School Infrastructure NSW

December 2023

Operational Biodiversity Management Plan

Jindabyne Education Campus

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Operational Biodiversity Management Plan
Jindabyne Education Campus

School Infrastructure NSW

WSP
Level 2, 121 Marcus Clarke Street
Canberra ACT 2601
PO Box 1551
Canberra ACT 2600

Tel: +61 2 6201 9600
Fax: +61 2 6201 9666
wsp.com

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	Name	Date	Signature
Prepared by:	Selga Harrington	11/12/2023	
Reviewed by:	Lukas Clews	11/12/2023	
Approved by:	Alex Cockerill	11/12/2023	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Abbreviations

BAM	Biodiversity Assessment Method
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BMP	Biodiversity Management Plan
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Ha	Hectares
MNES	Commonwealth Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
TEC	Threatened Ecological Community

1 Introduction

This Operational Biodiversity Management Plan (OBMP) has been prepared for retained native vegetation at the Jindabyne Education Campus.

1.1 Site location

The Jindabyne Education Campus comprises a two new schools, Jindabyne Public School and Jindabyne High School at 163A and 163B Barry Way (101 DP1019527) Jindabyne. The Jindabyne Education Campus is located within the Snowy Monaro Regional local government area and is approximately 2.2 km south of the Jindabyne town centre.

The area or retained native vegetation within the Jindabyne Education Campus is shown in Figure 1.1.

