its employees, contractors and the public.

This strategy outlines the responsibilities of each position, the risk identification and risk control process, accident and incident investigations, notification procedures and the role of the OH&S committee.

Occupational Health and Safety is a key concern for weed control works, as these activities often involve using herbicides and a variety of tools in difficult terrain and remote locations. Procedures to identify and minimise any risks are an integral part of planning any weed control activity.

### **5.5 Seasonal Issues**

Seasonal issues impact upon weed management in two distinct ways. Firstly weather conditions are an important determinant of daily work plans for weed control works. Some activities such as herbicide spraying can only be undertaken under certain conditions. Additionally access to some areas is restricted by weather conditions.

Secondly, seasonal issues also determine which species should be targeted at what time. It may be important to treat species prior to fruiting.



## 6 Summary of Recommendations

(not ranked within priorities)

	Action	Responsibility	Performance Measure	Category	Priority
7.1	Amend LHIB Plant Importation policy to remove inappropriate plants and develop list of a Bushland Friendly plants.	Senior Ranger	LHIB Plant importation policy amended and enforced, and list of “ Bushland Friendly” plants developed.	Quarantine	High
7.2	Bush regeneration sweeps throughout Upper and Lower	Ranger/Field Supervisor	On ground works commenced, using a range of appropriate weed control	On-ground works	High
7.3	Bush regeneration sweeps throughout Grey Face and Intermediate Hill	Ranger/Field Supervisor	On ground works commenced, using a range of appropriate weed control techniques	On-ground works	High
7.4	Follow up on-ground works for ground and climbing asparagus control on northern side of track in Kim’s Lookout and Malabar	Field Supervisor	Follow up works completed	On-ground works	High
7.5	Continue Noxious Weed Inspectoral Program and develop co-operative programs with special leaseholders to complement LHIB weed control works.	Ranger	Number of Noxious Weed Inspections undertaken per financial year	Noxious Weeds	High #
7.6	Support volunteer activities	Senior Ranger	Number of volunteers, hours worked and area treated.	On-ground/ Administration	High
7.7	Maintain treatment of existing sites within settlement	Field Supervisor	Treatment schedule implemented	On-ground works	High
7.8	Treat all W1 weed incursions on Board land	Ranger/Field Supervisor	All W1 weed incursions treated	On-ground works	High #

	<b>Action</b>	<b>Responsibility</b>	<b>Performance Measure</b>	<b>Category</b>	<b>Priority</b>
7.9	Implement actions as identified in Threatened Species Recovery Plans or interim reports on rare or threatened species.	Senior Ranger	Recovery actions implemented	On-ground works	High #

	Action	Responsibility	Performance Measure	Category	Priority
7.10	Develop and implement Bush Regeneration training package	Senior Ranger/Ranger	All relevant staff trained in Bush Regeneration	Training and Education	High
7.11	Develop and implement Community information package	Senior Ranger/Ranger	Range of information about weed control available to the community	Training and Education	High
7.12	Develop and maintain monitoring program as identified in section 5.5	Ranger	Monitoring program developed and implemented, with monitoring being completed within identified timeframes	Monitoring	High
7.13	Seek alternate funding sources	Senior Ranger	External funds from a range of sources	Administration	High
7.14	Address Field Officer tenure issues	Manager Operations	Ensure Field Officers will remain employed to undertake at least essential maintenance of weed control sites in the event of external funding being reduced	Administration	High
7.15	Control new incursions of noxious and potentially invasive weed species in southern mountains and off shore Islands	Ranger/Field Supervisor	Program in place for on-going control and mapping of new weed incursions in the southern mountains	On-ground works	High
7.16	Develop procedures for appropriate disposal of herbicides	Ranger	Herbicide disposed of appropriately	Research	High #
7.17	Ensure that Board commitments in relevant management plans are undertaken	Senior Ranger	Recommendations of plans implemented	Administrative	High
7.18	Facilitate and support research into the biological control agents for key weed species	Senior Ranger	Investigations into the release of bio-control agents undertaken	Research	High
7.19	Initiate, facilitate and support relevant research into weed management	LHIB and Senior Ranger/Ranger	Number weed management related research projects supported by LHIB per year	Research	High
7.20	Treat incursions of invasive species on PPP boundary	Ranger/Field Supervisor	Halt recession of native vegetation as a result of weed invasion	On-ground works	High

	<b>Action</b>	<b>Responsibility</b>	<b>Performance Measure</b>	<b>Category</b>	<b>Priority</b>
7.21	Monitor off shore Islands for new weed incursions	Ranger	Offshore Islands included in weed monitoring sites	On-ground works	High

