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Corpus Christi Primary School
The Northern Road, Cranebrook

Proposed Residential Development

Vegetation Management Plan

22 October 2013

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Proposed Residential Development

Vegetation Management Plan

22 October 2013

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CORPUS CHRISTI PRIMARY SCHOOL
THE NORTHERN ROAD, CRANEBROOK
PROPOSED RESIDENTIAL DEVELOPMENT

VEGETATION MANAGEMENT PLAN

22 October 2013

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The NORTHERN ROAD, CRANEBROOK
PROPOSED RESIDENTIAL DEVELOPMENT

VEGETATION MANAGEMENT PLAN

22 October 2013

PART A INTRODUCTION

1 INTRODUCTION

1.1 Background

The subject site for the purposes of this *Vegetation Management Plan* (VMP) is the existing Corpus Christi Primary School and adjacent vacant land, which is known formally as Lot 1 in DP 1144668 The Northern Road, Cranebrook (Figure 1). The subject site is on the eastern edge of the Cranebrook urban area in the northwestern Sydney metropolitian area, and is within the Penrith Council LGA.

A *Development Application* (DA) for a residential subdivision of the subject site, involving the retention of vegetation and threatened plants along the northern boundary, is currently in the process of being determined. The following *Vegetation Management Plan* (VMP) has been written as additional information to accompany the DA for the proposed residential subdivision (Figure 2).

The area to be the subject of the *Vegetation Management Plan* (VMP) is the corridor of vegetation located at the rear of proposed Lots 1 to 7, along the northern boundary of the subdivision area at Cranebrook (Figure 2). This area, for the basis of this document, will be referred to as the *Vegetation Management Area* (VMA) and is to be rehabilitated as native woodland.

This VMP also addresses:

- the translocation of threatened plants from the southern portion of the subject site;
- the retention and protection of a small patch of threatened plants in the northwestern corner of the subject site; and
- the salvage and re-use of plant materials from the portion of the site to be developed.

Detailed investigations of the subject site have been undertaken, and are documented in the accompanying *Flora & Fauna Assessment Report* (SLR Ecology 2012).

The VMA is already substantially vegetated, and despite some impact from surrounding land-use (such as the presence of rubbish and weeds and some areas of bare soil) a fairly good condition native woodland component (including a small population of threatened plants) remains.

The native woodland contains:

- flora species which are typical of the Cooks River Castlereagh Ironbark Forest (CRCIF) - an "*endangered ecological community*" (EEC) listed in the *Threatened Species Conservation Act 1995* (TSC Act);

- specimens of *Dillwynia tenuifolia* – a "*threatened species*" of plant listed as "*endangered*" in the TSC Act;
- specimens of the Juniper-leaved Grevillea *Grevillea juniperina* – a "*threatened species*" of plant listed as "*vulnerable*" in the TSC Act; and
- provides some potential habitat (though not very suitable) for the Cumberland Plain Land Snail (CPLS) – which is listed as "*vulnerable*" in the TSC Act.

1.2 The Project Team

The following parties would be required to fulfill the roles involved for the implementation of the VMP:

- a *Project Ecologist* (PE) - with suitable qualifications to monitor the success of the project;
- a *Bush Regeneration Contractor* (BRC) - to implement the bush regeneration activities of the VMP; and
- a *Construction Team* (CT) - to erect protection fencing.

The VMP is to be initiated on release of the *Subdivision Certificate* by Council and prior to any clearing or works within the development area. Implementation of the approved VMP, as a condition of future development, will guarantee the successful implementation of the VMP by the proponent.

2 SCOPE & AIMS of this VMP

This *Vegetation Management Plan* (VMP) has been prepared in response to a request for additional information provided by Penrith City Council to support the *Development Application* (DA) for the subdivision and rehabilitation of the subject site.

The objectives of this VMP are:

- to guide the clearing and protection measures associated with the proposed subdivision of the subject site;
- to guide the management, protection and maintenance of the *Vegetation Management Area* on the subject site;
- to assist in the implementation of appropriate enhancement measures within areas of retained native vegetation along the northern boundary of the subject site;
- to facilitate the management of the *Vegetation Management Area* to maintain biodiversity conservation values; and
- to facilitate the maintenance and enhancement of habitat for native fauna.

The specific aims of this VMP include:

- protection of vegetation within the VMA during construction activities;
- a significant reduction in the projected foliage cover of weeds within the entire *Vegetation Management Area*;

- the promotion of native regeneration through the *Vegetation Management Area*; and
- the generation of native vegetation which has low maintenance costs in the long-term.

The VMP will be implemented by a *Bush Regeneration Contractor* (BRC) and monitored by a qualified *Project Ecologist* (PE) for 2.5 years following completion of the initial VMP activities (see Chapter 7).

This *Vegetation Management Plan* (VMP) provides for the establishment and maintenance of an area of predominantly CRCIF vegetation near the northern boundary of the subject site (Figure 2). The *Vegetation Management Area* at the rear of proposed Lots 1 to 7 is to be retained and regeneration works are to be conducted to restore the degraded understory to a natural structure and species composition (of the CRCIF EEC).

3 SITE DESCRIPTION and VEGETATION

The subject site comprises Lot 1 in DP 1144668 which is located on the northeastern outskirts of the town of Cranebrook in the outer Sydney Metropolitan area. The site is relatively flat with a gentle west-facing slope towards the school.

The western portion of the site is occupied by the Corpus Christi Primary School, including carparking, buildings, paved and grassed areas. The eastern portion of the site which is proposed for residential subdivision and rehabilitation was previously the temporary location of the Xavier College. This area is now characterised by a cleared open area of exotic lawn grasses, with a narrow band of native vegetation along its peripheries – which is slightly more substantial along the northern boundary.

The vegetation and scattered trees in the eastern part of the subject site are dominated by a canopy of Broad-leaved Ironbark, with a mid-storey of *Melaleuca decora*. Other tree species include Rough-barked Apple (in the road reserve), Forest Oak, Green Wattle and Prickly-leaved Paperbark (Appendix A). The understory generally comprises scattered specimens of *Dillywnia sieberi*, Blackthorn, Gorse Bitter Pea, Berry Saltbush and Dogwood.