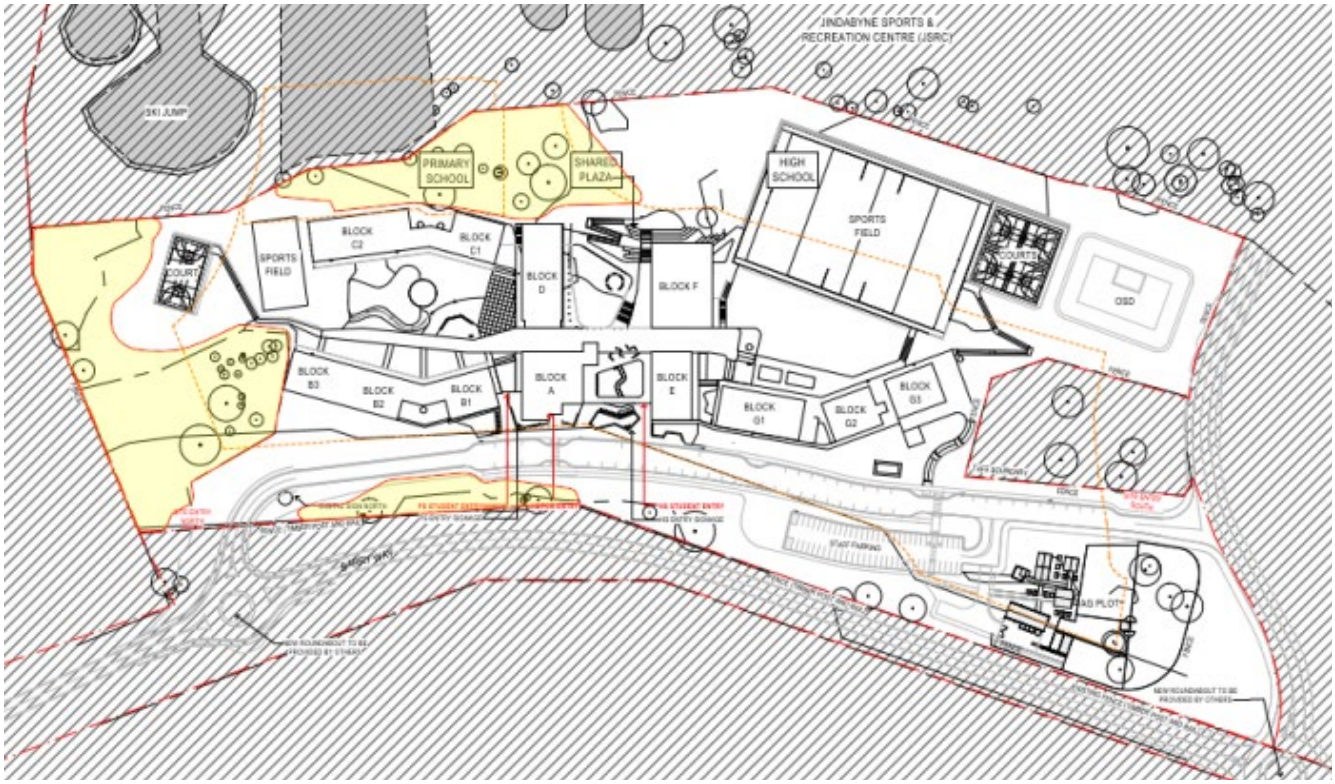

Figure 1.1 Jindabyne Education Campus, with retained native vegetation areas shown in yellow

1.2 Purpose and objectives

The impacts of the Jindabyne Education Campus to flora and fauna have been assessed within the Biodiversity Development Assessment Report (BDAR) (WSP 2022) and in assessment of modification 1 (SSD-15788005-Mod-1). Approval for the project was granted with Conditions of Consent (CoC) for the retention of areas of high biodiversity value and the preparation of an Operational Biodiversity Management Plan to manage the vegetation and habitats retained within the school site.

The objectives of the OBMP are to address the Conditions of Consent in relation to biodiversity management of vegetation and habitats adjacent to the school, as well as meeting the bushfire hazard management and school safety requirements.

The conditions of consent for the project relating to biodiversity management during the operational stage are outlined in Table 1.1. Table 1.1 outlines the conditions under B21 that are addressed within this OBMP.

Table 1.1 Conditions of Consent relevant to the Operational Biodiversity Management Plan

COC	Condition	Associated management procedure
CoC B21a	Be prepared by a suitably qualified and experienced person/s	This Plan, Section 1.3
CoC B21c	Prepare a vegetation management plan to regulate activity in vegetation and habitats adjacent to the school. The plan may include controls on rubbish disposal, wood collection, rock collection, fire management, and disturbance to nests and other niche habitats.	This Plan, Section 4
CoC B21c	Provide for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation and habitat on, or adjacent to, the development to industry best practice and standards.	This Plan, Section 4

1.3 Operational Biodiversity Management Plan preparation

This Operational Biodiversity Management Plan has been prepared based on the Biodiversity Development Assessment Report (WSP 2022) by personnel as outlined in Table 1.2.

Table 1.2 Personnel

Name	Role	Qualifications
Selga Harrington	Principal ecologist – report preparation	Bachelor of Science (Hons) Accredited BAM Assessor
Lukas Clews	Principal ecologist – report review	Bachelor of Science (Hons) Accredited BAM Assessor

2 Existing environment

The following section is a summary of the existing environment. The existing environment is described in detail in the BDAR (WSP 2022). Species recorded within the site and vegetation plot data (20 x 20 m plot) are provided in Appendix A and Appendix B respectively.

2.1 Vegetation

2.1.1 Description

The vegetation within the site consists of open woodland with a sparse shrub layer and a dense grassy groundcover. Grassland patches without canopy also occur. The woodland is dominated by *Eucalyptus pauciflora* with *Eucalyptus rubida, Eucalyptus stellulata* and occasional (planted) *Eucalyptus viminalis*, and *Eucalyptus bridgesiana.*

A sparse tall shrub layer is present and consists of *Acacia dealbata* and *Acacia melanoxylon.* The ground layer is characterised by low dense grassy understorey of native grasses, herbs and forbs including *Chrysocephalum apiculatum, Elymus scaber, Gonocarpus tetragynus, Hydrocotyle laxiflora, Microlaena stipoides*, and *Themeda triandra.*

A summary of the floristics is provided in Table 2.1. A list of species recorded is provided in Appendix A1.