	Action	Responsibility	Performance Measure	Category	Priority
7.22	Control as appropriate new incursions of species declared W1 (or equivalent) on mainland	Ranger	All known incursions treated	On-ground works/ Monitoring	High
7.23	Control of Asparagus species in Northern Hills (Malabar, Curio Point, North Head and Dawsons Point)	Ranger/Field Supervisor	On ground works commenced, using a range of appropriate weed control techniques	On-ground works	Medium
7.24	Undertake appropriate planning for the eradication of key invasive weed species from the Island	Senior Ranger/ Ranger	Key species for eradication identified and eradication plans developed	Administration	Medium
7.25	Seek amendments to noxious weed listings as identified in section 3.3	Ranger	Noxious weed listing amended to reflect to status of weed species	Noxious weeds	Medium
7.26	Seek and implement new methods for weed control, where appropriate	Senior Ranger/ Ranger/Field Supervisor	Techniques for weed control are appropriate for species and situation	Research	Medium
7.27	Update weed maps	Ranger	Accurate weed distribution and density maps available	Monitoring	Low
7.28	Develop database of contacts for weed management	Ranger	Database of contacts developed and regularly updated	Administration	Low
7.29	Implement new methods of weed surveillance and recording ie. GPS/GIS	Ranger/Field Supervisor	GPS routinely used for recording weed incursions.	Monitoring	Low
7.30	Increase staff familiarity with GIS	Ranger	Number of staff exposed to GIS	Training & Education/ Monitoring	Low
7.31	Develop weed education program with LHI Central School staff	Senior Ranger	Number of weed related projects undertaken by school students	Training & Education	Low

# Statutory Obligation

## **7 References**

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## **8 Appendices**

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### **8.1 *Appendix 1 - Percentage Cover of Weed Species by Vegetation Association***

	Bitou Bush	Bridal Creeper	Cherry Guava	Climbing Asparagus	Pittosporum	Crofton Weed	Tiger Lily	Ochna	Ground Asparagus
Drypetes (३ॷॷha)	१ॷ	१।	१।	।	०	ॢ०	।१	१ॷ	ॢ०
Cleistocavlix (१ॢ०ha)	१	०	ॢ१	०	०	०	ॢॷ	ॷ१	ॢ
Lowland Mixed (११०ha)	।	१	ॢ१	।	१	ॢ०	१ॢ	ॷॢ	१ॷ
Poa/Cyperus (१^ha)	ॷ	१०	०	०	ॷ	१	१०	१	१।
Howea (ॷ०।ha)	०	१	१०	१	१०	१ॷ	ॢॢ	१	१०
Bubbia (ॷ०ha)	०	०	०	०	०	।	१०	०	०
Chionanthus (०ॷha)	०	०	ॢ	०	०	।१	०	ॢ	०
Pandanus (ॷ१ha)	ॢ	०	।ॷ	०	०	।१	०	ॷ१	०
Melaleuca (ॷ०ha)	ॷ	।	ॢ	१	०	ॢ१	१।	ॢ	१ॷ
Fitzgeraldii (।ॢha)	।	०	१	०	०	११	१ॷ	ॢ	०
Cliffs (११ॷha)	१	११	ॷ	१	०	ॢ।	१०	०	१
Dodonaea (१ha)	०	०	१०	०	०	ॷ०	ॢ	ॢ०	०
Beach (ॢ०ha)	ॢ०	१०	०	०	०	ॷॷ	०	०	१
Cassinia (०^ha)	११	१ॢ	१०	ॷ	१	।ॢ	१ॷ	ॷ	ॢ०
Swamp (ॷha)	०	ॷ	०	।	११	०	१	१	१ॷ
Hedescebe (।^ha)	०	०	ॷ	०	०	०१	११	०	०

**8.2 Appendix 2B Checklist of all known weeds as at July 2001**

(Hutton and Le Cussan:2001)

Family	Species	Common name	First record	Weed type	Location
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<b>DICOTYLEDONS</b>					
AMARANTHACEAE	<i>Amaranthus blitum</i>		1938		S
ANACARDIACEAE	<i>Harpephyllum caffrum</i>	African plum		Potential	SN
ANACARDIACEAE	<i>Toxicodendron succedaneum</i>	Rhus tree		Noxious LHI	S
APIACEAE	<i>Apium graveolens</i>	Celery	1936		S
APIACEAE	<i>Centella asiatica</i>		1962		S
APIACEAE	<i>Ciclospermum leptophyllum</i>	Slender Celery, Carrot weed	1971		S
APIACEAE	<i>Hydrocotyle bonariensis</i>	Beach Pennywort	1936		S
APIACEAE	<i>Torilis nodosa</i>		1962		SN
APOCYNACEAE	<i>Vinca major</i>	Periwinkle	1965	Weedy	S
ARALIACEAE	<i>Hedera helix</i>	English ivy		Weedy/Potential	S
ARALIACEAE	<i>Schefflera actinophylla</i>	Umbrella tree		Weedy/Potential	S
ARALIACEAE	<i>Tetrapanax papyrifer</i>	Rice paper plant	1965	Potential	S
ASCLEPIADACEAE	<i>Araujia hortum</i>	Moth plant	Not verified		
ASTERACEAE	<i>Ageratina adenophora</i>	Crofton weed	1970	Noxious LHI	SNM
ASTERACEAE	<i>Ageratum conyzoides</i>	Billy goat weed	1970		SNM
ASTERACEAE	<i>Aster subulatus</i>	Bushy starwort	1977		SM
ASTERACEAE	<i>Bidens pilosa</i>	Teasers	1896		SNM
ASTERACEAE	<i>Centaurea melitensis</i>	Maltese Cockspur	1938		S
ASTERACEAE	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou bush	1963	Noxious LHI	SNM
ASTERACEAE	<i>Cirsium vulgare</i>	Spear thistle	1962	Noxious Other States	SNM
ASTERACEAE	<i>Conyza bonariensis</i>	Cobblers peg, Flaxleaf Fleabane	1898		SNM
ASTERACEAE	<i>Conyza parva</i>		1977		S
ASTERACEAE	<i>Conyza sumatrensis</i>		1970		SN
ASTERACEAE	<i>Delairea odorata</i>	Cape Ivy	1962	Noxious NSW	S
ASTERACEAE	<i>Gaillardia x grandiflora</i>		1898		S
ASTERACEAE	<i>Galinsoga parviflora</i>	Potato weed	1920		SM