The groundcover is relatively sparse, with a substantial amount of leaf litter accumulation beneath the canopy of Ironbarks. Native groundcover specimens are scattered or present only in small patches and included herbs (such as Kidney Weed, Slender Tick-trefoil and White Root), grasses (such as Wiregrass, Wiry Panic and Weeping Grass) and other graminoids (such as Spiny-headed Mat-Rush, *Lomandra filiformis* and *Lepidosperma laterale*).

There is substantial weed invasion and other disturbance within the vegetation on the site, including:

- exotic garden escapes, particularly along the northern fenceline (abutting adjoining residents);
- exotic invasive grasses (mainly African Lovegrass), particularly along the northern boundary and surrounding areas of threatened plants; and
- rubbish and waste including old garden pots and fencing around the threatened plants in the northwestern corner of the VMA.

There are 39 specimens of *Dillwynia tenuifolia* along the northern boundary of the subject site at Cranebrook. This species is listed as "*endangered*" in the *Threatened Species Conservation Act 1995*

(TSC Act). All specimens are within the VMA and the proposed detention basin and are to be retained and protected.

There are 50 specimens of Juniper-leaved Grevillea *Grevillea juniperina* within the subject site and the adjoining road reserve (of The Northern Road) at Cranebrook. This species is listed as "*vulnerable*" in the TSC Act. A large portion of the specimens on the site will be retained within the proposed VMA and the adjoining bio-retention swale in the northwest of the site. A few specimens in the southeast of the site (approximately 6 specimens) will be re-located (via cuttings) to the VMA. In addition any saplings which are small enough can be directly transplanted to the VMA.

4 MANAGEMENT APPROACH and ACTIVITIES

4.1 Approach and Initiation

The activities identified in the *Vegetation Management Plan* (VMP) are to be initiated on release of the *Subdivision Certificate* by Council, and prior to any clearing or construction works within the approved development area.

Given the presence of existing moderately good condition native woodland vegetation, minimal rehabilitation efforts, such as weeding and small scale re-planting, are required. The rehabilitation program will not involve major earthworks, soil remediation or large-scale replanting. Works within the *Vegetation Management Area* (VMA) at Cranebrook will predominantly involve low-intensity and passive rehabilitation and maintenance activities, designed to minimise the potential for adverse impacts to offset any indirect impacts associated with the proposed development.

The boundary between the VMA and the development area is to be fenced at the initiation of the VMP activities using link-mesh fencing and silt fencing. In addition, appropriate signage will be provided around the *Vegetation Management Area* - to inform people of the relevance of the bushland and of the rehabilitation program, and to encourage passive surveillance of the VMA.

Specific activities to be undertaken in the *Vegetation Management Area* include:

- *Rubbish removal* - in particular the fencing material, garden waste and stockpiling in the northwestern corner of the VMA would need to be removed.
- *Excavation and soil remediation* - there may be some small areas of exotic lawn requiring excavation (small scale soil turning by hand) and top-soil remediation, prior to re-planting.
- *Weed removal and maintenance* - a dedicated initial weed removal and monitoring program is required (in particular to control the garden escapes and African Lovegrass) followed by an ongoing weed maintenance program.
- *Replanting* - it is likely that following removal of rubbish, weeds and areas of lawn some re-planting would be required involving canopy, shrub and groundcover species obtained from the development portions of the site and/or propagated from seed sourced from the site or from a source of local provenance plants;
- *Salvage* - the salvage of plants and other natural materials during the clearing of the development areas is to be undertaken to support re-planting efforts in the VMA.
- *Translocation* - the translocation of Juniper-leaved Grevillea from the southern portion of the subject site (which is to be cleared and developed);
- *Threatened species management* – the population of threatened plants in the VMA and adjoining bio-retention swale need to be monitored and protected during any construction activities and throughout the implementation of the VMP.
- *Monitoring* - a monitoring program is to be implemented to identify any problems which may arise and to monitor the ongoing condition of vegetation in the VMA.
- *Access* – the VMA is to be fenced, with access during the VMP activities from Cassar Crescent and future access by residents at the rear of the lots.

4.2 Weed Suppression and Control

Flora surveys conducted on the subject site have identified 19 weed species, consisting of a variety of woody and herbaceous weeds (Appendix A). A variety of techniques will be used to suppress and control weeds within the *Vegetation Management Area* (Appendix C), including:

- cut-and-paint, stem scraping, stem injection, and frilling and chipping for woody weeds;
- hand removal and crowing for herbaceous weeds; and
- chemical control where appropriate.

As indicated above, a predominantly low intensity approach is to be employed, and the over-riding principles of the Bradley method of bush regeneration will be applied. Weed removal techniques are detailed in Appendix C.

Table 1 Noxious Weed species on the subject site at Cranebrook

Common name	**Class**
Bridal Creeper, Prickly Pear	4
Mother-of-millions	3

4.3 Plant Propagation and Revegetation

Given the level of natural regeneration already present within the *Vegetation Management Area* and/or that is likely to occur once weeds are removed from some areas, it is considered unlikely that intensive replanting works would be required over the whole or even most of the *Vegetation Management Area*. Nevertheless, in the event that areas (particularly where exotic vegetation is removed and where rubbish and other materials are removed) do not display satisfactory natural regeneration within 12 months of initiation of the VMP, then replanting works should be undertaken.

In preparation for any potential planting works, local provenance plant propagules should be collected from within the proposed development area at the initiation of the VMP by the *Bush Regeneration Contractor* (BRC), as detailed in Chapter 5. This includes the collection of cuttings and seeds of the *Grevillea juniperina* specimens in the southeastern corner. In addition, native seedlings from within this area could be transplanted into areas requiring assisted regeneration.

Native species selected for the compensatory plantings should be sourced from the Species List (Appendix A), based on availability of local provenance stock, at the discretion of the BRC. In addition local provenance specimens of species listed in the *Final Determination* for CRCIF (Appendix B) may be sourced.

Other sources of propagules for the planting program would include commercial nurseries that maintain local provenance stock and/or bush regenerators that also maintain local provenance stock for this locality.

Any supplementary planting which is required within the *Vegetation Management Area* will be targeted - based on locations within the *Vegetation Management Area*. The appropriate species will be determined by the BRC based on site circumstances.