Table 2.1 Floristic and structural summary of retained native vegetation

Vegetation layer	Dominant species recorded from the surveys
Tree canopy (upper stratum)	*Eucalyptus pauciflora, Eucalyptus rubida, Eucalyptus stellulata, Eucalyptus viminalis, Eucalyptus bridgesiana*
Midstorey (mid-stratum)	*Acacia dealbata, Melicytus angustifolius* subsp. *divaricatus*, *Acacia melanoxylon, Pimelea pauciflora, Bossiaea buxifolia, Mirbelia oxylobioides*
Groundcovers (ground stratum)	*Crassula sieberiana, Austrostipa scabra, Poa sieberiana* var. *sieberiana, Hydrocotyle laxiflora, Bulbine bulbosa, Rumex brownii, Asplenium flabellifolium, Poa meionectes, Carex inversa, Wahlenbergia communis, Convolvulus erubescens, Microlaena stipoides, Acaena ovina, Geranium solanderi* var. *solanderi, Swainsona monticola, Rytidosperma tenuius, Elymus scaber, Acaena novae-zelandiae, Dichondra repens, Lomandra longifolia, Swainsona behriana, Vittadinia muelleri, Panicum effusum, Chrysocephalum apiculatum, Chrysocephalum semipapposum, Themeda triandra, Asperula conferta, Cymbonotus lawsonianus*
Exotic species	*Bromus hordeaceus, Petrorhagia nanteuilii, Echium plantagineum, Avena barbata, Arenaria leptoclados, Verbascum thapsus, Hirschfeldia incana, Trifolium arvense, Vulpia myuros, Taraxacum officinale, Hordeum leporinum, Hypochaeris radicata, Cirsium vulgare, Erodium cicutarium, Plantago lanceolata, Potentilla recta, Lolium perenne, Salvia coccinea, Marrubium vulgare*
High Threat Weeds	*Bromus diandrus, Crataegus monogyna, Acetosella vulgaris, Hypericum perforatum, Pyracantha* sp.

Photo 2.1 Vegetation retained in north (plot 3)

Photo 2.2 Vegetation retained in east (Plot 5)

Five threatened species plant species have potential habitat and may be present (Table 2.2).

Table 2.2 Threatened flora species

Scientific name	Common name	BC Act status	EPBC Act status
Calotis glandulosa	Mauve Burr-daisy	Vulnerable	Vulnerable
Leucochrysum albicans var. tricolor	Hoary Sunray	–	Endangered
Prasophyllum petilum	Tarengo Leek Orchid	Endangered	Endangered
Swainsona sericea	Silky Swainson-pea	Vulnerable	–
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable

2.1.2 *Threatened ecological community*

The retained vegetation within the site is part of the Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion as listed as Critically Endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act). This Threatened Ecological Community is identified as a threatened entity at risk of a Serious and Irreversible Impact (SAII).

Trees may be absent from this TEC as a consequence of tree removal under pastoral management and grazing by domestic stock. As such, areas of derived native grassland, lacking a tree canopy, are also considered to be part of this Threatened Ecological Community.

2.2 Fauna and habitats

The site consists of a small area of remnant grassy woodland in a landscape of open grassland with scattered trees and woodland patches. The vegetation within the site provides habitat for a range of fauna including highly mobile fauna species (such as birds, large mammals, and microbats).

These trees provide local foraging habitat for several common open woodland birds (i.e.,, Crimson Rosella, Galah, Brown-headed Honeyeater, Yellow-faced Honeyeater, Rufous Whistler). Several threatened woodland birds and bats are also considered to have potential to use the woodland areas within the project site as foraging habitat on occasion.

The woodland includes hollow bearing trees and nest boxes installed as part of the Conditions of Approval for the development of the Jindabyne Education Campus.