ASTERACEAE	<i>Gamochaeta purpurea</i>		1944		SNM
ASTERACEAE	<i>Hypochaeris radicata</i>	Cat's ear, Flatweed	1938		SNM
ASTERACEAE	<i>Lactuca saligna</i>	Wild lettuce, Willow-leaved lettuce	1971		SN
ASTERACEAE	<i>Leucanthemum x superbum</i>		1971		S
ASTERACEAE	<i>Onopordum acanthium</i>		Not verified		
ASTERACEAE	<i>Roldana petasitis</i>		1970	Potential	SN

ASTERACEAE	<i>Senecio elegans</i>	Purple groundsel	1917	Weedy	SN
ASTERACEAE	<i>Senecio vulgaris</i>	Common groundsel	1917		
ASTERACEAE	<i>Silybum marianum</i>	Variiegated thistle	1971		SN
ASTERACEAE	<i>Sonchus asper</i> subsp. <i>glaucescens</i>	Prickly Sowthistle	1962	S	
ASTERACEAE	<i>Sonchus megalocarpus</i>	Dune Thistle	1970		N
ASTERACEAE	<i>Sonchus oleraceus</i>	Common Sowthistle, Milk thistle	1869		SN
ASTERACEAE	<i>Taraxacum officinale</i>	Dandelion	1898		SNM
BASSELLACEAE	<i>Anredera cordifolia</i>	Madeira vine	1971	Noxious LHI	S
BRASSIACEAE	<i>Cakile edentula</i>	Sea rocket	1898		SN
BRASSIACEAE	<i>Capsella bursa-pastoris</i>	Medic, Shepherd's Purse	1870		SN
BRASSIACEAE	<i>Coronopus didymus</i>	Lesser swinecress, Swinecress	1870		SNM
BRASSIACEAE	<i>Lepidium africanum</i>		1971		SN
BRASSIACEAE	<i>Lepidium bonariense</i>	Peppergrass	1980		S
BRASSIACEAE	<i>Lobularia maritima</i>	Sweet Alyssum	1963		S
BRASSIACEAE	<i>Sisymbrium officinale</i>	Hedge Mustard	1920		S
CAESALPINIACEAE	<i>Caesalpinia major</i>		1936		
CAESALPINIACEAE	<i>Senna septemtrionalis</i>	Brazilian buttercup	1898	Potential	S
CAESALPINIACEAE	<i>Senna pendula</i> (?) var. <i>glabrata</i>		1971	Noxious NSW	SN
CAMPANULACEAE	<i>Pratia purpurascens</i>	White-root	1938		S
CARYOPHYLLACEA	<i>Arenaria serpyllifolia</i>	Sandwort	1962		S
CARYOPHYLLACEA	<i>Cerastium fontanum</i> subsp. <i>vulgare</i>		1898		S
CARYOPHYLLACEA	<i>Cerastium glomeratum</i>	Mouse eared chickweed	1898		S
CARYOPHYLLACEA	<i>Polycarpon tetraphyllum</i>	Four leaf Allseed	1898		SNM
CARYOPHYLLACEA	<i>Sagina apetala</i>	Pearlwort	1971		S
CARYOPHYLLACEA	<i>Silene gallica</i>	Catchfly	1937		S
CARYOPHYLLACEA	<i>Stellaria media</i>	Chickweed	1896		SNM
CASUARINACEAE	<i>Casuarina glauca</i>	Swamp sheoak	1988	Weedy/Potential	S
CHENOPODIACEAE	<i>Atriplex australasica</i>		1938		

CHENOPODIACEAE	Atriplex prostrata		1970		SN
CHENOPODIACEAE	Chenopodium murale	Nettle-leaf goosefoot	1898		SNM
CONVOLVULACEAE	Ipomoea alba		1869		S
CONVOLVULACEAE	Ipomoea cairica	Coastal Morning glory	1869	Noxious NSW	SNM
CONVOLVULACEAE	Ipomoea indica	Blue Morning glory		Noxious NSW	S
CRASSULACEAE	Bryophyllum pinnatum	Mother of millions	1962	Weedy	S