It is indicated in Chapter 8 of this VMP that the target for weed species across the *Vegetation Management Area* at the end of implementation of the VMP is that the *Projected Foliage Cover* (PFC) of weed species be 5% or less. Setting targets of absolute numbers of native plants within the *Vegetation Management Area* is not regarded as realistic or appropriate. However, the following goals or targets are to be pursued (these are average numbers):

- 1 semi-mature to mature canopy tree per $16m^2$;
- 1 shrub per $4m^2$; and
- 4 groundcover species per $1m^2$.

In addition, the targets for native plants proposed within the *Vegetation Management Area* are:

- a minimum of 35 native species across the *Vegetation Management Area*; and
- 95% of plant species (both by densities and by species numbers) to be native species.

The native plant species to be used in the rehabilitation program will be selected from the lists provided in Appendices A and B, depending on availability. The BRC will determine the appropriate species to be used, based on natural regeneration on the subject site, and the availability and suitability of other stock.

Target densities for native plants in the various strata are indicated below (Table 2). These targets are to be used:

- for monitoring natural regeneration within the *Vegetation Management Area*; and
- to determine planting densities in areas where active plantings are required.

Table 2 Average plant density and diversity in each stratum within the *Vegetation Management Area*

Layer	**Density**	**Diversity**
Canopy	One canopy tree/$16m^2$	3 species
Mid-storey	One plant/$6m^2$ in clumps	4 species
Shrub layer	One plant/$4m^2$	8 species
Groundcover	Four plants/m^2	16 species

4.4 Permanent Fencing and Protection Measures

As noted above, the entire perimeter of the *Vegetation Management Area* is to be fenced at initiation of the VMP activities (Figure 2), signage and temporary sediment-capturing mesh at the base. The sediment fences are to be removed at the completion of construction activities to allow movement of the Cumberland Plain Land Snail. There are to be no other fences through the VMA.

The Bio-retention lot in the northwestern corner of the site is to be permanently fenced in a similar fashion, which will allow the protection of the additional threatened plants in this area. An internal fence and sediment trap to protect the threatened plants would be required during construction of the bio-retention structure.

Within the *Vegetation Management Area*, planted trees and shrubs are to be protected using plastic 'grow tubes' - to protect the plants from the elements during their establishment period, and to prevent any grazing from rabbits (if present), kangaroos and wallabies.

5 IMPLEMENTATION of the VMP

5.1 Initiation of the VMP

The following activities are to be implemented on the release of the *Subdivision Certificate* by Council.

The *Project Ecologist* (PE) is to:

- collect baseline monitoring data, involving photo-monitoring points and vegetation quadrats, within the *Vegetation Management Area* on the subject site;
- perform a search of the development area following rain (in warm weather), and re-locate any detected Cumberland Plain Land Snails and any natural habitat (*ie* any fallen logs or debris) to suitable locations within the *Vegetation Management Area*;
- remove rubbish and refuse from within the *Vegetation Management Area* and, in the event that any Snails are detected, re-locate those specimens into suitable habitat in the *Vegetation Management Area*;
- undertake monitoring inspections of the site to ensure activities have been satisfactorily completed; and
- prepare an *Initial Site Report* detailing site conditions at the initiation of the VMP.

The PE will also perform a site induction (in consultation with the Project Manager) for site workers, once subdivision works commence, including informing workers of the protected vegetation and their responsibilities to protect the vegetation.

The *Bush Regeneration Contractor* (BRC) is to:

- collect native plant material (in particular from the development area and including all specimens of *Grevillea juniperina* in the southeastern corner of the site) and store that material for re-use in the *Vegetation Management Area*;

- collect seeds and other propagules, and grow native seedlings, for supplementary planting works (in particular of the *Grevillea juniperina*);
- identify appropriate commercial nurseries from which to obtain local provenance seedlings, if necessary; and
- provide a detailed costing for implementation of the VMP.

The *Construction Team* (CT) is to:

- fence the *Vegetation Management Area* as detailed in Chapter 4.4 and Figure 2; and
- erect permanent signage (*eg* Conservation Area - Keep out) around the VMA.

5.2 Immediately After Initiation

The BRC is to:

- implement an intensive weed removal program, involving the extensive removal of any large woody weeds, herbs and grasses within the *Vegetation Management Area*;
- prepare areas of bare soil, exotic lawn and highly disturbed portions of the site for replanting, where deemed necessary; and
- plant prepared areas with stored propagules collected from the development area or other local provenance specimens, as necessary.

The PE is to:

- monitor the regeneration activities and weed removal during the initial phase of the project - to ensure that the VMP is being implemented satisfactorily; and
- ensure that fencing and silt fences are being maintained.

5.3 Ongoing Management of the VMP

On completion of the initial phase of the VMP (*ie* from 6 months after initiation), the following activities will be required.

The BRC is to:

- maintain the management and control of any weed species in the *Vegetation Management Area*;
- undertake supplementary plantings, as necessary, to achieve the goals set out in this VMP; and
- maintain new plantings until self-sustainable.

The PE is to:

- repeat the surveys at the fixed photo and survey points;
- monitor ongoing activities;

- provide advice where necessary regarding the VMP activities; and
- prepare the 6-monthly *Reports* to Council.

5.4 Costings for Implementation of the VMP

The BRC will provide a detailed costing estimate for implementation of the VMP after inspection of the subject site. An approximate costing of the VMP is provided below, but the future BRC will provide a more accurate costing for the project and should not be held to this estimate (in part because the quantum of ongoing weed control and supplementary plantings required to achieve the goals of the VMP cannot be pre-determined).

Activities and approximate costings for the VMP at The Northern Road, Cranebrook include:

- Primary weeding $15,000
- Collection and maintenance of propagules $10,000
- Supplementary planting (estimate) $50,000
- 2.5 years maintenance $25,000

6 ONGOING MAINTENANCE ACTIVITIES

Activities to maintain the vegetation within the *Vegetation Management Area* are to be undertaken by the *Bush Regeneration Contractor* (BRC). These activities will involve:

- site preparation - as outlined in Chapter 5 of this VMP;
- a dedicated weed removal and monitoring program - involving management of weeds every 3 months for 2.5 years after completion of the initial VMP works;
- 6-monthly monitoring of any natural regeneration which might occur;
- determination of a supplementary planting regime (if the monitoring of natural regeneration indicates the need); and
- maintenance of any plantings which are undertaken, and the replacement of any planted specimens which do not survive.