Surveys of hollow bearing trees within the broader education campus prior to construction identified:

- Crimson Rosella (*Platycercus elegans*) breeding
- Galah (*Eolophus roseicapilla*) breeding
- Striated Pardalote (*Pardalotus striatus*) breeding
- Chocolate Wattled Bat (*Chalinolobus morio*).

A list of fauna species recorded is provided in Appendix A2.

No threatened fauna species have been recorded; however the site contains a number of hollow-bearing trees which provide important habitat for fauna including threatened species

2.3 Exotic species and high threat weeds

Exotic species and High Threat Weeds were present within the project area. A total of 24 introduced species of plant were recorded within the project area, including 5 species of High Threat Weeds (Table 2.3).

Table 2.3 Exotic and weed species recorded

Status	Scientific name	Common name	Biosecurity duty
High Threat Weeds	*Bromus diandrus*	Great Brome	**General Biosecurity Duty** – prevent, eliminate or minimise spread
	Crataegus monogyna	Hawthorn	**General Biosecurity Duty** – prevent, eliminate or minimise spread
	Rumex acetosella	Sheep Sorrel	**General Biosecurity Duty** – prevent, eliminate or minimise spread
	Hypericum perforatum	St Johns Wart	**General Biosecurity Duty** – prevent, eliminate or minimise growth **Regional Recommended Measure** – land managers should mitigate spread, plant should not be bought, sold, grown or released into the environment
	Pyracantha sp.	Firethorn	**General Biosecurity Duty** – prevent, eliminate or minimise spread
Exotic species	*Bromus hordeaceus*	Soft Brome	**Due diligence –** prevent spread where possible
	Petrorhagia nanteuilii	–	**Due diligence –** prevent spread where possible
	Echium plantagineum	Paterson's Curse	**General Biosecurity Duty** – prevent, eliminate or minimise spread
	Avena barbata	Bearded Oats	**Due diligence –** prevent spread where possible
	Arenaria leptoclados	Lesser Thyme-leaved Sandwort	**Due diligence –** prevent spread where possible
	Verbascum thapsus	Great Mullein	**Due diligence –** prevent spread where possible
	Hirschfeldia incana	Shortpod Mustard	**Due diligence –** prevent spread where possible
	Trifolium arvense	Haresfoot Clover	**Due diligence –** prevent spread where possible
	Vulpia myuros	Rat's Tail Fescue	**Due diligence –** prevent spread where possible

Status	Scientific name	Common name	Biosecurity duty
	Taraxacum officinale	Common Dandelion	**Due diligence –** prevent spread where possible
	Hordeum leporinum	Wall Barley	**Due diligence –** prevent spread where possible
	Hypochaeris radicata	Flatweed	**Due diligence –** prevent spread where possible
	Cirsium vulgare	Spear Thistle	**General Biosecurity Duty** – prevent, eliminate or minimise spread
	Erodium cicutarium	Common Stork's-bill	**Due diligence –** prevent spread where possible
	Plantago lanceolata	Ribwort Plantain	**Due diligence –** prevent spread where possible
	Potentilla recta	Sulphur Cinquefoil	**Due diligence –** prevent spread where possible
	Lolium perenne	Perennial Ryegrass	**Due diligence –** prevent spread where possible
	Salvia coccinea	Scarlet Sage	**Due diligence –** prevent spread where possible
	Marrubium vulgare	Horehound	**General Biosecurity Duty** – prevent, eliminate or minimise spread

2.4 Threats to conservation values of retained vegetation

Threats to the retained areas of the viability and condition of the ecological community include:

- reduced viability due to edge effects
- noise, dust or light spill
- transport of weeds and pathogens into the site
- trampling of flora species
- disturbance of fauna
- rubbish
- wood collection
- removal and disturbance of rocks, including bush rock.

3 Site management

This section presents the management actions suggested to maintain and improve the biodiversity values present. Some management actions are required immediately, while others may be implemented in future years depending on results of annual monitoring events.