EUPHORBIACEAE	<i>Euphorbia cyathophora</i>	Painted Spurge	1962	Weedy/Potential	S
EUPHORBIACEAE	<i>Euphorbia paralias</i>	Sea Spurge	2001	Weedy/Potential	S
EUPHORBIACEAE	<i>Euphorbia peplus</i>	Petty Spurge	1965		SNM
EUPHORBIACEAE	<i>Euphorbia prostrata</i>		1971		S
EUPHORBIACEAE	<i>Euphorbia supina</i>		1938	Possibly extinct	
EUPHORBIACEAE	<i>Phyllanthus tenellus</i>	Hen and Chickens			
EUPHORBIACEAE	<i>Ricinus communis</i>	Castor oil plant	1870 1843	Noxious LHI	NS
FABACEAE	<i>Acacia saligna</i>	Golden wattle	Not verified		
FABACEAE	<i>Erythrina x sykesii</i>	Coral tree	1962	Weedy/Potential?	S
FABACEAE	<i>Lathyrus latifolius</i>	Sweet pea	1962	Weedy	N
FABACEAE	<i>Medicago lupulina</i>	Black medic	1971		S
FABACEAE	<i>Medicago polymorpha</i>	Burr medic	1898		S
FABACEAE	<i>Melilotus indicus</i>	King Island Melilot, Hexham Scent	1975		SNM
FABACEAE	<i>Trifolium dubium</i>	Clover, Yellow Suckling Clover			
FABACEAE	<i>Trifolium glomeratum</i>	Clustered clover	1962	Potential	SN
FABACEAE	<i>Trifolium repens</i>	White or Dutch clover	1962		S
FABACEAE	<i>Trifolium subterraneum</i>	Subterranean Clover	1962		S
FABACEAE	<i>Vicia sativa</i> subsp. <i>nigra</i>	Common Vetch	1898		SNM
FUMARIACEAE	<i>Fumaria bastardii</i>	Bastard's Fumitory	1971		
FUMARIACEAE	<i>Fumaria muralis</i>	Wall Fumitory	1962		S
GENTIANACEAE	<i>Centaurium tenuiflorum</i>	Centaury	1971		SNM
GERANIACEAE	<i>Geranium molle</i>		1971		S
GERANIACEAE	<i>Pelargonium australe</i>				SM
LAMIACEAE	<i>Lamium amplexicaule</i>	Dead nettle	1962		S
LAMIACEAE	<i>Mentha spicata</i>	Spearmint			S
LAMIACEAE	<i>Prunella vulgaris</i>	Self-heal	1962		S
LAMIACEAE	<i>Salvia coccinea</i>	Texas sage	1962		SN
LAMIACEAE	<i>Stachys arvensis</i>	Stagger weed	1920		S

LAURACEAE	<i>Cinnamomum camphora</i>	Camphor laurel	1898	Noxious NSW	S
LYTHRACEAE	<i>Lythrum hyssopifolia</i>		1962		SM
MALVACEAE	<i>Hibiscus mutabilis</i>	Hibiscus			S
MALVACEAE	<i>Malva parviflora</i>	Mallow	1936		SM
MALVACEAE	<i>Malvastrum coromandelianum</i>	Little Jack	1920		SN
MALVACEAE	<i>Modiola caroliniana</i>	Red flower mallow	1938		S