These activities are to be conducted by the BRC for a period of 2.5 years following completion of the initial weed removal and supplementary plantings activities in the *Vegetation Management Area* (*ie* the VMP has an operational life of 3 years). The *Project Ecologist* (PE) is to monitor the success of the bush regeneration works over that period, and provide advice to the BRC when and if required. The PE will also provide relevant *Reports* to the Council, as detailed in Chapter 8 of this VMP.

7 TIMETABLE

Table 1 Summary of vegetation management activities, their timing and persons responsible

Activity	Timing	Role
Initial Works		
Collect baseline monitoring data (photos and quadrat)	On approval of the VMP	PE
Re-locate Cumberland Plain Land Snails and natural habitat from the development area to the *Vegetation Management Area*	On approval of the VMP	PE
Remove rubbish and refuse, and re-locate any detected Cumberland Plain Land Snails to the enhanced natural habitat within the *Vegetation Management Area*	On approval of the VMP	PE
Collect and store seeds and seedlings of native plants from within the development area (in particularly the *Grevillea juniperina*)	Up to the clearing of vegetation footprint	BRC
Temporarily fence and erect signage around *Vegetation Management Area*	On release of the *Subdivision Certificate*	CT
From Release of *Subdivision Certificate*		
Implement an intensive weed removal program at the *Vegetation Management Area*	On release of the *Subdivision Certificate*	BRC
Prepare bare soil and highly disturbed portions of the *Vegetation Management Area* for replanting	On release of the *Subdivision Certificate*	BRC
Plant those prepared areas with stored vegetation previously collected from the development area	On release of the *Subdivision Certificate*	BRC
Maintenance Period (Post Establishment Period)		
Management of weeds, monitoring of natural regeneration and maintenance of plantings and replacement of failed plants	Every 3 months for 2 years	BRC
Collection of photo point and quadrat monitoring data as well as monitoring of the Cumberland Plain Land Snail and CRCIF	Every 6 months for 2 years	PE
Monitoring Reports to Council for the life of the VMP	Every 6 months for 2 years	PE
Prior to Construction Works		
Perform a site induction for site workers	Prior to any construction works	CT
Install sediment fences around areas of earthworks, where relevant, to protect areas of retained vegetation	Prior to any construction works	BRC
Inspection of the pre-construction works	Prior to any construction works	PE

8 MONITORING PROGRAM

The *Project Ecologist* (PE) is to monitor the success of the bush regeneration works and to report to the *Bush Regeneration Contractor* (BRC) if any problems are identified, so that appropriate remedies can be pursued. Monitoring activities would involve:

- baseline quadrat and photo monitoring, as well as an inspection of site preparation activities prior to the construction works, as outlined in Chapter 5 of this VMP;
- continued 6-monthly updating of the photo point and quadrat monitoring data;
- monitoring of the Cumberland Plain Land Snail and CRCIF vegetation; and
- compilation of *Monitoring Reports* to Council every 6 months for the life of the VMP project (*ie* for a total of 3 years after initiation).

Monitoring *Reports* to Council will document:

- the works which have been undertaken during the previous survey period;
- the changes in weed densities throughout the subject site;
- the rates of success and failure of supplementary plantings, and documentation of remedial measures implemented (as required); and
- recommendations for additional works or activities which may be required during the ensuing survey period.

Implementation of the VMP at Cranebrook is intended to achieve several goals by the end of 3 years of implementation, including:

- a reduction in the Projected Foliage Cover (FPC) of weeds across the *Vegetation Management Area* to 5% or less;
- the survival (or replacement) of any supplementary plantings (as identified in the management activities for the site);
- achievement of the native plant densities (Chapter 4.3):
  - 1 semi-mature to mature canopy tree per 16m^2;
  - 1 shrub per 4m^2; and
  - 4 groundcover species per 1m^2.
- a minimum of 35 CRCIF species through the *Vegetation Management Area*;
- 95% of plant species (by density and by species numbers) to be CRCIF species; and
- an ongoing monitoring and maintenance program to identify areas of new weed infestation and to provide a mechanism for their control.

Figure 1

Location of the subject site at The Northern Road, Cranebrook

LEGEND

Subject site

0 100 200 400 600 800
Metres

N

NOTES

1. Basemap courtesy of Nearmap 26/08/2012
2. Digital cadastral database (DCDB) © LPMA 2012
3. Subject site boundary based on DCDB © 2012
4. All features are approximate only and subject to detailed survey

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Project No: **610.11706**

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Drafted	Approved
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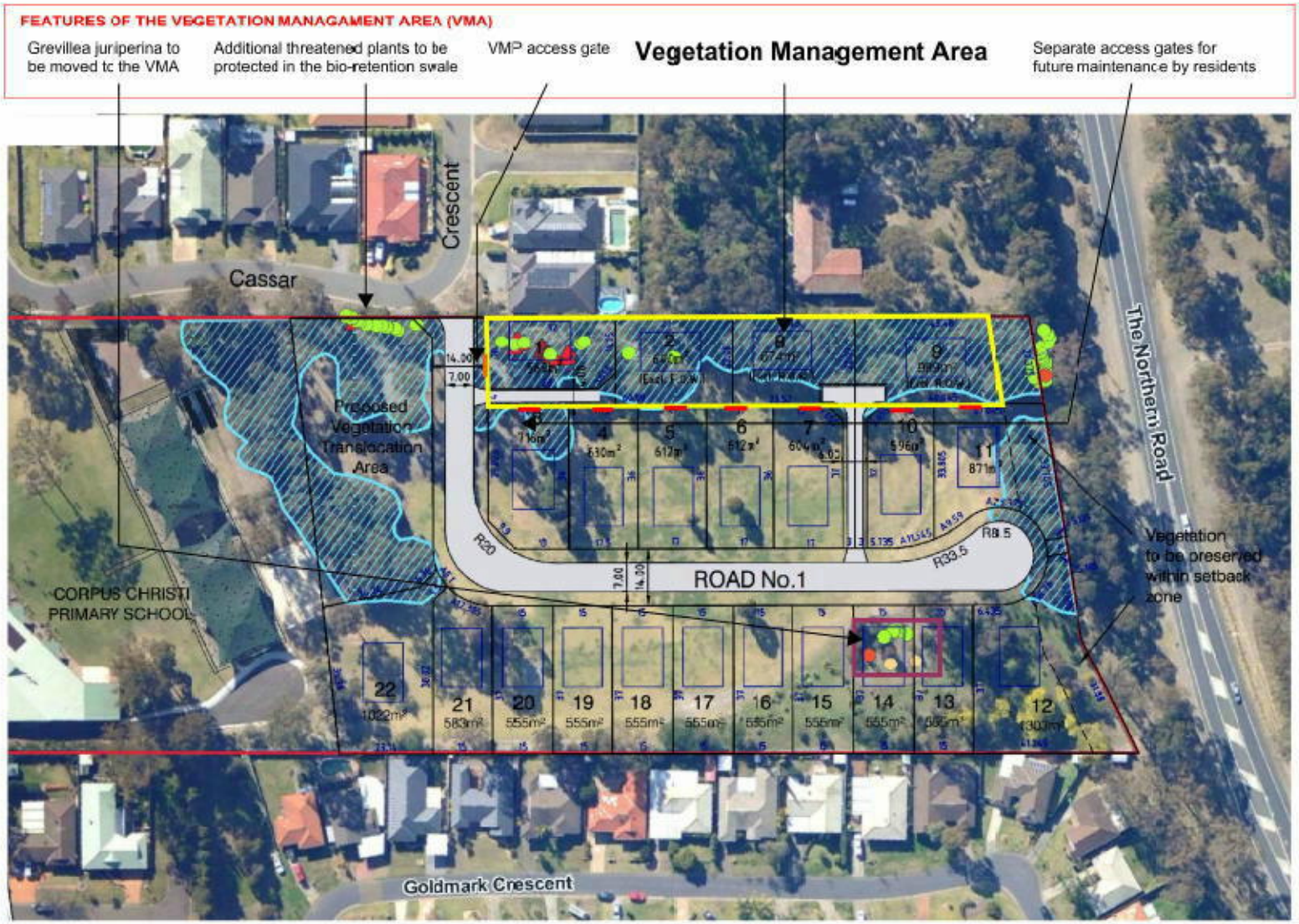
Figure 2 The Proposed Subdivision and Vegetation Management Area at Cranebrook



LEGEND

- Subject site
- EEC Vegetation
- Dillwynia tenuifolia (39)

Grevillea juniperina
- dead (2)
- dying (2)
- live (50)

NOTES

1. Plan courtesy of InSites, 17/12/2012
2. All features are approximate only and subject to detailed survey

PRELIMINARY ISSUE

DIOCESE OF PARRAMATTA

OPTION No.5
PROPOSED SUBDIVISION OF
CORPUS CHRISTI PRIMARY SCHOOL SITE
ANDROMEDA DRIVE, CRANEBROOK

INT: 117-P5-001 SCALE: 1:1000 A3
DATE: 17.12.2012

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Drafted: Sara Haddady | Approved: Fiona Iolini

global environmental solutions

Corpus Christi Primary School
The Northern Road, Cranebrook

Proposed Residential Subdivision

Vegetation Management Plan

Appendix A
Flora species list on the subject site at Cranebrook

22 October 2013

Appendix A Flora Species List surveyed from the subject site on the 27th of August 2012

KEY	
Symbol	**Description**
Status	
*	Exotic species
**	Noxious species in the Penrith LGA
CRCIF	Species is listed as "*characteristic*" within the Final Determination for the Cooks River/Castlereagh Ironbark Forest, which is listed as an EEC on the TSC Act.

Status	Species name	Common name
	Acanthaceae	
	Brunoniella australis	Blue Trumpet
	Apocynaceae	
*	*Araujia sericifera*	Moth Vine
	Asparagaceae	
*	*Asparagus aethiopicus*	Asparagus 'Fern'
**	*Asparagus asparagoides*	Bridal Creeper
	Asteraceae	
*	*Bidens pilosa*	Cobblers Peg
	Cotula australis	Carrot Weed
*	*Gamochaeta purpurea*	Purple Cudweed
*	*Hypochaeris radicata*	Catsear
CRCIF	*Ozothamnus diosmifolius*	White Dogwood
*	*Sonchus oleracheus*	Common Sowthistle
*	*Taraxacum officinale*	Dandelion
CRCIF	*Vernonia cinerea* var. *cinerea*	-
	Cactaceae	
*	*Hylocereus undatus*	Dragon Fruit
**	*Opuntia* sp.	Prickly Pear
	Casuarinaceae	
	Allocasuarina torulsa	Forest Oak
	Chenopodiaceae	
	Einadia hastata	Berry Saltbush
CRCIF	*Einadia nutans* subsp. *linifolia*	-
	Commelinaceae	
*	*Tradescantia fluminensis*	Wandering Jew
	Convolvulaceae	
	Dichondra repens	Kidney Weed
	Crassulaceae	
**	*Bryophyllum delagoense*	Mother-of-millions
	Cyperaceae	
CRCIF	*Lepidosperma laterale*	-

Appendix A Flora Species List surveyed from the subject site on the 27th of August 2012

Status	Species name	Common name
	Fabaceae – Faboideae	
	Daviesia ulicifolia	Gorse Bitter Pea
	Desmodium varians	Slender Tick-trefoil
CRCIF	*Dillwynia sieberi*	-
V	*Dillwynia tenuifolia*	-
	Hardenbergia violaceae	False Sarsparilla
*	*Medicago lupulina*	Black Medic
*	*Trifolium repens*	White Clover
*	*Vicia sativa* subsp. *nigra*	Narrow-leaved Vetch
	Fabaceae – Mimosoideae	
	Acacia decurrens	Black Wattle
	Acacia parramattensis	Green Wattle
	Lauraceae	
CRCIF	*Cassytha sp.*	-
	Lobeliaceae	
CRCIF	*Pratia purpurascens*	White-root
	Lomandraceae	
	Lomandra filiformis	
CRCIF	*Lomandra longifolia*	Mat Rush
	Myrtaceae	
CRCIF	*Angophora floribunda*	Rough-barked Apple
CRCIF	*Eucalyptus fibrosa*	Broad-leaved Ironbark
CRCIF	*Eucalyptus mollucana*	Grey Box
CRCIF	*Melaleuca decora*	-
CRCIF	*Melaleuca nodosa*	Prickly-leaved Paperbark
CRCIF	*Syncarpia glomulifera*	Turpentine
	Pittosporaceae	
CRCIF	*Bursaria spinosa*	Blackthorn
	Plantaginaceae	
*	*Plantago lanceolata*	Lamb's Tongue
	Poaceae	
	Aristida sp.	A Wiregrass
+	*Cynodon dactylon*	Common Couch
	Echinopogon sp.	Hedgehog Grass
*	*Ehrharta erecta*	Panic Veldt Grass
*	*Eragrostis curvula*	African Love Grass
CRCIF	*Entolasia stricta*	Wiry Panic
CRCIF	*Microlaena stipoides* var. *stipoides*	Weeping Grass
	Poa affinis	-
*	*Setaria pumila*	Pale Pigeon Grass
	Polygonaceae	
	Rumex brownie	Swamp Dock
	Proteaceae	
V	*Grevillea juniperina* subsp. *juniperina*	Juniper-leaved Grevillea
	Pteridaceae	
CRCIF	*Cheilanthes sieberi* subsp. *sieberi*	Poison Rock Fern