MALVACEAE	<i>Sida rhombifolia</i>	Paddy's lucerne, Common Sida, Big Jack	1936		S
MELIACEAE	<i>Melia azedarach</i> var. <i>australasica</i>	White cedar		Weedy/Potential	S
MELIANTHACEAE	<i>Melianthus major</i>		1988		S
MORACEAE	<i>Morus alba</i>	White Mulberry	1898		S
MYRTACEAE	<i>Eugenia uniflora</i>	Brazilian cherry		Weedy/Potential	S
MYRTACEAE	<i>Eucalyptus siderophloia</i>	Northern Grey ironbark		Potential	S
MYRTACEAE	<i>Psidium cattleianum</i>	Cherry guava	1898	Noxious LHI	SNM
MYRTACEAE	<i>Psidium guajava</i>	Yellow guava	1898	Weedy	SNM
NYCTAGINACEAE	<i>Bougainvillea glabra</i> Choisy	Bougainvillea			S
NYCTAGINACEAE	<i>Mirabilis jalapa</i>	Four o'clock, Marvel of Peru	1898		
OCHNACEAE	<i>Ochna serrulata</i>	Mickey Mouse Plant	1984	Noxious LHI	SM
OLEACEAE	<i>Ligustrum lucidum</i>	Large leaved Privet	1898	Noxious NSW	
OLEACEAE	<i>Ligustrum sinense</i>	Small leaved Privet	1970	Noxious NSW	SN
OLEACEAE	<i>Olea europaea</i>	Olive	Not	Noxious NSW	
ONAGRACEAE	<i>Oenothera drummondii</i>	Evening Primrose	1970		SM
ONAGRACEAE	<i>Oenothera stricta</i> subsp. <i>stricta</i>				
OXALIDACEAE	<i>Oxalis debilis</i>	Large-leaved Wood Sorrel	1962		SN
PAPAVERACEAE	<i>Papaver rhoeas</i>		1962		S
PAPAVERACEAE	<i>Papaver somniferum</i>	Opium poppy	1962		
PASSIFLORACEAE	<i>Passiflora edulis</i>	Black passionfruit	1898	Weedy	SM
PITTIOSPORACEAE	<i>Pittosporum undulatum</i>	Sweet pittosporum, Snowdrop tree (Maiden sent from Roy. Bot. Gardens)	1898	Noxious LHI	SN
PLANTAGINACEAE	<i>Plantago lanceolata</i>	Ribwort, Rib-grass, Lamb's Tongue or Plantain	1962		SNM
PLANTAGINACEAE	<i>Plantago major</i>	Large Plantain	1970		SNM
POLYGONACEAE	<i>Rumex brownii</i>	Swamp dock	1898		S
POLYGONACEAE	<i>Rumex crispus</i>	Curled dock	1898		S
PORTULACACEAE	<i>Portulaca oleracea</i>	Portulaca	1975		S

PRIMULACEAE	Anagallis arvensis	Pimpenell, Pimpernel	1914		SNM
PROTEACEAE	Grevillea robusta	Silky oak	1898	Weedy	SN
PUNICACEAE	Punica granatum	Pomegranate	1898		SN
RANUNCULACEAE	Ranunculus parviflorus		1962		S
RANUNCULACEAE	Ranunculus sessiliflorus		1971		
ROSACEAE	Cotoneaster glaucophyllus	Cotoneaster	1971	Noxious NSW	SN

ROSACEAE	Duchesnea indica	Wild strawberry	1971		SNM
ROSACEAE	Eriobotrya japonica	Loquat	1971		S
ROSACEAE	Prunus persica	Peach			SNM
RUBIACEAE	Coffea arabica	Coffee	1882	Weedy/Potential	SN
RUBIACEAE	Richardia stellaris		1991		SN
RUBIACEAE	Sherardia avensis		1975		S
RUTACEAE	Citrus jambhiri	Bush lemon	1882	Weedy/Potential	SNM
SCROPHULARIACEAE	Verbascum virgatum	Mullein, Twiggly Mullein	1938		S
SCROPHULARIACEAE	Veronica arvensis	Wall speedwell	1962		S
SCROPHULARIACEAE	Veronica persica		1962		S
SOLANACEAE	Cestrum nocturnum	Lady of the night	2001	Potential	S
SOLANACEAE	Datura stramonium	Thornapple, Jimson Weed	1920		S
SOLANACEAE	Lycium ferocissimum	African boxthorn	1962	Noxious LHI	SN
SOLANACEAE	Nicotiana tabacum	Tobacco	1898		S
SOLANACEAE	Petunia x hybrida	Petunia	1971		S
SOLANACEAE	Physalis ixocarpa		1980		
SOLANACEAE	Physalis peruviana	Cape gooseberry	1870	Weedy	SNM
SOLANACEAE	Solanandra maxima		2000	Potential	S
SOLANACEAE	Solanum americanum subsp. nutans	Black currant	1963	Weedy	SN
SOLANACEAE	Solanum mauritianum	Tree tobacco, Wild tobacco	1854	Weedy	SNM
SOLANACEAE	Solanum nigrum	Nightshade	1898	Weedy	SNM
STERCULIACEAE	Brachychiton acerifolius	Flame tree	1971		S
TROPAEOLACEAE	Tropaeolum majus	Nasturtium	1971		S
URTICACEAE	Urtica urens	Stinging nettle	1936		S (extinct?)
VALERIANACEAE	Centranthus ruber		1971	Weedy	S
VERBENACEAE	Lantana camara	Lantana	1971	Noxious LHI	SM
VERBENACEAE	Verbena basiliensis	Purple top, Gin Case	1870		SNM
WINTERACEAE	Alternanthera bettzichiana				

MONOCOYTTLEDONS					
AGAVACEAE	Agave americana	Aloe, Century Plant	1988	Weedy	S
AGAVACEAE	Furcraea foetida		1988		S
AGAVACEAE	Sansevieria irifasciata	Mother in law's tongue	1988	Weedy/Potential	S
ALOACEAE	Aloe ciliaris	Aloe	1843		S
ALOACEAE	Aloe maculata	Aloe	1843		S