Appendix A Flora Species List surveyed from the subject site on the 27th of August 2012

Status	Species name	Common name
	Rubiaceae	
CRCIF	*Pomax umbellata*	-
	Santalaceae	
CRCIF	*Exocarpos cupressiformis*	Native Cherry
	Sapindaceae	
	Dodonaeae triquetra	Large-leaf Hop-bush

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Appendix B
CRCIF – Final Determination

22 October 2013

Cooks River/Castlereagh ironbark forest in the Sydney Basin Bioregion - endangered ecological community listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act, and to omit reference to the Cooks River Clay Plain Scrub Forest as an Endangered Ecological Community. Listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is the name given to the ecological community characterised by the species assemblage listed in paragraph 2. All sites are within the Sydney Basin Bioregion.

2. Cooks River/Castlereagh Ironbark Forest is characterised by the following assemblage:

- Acacia binervia
- Acacia falcata
- Angophora bakeri
- Angophora floribunda
- Aristida ramosa
- Aristida vagans
- Astroloma humifusum
- Austrodanthonia setacea
- Austrodanthonia tenuior
- Austrostipa pubescens
- Austrostipa rudis
- Billardieria scandens
- Boronia polygalifolia
- Bursaria spinosa
- Calotis cuneifolia
- Cassinia arcuata
- Cassytha glabella form glabella
- Cheilanthes sieberi subsp. sieberi
- Dianella revoluta
- Dichelachne micrantha
- Dillwynia parviflora
- Dillwynia sieberi
- Einadia nutans
- Einadia trigonos
- Entolasia stricta
- Eragrostis brownii
- Eucalyptus capitellata
- Eucalyptus fibrosa
- Eucalyptus longifolia
- Eucalyptus moluccana
- Eucalyptus resinifera

- Exocarpos cupressiformis
- Glycine clandestina
- Gonocarpus tetragynus
- Goodenia belledifolia
- Goodenia hederacea subsp. hederacea
- Goodenia paniculata
- Hakea sericea
- Hibbertia empetrifolia
- Hibbertia serpyllifolia
- Kunzea ambigua
- Laxmannia gracilis
- Laxmannia gracilis
- Lepidosperma laterale
- Leptospermum trinervium
- Leucopogon juniperinus
- Lissanthe strigosa
- Lomandra longifolia
- Lomandra multiflora subsp. multiflora
- Melaleuca decora
- Melaleuca decora
- Melaleuca nodosa
- Microlaena stipoides
- Microtis parviflora
- Notelaea longifolia
- Opercularia diphylla
- Orthoceras strictum
- Ozothamnus diosmifolius
- Ozothamnus diosmifolius
- Panicum simile
- Paspalidium distans
- Podolobium ilicifolium
- Pomax umbellata
- Poranthera microphylla
- Pratia purpurascens
- Pultenaea villosa
- Rhytidosporum procumbens
- Stackhousia viminea
- Syncarpia glomulifera
- Thelymitra pauciflora
- Themeda australis
- Vernonia cinerea var. cinerea
- Wahlenbergia gracilis
- Xanthorrhoea media

3. The total species list of flora and fauna of the community is considerably larger than that given in 2 (above), with many species present in only one or two sites or in very small quantity. The community includes invertebrates, many of which are poorly known, as well as vertebrates. In any particular site not all of the assemblage listed above may be present. At any one time, some species may only be present as seeds in the soil seed bank with no above-ground individuals present. Invertebrate species may be restricted to sediments or canopy trees and shrubs for example. The species composition of the site will be influenced by the size of the site and by its recent disturbance history. The number of species and the above-ground composition of species will change with time since fire, and may also change in response to changes in fire frequency.

4. Cooks River/Castlereagh Ironbark Forest is predominantly of open-forest to low woodland structure usually with trees of Eucalyptus fibrosa and Melaleuca decora, sometimes with Eucalyptus longifolia. A relatively dense shrub stratum is typical, commonly with Melaleuca nodosa and Lissanthe strigosa, and to a lesser extent Melaleuca decora. A variety of shrub species may occur, including Acacia pubescens, Dillwynia tenuifolia, Daviesia ulicifolia, Pultenaea villosa and Grevillea juniperina. Commonly occurring species in the ground stratum include Entolasia stricta,

Lepidosperma laterale, Opercularia diphylla, Dianella revoluta, Themeda australis, Microlaena stipoides and Pratia purpurascens.

5. Cooks River/Castlereagh Ironbark Forest usually occurs on clay soils on Tertiary alluvium, or on shale soils on Wianamatta Shale including the Birrong Soil Landscape and associated shale lowlands.

6. Cooks River/Castlereagh Ironbark Forest is described in NSW NPWS (2000a&b) which lists diagnostic plant species for the community. These species provide a guide to identification of the community, but care should be taken in the application and interpretation of diagnostic plant species because of sampling limitations; the reduction in species diversity in degraded sites; and the fact that some species may only be present at a site at some times as a soil seedbank or as dormant bud/tubers.

7. Cooks River/Castlereagh Ironbark Forest is or has been known to occur in the Auburn, Bankstown, Blacktown, Canterbury, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Strathfield local government areas, but may occur elsewhere in the Sydney Basin Bioregion.

8. It occurred extensively in the Castlereagh area, Holsworthy-Voyager Point area, Kemps Creek area and the upper Cooks River valley, Duck River and associated shale lowlands in the Canterbury-Auburn-Strathfield- Bankstown-Parramatta-Holroyd area.