ARACEAE	Zantedeschia aethiopica	Arum lily		Weedy/Potential	SN
ARACEAE	Colocasia esculenta	Taro	1898		S
ASPARAGACEAE	Asparagus asparagoides	Bridal creeper	1962	Noxious on LHI	SN
ASPARAGACEAE	Asparagus aethiopicus	Ground asparagus	1930=s	Noxious on LHI	SNM
ASPARAGACEAE	Asparagus plumosus	Climbing asparagus	1930=s	Noxious on LHI	SN
CANNACEAE	Canna x generalis		1974		S
COMMELINACEAE	Callisia		1988		S
COMMELINACEAE	Tradescantia fluminensis	Wandering Jew	1970		S
COMMELINACEAE	Tradescantia spathacea		1988		S
COMMELINACEAE	Tradescantia zebrina	Striped Wandering Jew	1970	Weedy	S
CYPERACEAE	Cyperus eragrostis	Umbrella sedge	1970		S
CYPERACEAE	Cyperus involucratus		1970		S
CYPERACEAE	Cyperus rotundus	Nut grass	1898	Noxious Other States	S
CYPERACEAE	Kyllinga brevifolia		1962		SNM
CYPERACEAE	Pycnus polystachyos		1962		S
IRIDACEAE	Crococsmia x crocosmiiflora		1988		S
IRIDACEAE	Gladiolus x hortulanus		1988		S
IRIDACEAE	Romulea rosea var. australis	Onion grass, Guildford grass	1963		SN
IRIDACEAE	Sisyrinchium micranthum	Scour weed, Yellow Rush lily	1971		SN
JUNCACEAE	Juncus aridicola		1971		S
JUNCACEAE	Juncus bufonius		1947		S
JUNCACEAE	Juncus pallidus		1963		S
LILIACEAE	Agapanthus praecox subsp. orientalis	Agapanthus	1962		S
LILIACEAE	Alstroemeria pulchella	Christmas lily	1970	Weedy	SN
LILIACEAE	Aspidistra elatior				S
LILIACEAE	Chlorophytum comosum	Spider plant		Weedy/Potential	S
LILIACEAE	Gloriosa superba	Glory lily	1988	Noxious LHI	S
LILIACEAE	Hippeastrum puniceum		1980		SM

LILIACEAE	<i>Lilium formosanum</i>	Formosan lily, Tiger lily	1970	Noxious LHI	NM
LILIACEAE	<i>Narcissus tazetta</i>		1980		S
LILIACEAE	<i>Nothoscordum borbonicum</i>	Wild onion	1898		NS
POACEAE	<i>Agrostis gigantea</i>	Red top bent	1947		SNM
POACEAE	<i>Arundinaria simonii</i>	Bamboo	1921	Noxious LHI	SN
POACEAE	<i>Avena barbata</i>	Beared oat	1898		S

POACEAE	<i>Avena byzantina</i>		1948		S
POACEAE	<i>Axonopus compressus</i>	Broad leaf carpet grass	1971		SNM
POACEAE	<i>Briza maxima</i>	Giant Shivery grass, Quaking grass	1963		SN
POACEAE	<i>Briza minor</i>	Small Shivery grass, Quaking grass	1878		SN
POACEAE	<i>Bromus catharticus</i>	Prairie grass	1898		SN
POACEAE	<i>Bromus diandrus</i>	Great Brome	1963		SN
POACEAE	<i>Bromus hordeaceus</i>		1962		S
POACEAE	<i>Catapodium rigidum</i>	Rigid fescue	1963		SN
POACEAE	<i>Chloris gayana</i>	Rhodes grass	1947		SN
POACEAE	<i>Chloris truncata</i>		1962		SN
POACEAE	<i>Cortaderia selloana</i>	Pink Pampas Grass		Noxious NSW	SN
POACEAE	<i>Cynodon dactylon</i>	Couch	1870		SN
POACEAE	<i>Dactylis glomerata</i>	Cocksfoot	1898		SN
POACEAE	<i>Digitaria ciliaris</i>	Summer grass	1947		SNM
POACEAE	<i>Digitaria sanguinalis</i>	Summer grass, Crab grass	1874		SNM
POACEAE	<i>Digitaria violescens</i>		1971		S
POACEAE	<i>Echinochloa crusgalli</i>	Barnyard grass	1962		S
POACEAE	<i>Ehrharta erecta</i>		2000		SN
POACEAE	<i>Eleusine indica</i>	Crowsfoot grass, Crab grass	1947		S
POACEAE	<i>Elymus scaber</i>		1971		S
POACEAE	<i>Eragrostis cilianensis</i>	Stink grass	1947		S
POACEAE	<i>Hordeum murinum</i> subsp. <i>glaucum</i>	Hedgehog grass	1962		S
POACEAE	<i>Hordeum murinum</i> subsp. <i>leporinum</i>	Barley grass	1947		S
POACEAE	<i>Imperata cylindrica</i> var. <i>major</i>	Bladey grass	1898		S
POACEAE	<i>Lagurus ovatus</i>	Harestail grass	1975		S
POACEAE	<i>Lepturus repens</i>		1975		M
POACEAE	<i>Lolium perenne</i>	Rye Grass	2000		N

POACEAE	Lolium rigidum var. rigidum	Rigid rye grass	1937		S
POACEAE	Lolium rigidum var. Rottboellioides		1962		SN
POACEAE	Melinis minutiflora		1978		SM
POACEAE	Paspalum dilatatum	Paspalum	1890		SNM
POACEAE	Paspalum sp	Paspalum	2001		SNM
POACEAE	Pennisetum clandestinum	Kikuyu grass	1947	Weedy	SNM

POACEAE	<i>Pennisetum purpureum</i>	Elephant grass, Napier fodder	Not verified	Noxious NSW	
POACEAE	<i>Phalaris aquatica</i>	Phalaris	1970		SN
POACEAE	<i>Phalaris canariensis</i>	Canary grass	1948		S
POACEAE	<i>Phylostachys</i> spp.	Rhizomatous bamboo	Not verified	Noxious LHI	
POACEAE	<i>Poa annua</i>	Winter grass	1878		S
POACEAE	<i>Poa pratensis</i>		1962		S
POACEAE	<i>Polypogon monspeliensis</i>	Annual beard grass	1873		SM
POACEAE	<i>Rostraria cristata</i>	Annual catstail	1937		SN
POACEAE	<i>Rottboellia coelorachis</i>		1911		S
POACEAE	<i>Setaria gracilis</i>		2000		S
POACEAE	<i>Setaria palmifolia</i>	Palm grass, Pampas	1947	Weedy	SNM
POACEAE	<i>Setaria verticillata</i>	Whorled pigeon grass	1947		SNM
POACEAE	<i>Sporobolus africanus</i>	Parramatta grass, Rat's tail, Tufty grass	1870		SNM
POACEAE	<i>Stenotaphrum secundatum</i>	Buffalo grass	1898	Weedy	S
POACEAE	<i>Stipa ramosissima</i>	Bamboo grass	1970		S
POACEAE	<i>Vulpia bromoides</i>	Rat's or Squirrel's tail fescue, Silver grass	1962		SN
PINOPHYTA					
ARAUCARIACEAE	<i>Araucaria heterophylla</i>	Norfolk Island Pine		Potential	SN
PTERIDOPHYTA					
DRYOPTERIDACEAE	<i>Phanerophlebia falcata</i>	Holly fern		Potential/Weedy	SN

**Notes on Abbreviations used in above table.**

**S = Settled area, N = Northern hills, M = southern mountains**

**Noxious LHI = Declared Noxious in LHI district**

**Noxious NSW = Declared Noxious in other districts of NSW**

**Noxious Other States = Declared Noxious in Other States of**

**Weedy = Known weeds in other areas of similar habitats, eg. Northern NSW**

**Potential = plants with potential to become weedy on**

**Not verified = allegedly recorded, but not verified by herbarium specimens and not recorded by the authors**

## 8.3 Appendix 3 B Weed Removal and Control Techniques<sup>7</sup>

### 8.3.1 Chemical Control Techniques

#### Cut and paint

This technique is useful for all small to medium sized woody weeds and soft leafy perennials.

- \_ For large plants, remove the top of the plant to provide safe access
- \_ With an appropriate tool (secateurs, loppers or bush-saw) cut the base of the plant close to the ground with a straight, flat cut. The cut must be horizontal so that the herbicide rests on the cut area whilst being absorbed, rather than running down the side of the stem. If the plant forks or has suckers, all stems must be treated.
- \_ The cut should be as close as possible to the ground as stumps may be dangerous.

Apply herbicide immediately to the growing parts of the stem using a dropper bottle. In smaller plants the whole cross-section of the stem can be treated, but larger trees only require the herbicide to be applied to the outer layers of the stem as it is these which are actively growing.

#### Cut, scrape and paint

This technique can be used on vines. This technique has been used successfully on Lord Howe Island for Climbing Asparagus control.

- \_ Scrape sides lightly to reveal green tissues and apply the herbicide to the scraped area
- \_ Cut plant above scrape with a flat straight cut and apply herbicide

#### Stem injection

This method applies to all woody trees and shrubs with a diameter of about 6-10 centimetres or greater and is used in areas where removal of waste is not feasible and for the treatment of larger trees.

- \_ Using a cordless drill, drill holes into the sapwood at regular intervals
- \_ Apply herbicide immediately into the cut using a tree injecting gun. Ensure that the correct dose of herbicide is applied, this may require waiting until the liquid has been absorbed and refilling the holes.
- \_ Repeat this procedure in a brickwork pattern around the circumference of the tree, as close to the ground as possible
- \_ For multi-stemmed plants inject the lowest branch or treat each stem individually. There must be no actively growing sections below the treated area.

#### Frilling or chipping

This technique is very similar to stem injection, and is used when a drill is not available.

- \_ Using a sharp chisel or axe, make a deep cut into the sapwood at regular intervals around the base of a tree. **DO NOT RINGBARK THE TREE.**
- \_ Apply herbicide immediately into the cut using a tree injecting gun. Ensure that the correct dose of herbicide is applied, this may require waiting until the liquid has been absorbed and refilling the holes.