9. Cooks River/Castlereagh Ironbark Forest may grade into Castlereagh Swamp Woodland in poorly-drained depressions or into Castlereagh Scribbly Gum Woodland where the soil is sandier. Where the Tertiary alluvium is shallow, the community may grade into Shale Gravel Transition Forest.

10. Disturbed Cooks River/Castlereagh Ironbark Forest remnants are considered to form part of the community including remnants where the vegetation would respond to assisted natural regeneration such as where the natural soil and associated seedbank is still at least partially intact.

11. Cooks River/Castlereagh Ironbark Forest has been extensively cleared for urban and rural developments. About 7% of the original distribution is estimated to remain (NSW NPWS 2000a). There has been very extensive clearing and major fragmentation and isolation of remnants in the Canterbury-Auburn-Strathfield-Bankstown-Parramatta-Holroyd area. Much of the remaining area of Cooks River/Castlereagh Ironbark Forest elsewhere has been disturbed by clearing, tracks, weed invasion and soil disturbance. Continuing threats to the community include invasion by exotic species, illegal dumping, water pollution, unauthorised access, fragmentation and clearing for urban, rural-residential, recreational and industrial development.

12. Cooks River/Castlereagh Ironbark Forest has been reported from Agnes Banks Nature Reserve, Castlereagh Nature Reserve and Windsor Downs Nature Reserve. The area of the community in these reserves is about 1.7% of the original distribution.

13. The eastern occurrences of this community, in the Canterbury-Auburn-Strathfield-Bankstown-Parramatta-Holroyd area, are currently listed as the Cooks River Clay Plain Scrub Forest Endangered Ecological Community. The present determination recognises that similar areas in Western Sydney, previously not recognised as part of the community, should be included as part of the listed Endangered Ecological Community.

14. In view of the originally restricted distribution of this community, its inadequate representation within conservation reserves, the extensive disturbance and fragmentation and weed invasion that has occurred and the ongoing development and use threats, the Scientific Committee is of the opinion that Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate and that the community is eligible for listing as an endangered ecological community.

Proposed Gazettal date: 10/05/02
Exhibition period: 10/05/02 - 14/06/02

References

NSW NPWS (2000a). Native vegetation maps of the Cumberland Plain, western Sydney - Interpretation guidelines. NSW National Parks & Wildlife Service, January 2000.

NSW NPWS (2000b). The native vegetation of the Cumberland Plain, Western Sydney - Technical report. NSW National Parks & Wildlife Service, April 2000

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Vegetation Management Plan

Appendix C
Weed Removal Techniques

22 October 2013

Control of Woody Weeds *(eg Lantana, Cotoneaster, Privet, Camphor Laurel Cassia/Senna)*	
Cut and Paint	• Useful for small to medium sized woody weeds up to 100mm in diameter. • Make horizontal cut as close to the ground as possible with secateurs, loppers or a bush saw. • Apply herbicide immediately to the exposed flat stump.
Stem Injection	• For use on larger shrubs or trees with a diameter of more than 100mm. • At the base of the shrub or tree drill at a 45 degree angle into the sapwood at 5cm intervals and inject the herbicide immediately.
Frilling or Chipping	• Make a hole in the sapwood with a chisel or axe. • Fill each hole/cut with herbicide immediately. • Repeat the process at 5m intervals around the tree.
Control of Weeds with Underground Reproductive Systems *(eg Dandelion, Paddys Lucerne, Catsear, Asparagus Fern, Ginger Plant, Oxalis, Onion Weed, Madiera Vine)*	
Hand Removal of Plants with Taproots (*eg* Paddys Lucerne, Dandelion)	• Gently remove and bag seeds or fruit. • Push a narrow trowel or knife into the ground next to the taproot. Carefully loosen soil and repeat this step around the taproot. • Grasp stem at ground level, rock plant backwards and forwards pulling gently.
Crowning (*eg* Asparagus Fern)	• Gently remove and bag stems with seed and/or fruit. • Grasp the stems or leaves together so that the base of the plant is visible. • Insert, at an angle, a knife or lever close to the crown. • Cut through all the roots around the crown. • Remove and bag the crown.
Removal of Plants with Bulbs, Corms or Tubers (*eg* Onion Weed)	• Move leaf litter away from base of plant. • Dig down next to the stem until the bulb or tuber is reached. • Remove plant and carefully remove and bag bulb or tuber.
Herbicide Treatment: Stem Swiping	• Gently remove any seed or fruit and carefully place into a bag. • Using a herbicide applicator, swipe the stems/leaves.
Control of Small Hand Pullable Plants *(eg Fleabane, Crofton Weed, small grasses, seedlings)*	
Hand Removal (minimal disturbance)	• Gently remove any seeds or fruits and carefully place into a bag. • Grasp stem at ground level. • Rock plant backwards and forwards to loosen roots and pull out gently. • Carefully tap the roots to dislodge any soil. • Replace disturbed soil and pat down.
Control of Vines and Scramblers *(eg Balloon Vine, Morning Glory, Madeira Vine, Blackberry)*	
Hand Removal	• Take hold of one runner and gently pull it along the ground towards you. • Check points of resistance where fibrous roots grow from the nodes. • Cut roots with a knife or dig out with a trowel and continue to follow the runner. • The major root system needs to be removed manually or scrape/cut and paint with herbicide immediately. • Bag any reproductive parts.
Stem Scraping	• With a knife, scrape 15-30cm of the stem to reach the layer below the bark/outer layer. • Immediately apply herbicide along the length of the scrape.

BUSH REGENERATION INFORMATION SHEET

Control of Woody Weeds

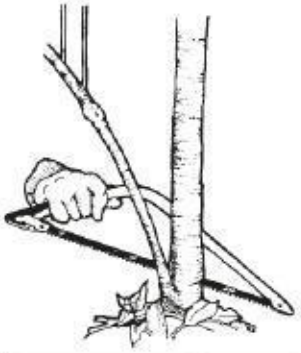
Examples of woody weeds include:
- lantana, bitou bush, cotoneaster, privet (cut and paint)
- camphor laurel, Mickey Mouse bush (ochna) and cassia/senna (stem scrape)

METHODS OF REMOVAL

❶ *CUT AND PAINT* —Useful for small to medium sized woody weeds up to 10cm basal diameter

STEP 1 Make a horizontal cut as close to the ground as possible with secateurs, loppers or a bush saw.