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<sup>7</sup> National Trust of Australia (1991)

- Repeat this procedure in a brickwork pattern around the circumference of the tree, as close to the ground as possible
- For multi-stemmed plants inject the lowest branch or treat each stem individually. There must be no actively growing sections below the treated area.

### **Folia spraying**

This method is used for the application of herbicide to the leaves of plants, the herbicide is then transported via the plants fluid transport systems. 15L backpack sprayers are used, but usually only filled to 10L in the interest of occupational safety. Dye markers are always used.

- \_ Folia spraying should only be conducted when there is no threat of rain within 4 hours of the herbicide application (preferably longer). Nor should it be undertaken when wind speeds will result in spray drift.
- \_ Ensure that the spraypack is clean. Add the carefully measured herbicide to the pack and add approximately 2 L of water.
- \_ Mix the contents of the pack and then make up to the 10L. This prevents excessive foaming and ensures that the herbicide is fully mixed.
- \_ Wearing appropriate personal protective equipment, spray the leaves of the target weed until they just begin to drip.
- \_ In situations where climbing plants are too high to spray using this method the plants should be cut back and the regrowth sprayed.
- \_ All equipment should be triple rinsed and the rinsate disposed of appropriately.

### **Basal spray**

Basal spraying is used for plants which are too tall for folia spray techniques. This technique is similar to injection and frilling as the plant dies in situ.

- \_ Basal spraying should only be conducted when there is no threat of rain within 4 hours of the herbicide application (preferably longer). Nor should it be undertaken when wind speeds will result in spray drift.
- \_ Ensure that the spraypack is clean. Add the carefully measured herbicide to the pack and add approximately 2 L of water.
- \_ Mix the contents of the pack and then make up to the 10L. This prevents excessive foaming and ensures that the herbicide is fully mixed.
- \_ Wearing appropriate personal protective equipment, spray the stem of the plant from the ground to a height of approximately 1m around the entire diameter of the stem.
- \_ All equipment should be triple rinsed and the rinsate disposed of appropriately.

## **8.3.2 Manual Removal Techniques**

### **Hand removal of entire plant**

This technique can be used for small soft weeds, seedlings and some shallow rooted grasses

- \_ Grasp the leaves or stems of the plant and pull out ensuring that the entire plant is removed. If the plant breaks at a higher point the plant may re-shoot
- \_ If the plant has lateral roots these will need to be removed by pulling roots horizontally through the soil through the soil
- \_ Replace any disturbed soil and replace any mulch back over the spot
- \_ Small fleshy plants can be left in on site, be careful to ensure that the roots do not contact with the soil as they may take root again

### **Crowning**

This method is used on plants which have their growing points below the ground.

- \_ Grasp the leaves/stems and hold them tightly so that the base of the plant is visible

- Insert the knife close to the base of the plant at a slight angle towards the roots Ensure that the knife is below all of the underground reproductive structures
- Cut through the roots close to the base, larger plants may need two or three cuts to totally sever the roots
- Remove the plant and ensure that all of the reproductive structures have been removed

## Biological Control

Biological control involves the introduction of a biological agent (eg. Rust, insect, gall wasp) into the environment. The agents released are usually those which are present in the natural range of the weed species, but not in the area where it has become a problem. The impacts upon non-target species is a key concern which requires investigation prior to the release of any such agent. The use of biological control agents on Lord Howe Island is currently being investigated.

**IT SHOULD BE NOTED THAT SOME OF THE ABOVE APPLICATIONS MAY REQUIRE THE ISSUE OF A PERMIT FROM THE NATIONAL REGISTRATION AUTHORITY, CANBERRA.**

#### **8.4 Appendix 2 B Notes on Supervision and Documentation**

#### **8.4.1 Supervision<sup>8</sup>**

The regeneration team supervisor is responsible for

- day to day supervision of staff in the field
- developing site work programs within the context of this plan
- record keeping
- monitoring of project progress
- training new employees and volunteers
- liaison with management
- equipment maintenance
- OH&S (self, staff & public)
- researching and implementing up-to-date treatment techniques

#### **8.4.2 Documentation**

The following form should be completed for all activities recommended in this plan. This record keeping procedure will take only approximately 5 minutes per day, but will provide valuable information about the activities being undertaken and enable proper scheduling of follow up works. This form will be completed for activities undertaken by both LHIB staff and volunteer groups.

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<sup>8</sup> Joseph 1998:60

# Lord Howe Island Board

## Environmental Section

### Weed Control Activities Daily Report Sheet

1. Date and hours	2. Location
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3. Weather		4. Zone (from plan)	
5. Treatment Method (including Herbicide mixes )		6. Weeds Treated	
8. Accidents / near misses		9. Weed Density	
10. Staff			
12. Total Person Hours			
13. Other observations			

Signed YYYYYYYYYYYYYYYYYYYY.. Date YYYYYYYYYYYY