STEP 2 Immediately apply herbicide to the exposed flat stump surface.



SAFETY CONSIDERATIONS

The following general precautions should be made when using herbicides:
- Read the label before opening the container and follow the instructions.
- Wear protective clothing as directed on the label.
- Wash hands after use and before eating or smoking.

considerations

- Cuts should be horizontal to prevent herbicide from running off the stump. Sharp angle cuts are hazardous.
- Herbicide must be applied immediately before the plant cells close and translocation of herbicide ceases.
- If plants resprout, cut and paint the shoots after sufficient regrowth has occurred.
- Stem scraping can be more effective on some woody weeds.

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AABR Australian Association of Bush Regenerators

Illustrations: V Bear

BUSH REGENERATION INFORMATION SHEET

Control of Weeds with Underground Reproductive Structures

Examples: Weeds with
- Tap roots - catsear, dandelion
- Rhizomes - asparagus fern, ginger plant
- Bulbs and corms - oxalis, onion weed, watsonia, freesias, montbretia
- Tubers - madiera vine, arrow head vine

METHODS OF REMOVAL

❶ *HAND REMOVAL OF PLANTS WITH A TAPROOT*

Examples: Paddy's lucerne, dandelion

STEP 1 Gently remove and bag seeds or fruit.

STEP 2 Push a narrow trowel or knife into the ground next to the taproot. Carefully loosen soil. Repeat this step around the taproot.

STEP 3 Grasp stem at ground level, rock plant back wards and forwards and pull gently.

STEP 4 Gently tap the roots to dislodge soil. Replace disturbed soil and lightly pat down.

❷ *CROWNING (Many grasses can be crowned)*

Example: asparagus fern

STEP 1 Gently remove and bag stems with seed or fruit.

STEP 2 Grasp the leaves or stems together so that the base of the plant is visible.

STEP 3 Insert, at an angle, a knife or lever, close to the "crown".

STEP 4 Cut through all the roots around the crown.

STEP 5 Remove and bag the crown.

HAND REMOVAL

CROWNING

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BUSH REGENERATION INFORMATION SHEET

Control of Small Hand-pullable Plants

To Control:
- **Small soft weeds eg. fleabane, crofton weed, small grasses**
- **Seedlings of any weeds including privet, lantana, moth vine**

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AABR Australian Association of Bush Regenerators

Illustrations: V.Bear

METHODS OF REMOVAL

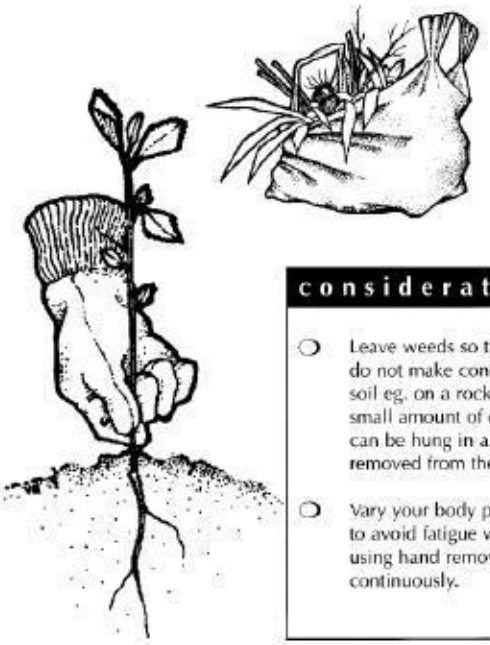
1 ***HAND REMOVAL (Minimal Disturbance)***

STEP 1 Gently remove any seeds or fruits and carefully place into a bag.

STEP 2 Grasp stem at ground level.

STEP 3 Rock plant backwards and forwards to loosen roots, and pull out gently.

STEP 4 Carefully tap the roots to dislodge any soil. Replace disturbed soil and pat down.



considerations

- Leave weeds so that roots do not make contact with soil eg. on a rock - a small amount of debris can be hung in a tree or removed from the site.
- Vary your body position to avoid fatigue when using hand removal continuously.

BUSH REGENERATION INFORMATION SHEET

Control of Vines and Scramblers

Examples of vines include:
- **balloon vine, morning glory, honeysuckle, cape ivy, jasmine, madeira vine, blackberry**

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AABR Australian Association of Bush Regenerators

Illustrations: V.Bear

METHODS OF REMOVAL

1 ***HAND REMOVAL***

STEP 1 Take hold of one runner and gently pull it along the ground towards you.

STEP 2 Check points of resistance where fibrous roots grow from the nodes. Cut roots with a knife or dig out with a trowel and continue to follow the runner.

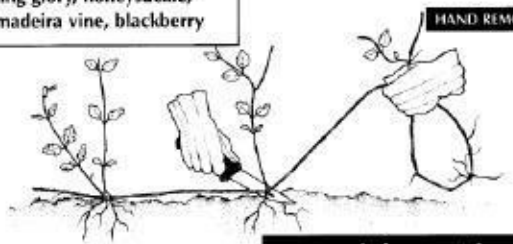
STEP 3 The major root systems need to be removed manually or scrape/cut and painted with herbicide.

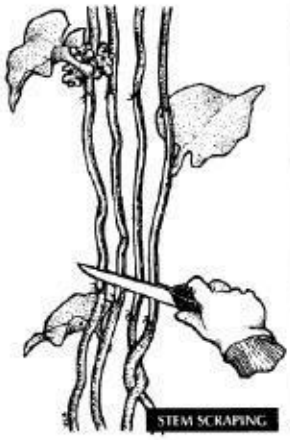
STEP 4 Bag any reproductive parts.

2 ***STEM SCRAPING***

STEP 1 With a knife, scrape 15 to 30 cm of the stem to reach the layer below the bark/outer layer.

STEP 2 Immediately apply herbicide along the length of the scrape.





considerations

- A maximum of half the stem diameter should be scraped. Do not ring bark.
- Larger stems (>1cm) should have two scrapes opposite each other.
- Aerial tubers on madeira vine should die with the plant when stem scraping is used. Those that fall from the plant in the scraping process need to be bagged.
- Vines can be left hanging in trees after treatment.