3.1 Adaptive monitoring and management framework

Monitoring and vegetation management should follow an adaptive framework, by which management as set out in this management plan is undertaken, but with some flexibility to change based on monitoring results. Proposed changes to the program will be carefully considered prior to implementing the changes to ensure that they do not undermine or compromise the objectives.

The results of the monitoring will inform any additional management or changes to management required. If monitoring shows that these management measures are not working as anticipated the management actions should be reviewed and revised to improve the outcomes for the species and habitats at the site.

Similarly, management actions should be informed by monitoring results and should be best practice at the time of implementation.

As such, actions to achieve the ongoing objectives may change over the course of the management period covered by this plan.

3.2 Management actions

3.2.1 Asset Protection Zone and Biomass management

As the campus is within bushfire prone land, the vegetation within the campus requires management as an Inner Protection Area consistent with Bushfire Planning requirements (Blackash 2023). This includes maintaining grass at less than 100 mm height and removal of leaves and vegetation debris.

Biomass management will be required for fire risk management to reduce height and density of grass and fuel load. Biomass management can also be dual-purpose and act as a weed control measure when timed appropriately.

Since the vegetation is of conservation value, planning and regular monitoring to assess biomass levels is recommended to ensure that biomass reduction is only undertaken as necessary and in response to level of fire risk.

For slashing and mowing, it is recommended that:

- clean, weed-free equipment be used
- slashing/mowing begin in weed free/low weed areas
- should not be carried out when the ground is damp/wet
- slashing be carried out when exotic grasses are not fruiting to minimise transport of weed propagules around the site
- any slashed material is removed from the site as it inhibits the growth and seed development of native grasses and forbs
- that flail mowers (mower with catcher that is suitable for long grass) be preferentially used allowing the operator to specify the minimum height that the grass is mown. Ideally, grassland areas should be mown to a minimum height of 50 mm
- slashing/mowing occur in a mosaic fashion to retain patches of higher cover refugia for fauna.

3.2.2 Planting

As the campus is within bushfire project land, the vegetation within the campus requires management as an Inner Protection Area consistent with Bushfire Planning requirements (Blackash 2023). This limits the planting opportunities within the site due to the following bushfire hazard management requirements:

- Trees:
  - canopy should be less than 15% at maturity
  - trees at maturity should not touch or overhand the building
  - tree canopies should be separated by 2 to 5 m.
- Shrubs
  - creation of large discontinuities or gaps in the vegetation
  - should not be located under trees
  - should not form more than 10% of groundcover
- Grass
  - maintaining grass at no more than 100 mm in height.

Regeneration of dominant tree species is an important factor in the long term retention of woodland communities. Planting of locally indigenous species characteristic of the woodland within the site is recommended in areas lacking trees, taking into consideration the bushfire asset protection area requirements. Planting of smooth barked species *Eucalyptus pauciflora* and *Eucalyptus rubida* is recommended at low densities in grassland areas.

Planting may also be required in areas where significant weed infestations are cleared if native species seed bank has been lost. Where groundcover planting is required, these should consider bushfire requirements and consist of locally indigenous grass and forb species that are tolerant of regular mowing. Tubestock or seed mix could be used depending on the area requiring revegetation. A mix of ground cover species should be used including grasses and forbs. Planted areas should be fenced with temporary fencing while plants become established.

A list of suitable species for planting is provided in Appendix C.

3.2.3 Site protection

Fencing is important to delineate areas and control and manage access to protect high value conservation areas. Fencing of the area should be strong, permanent, good quality and low maintenance. Fencing design should provide a visual cue that the area is managed and cared for while still providing opportunities for access and engagement of the school community. Fencing should be in line with the fencing plan for the campus (includes FN1 around eastern boundary, FN2 around northern and western section of northern biodiversity protection zone, and FN5 around other edges) or similar.

Fencing will minimise disturbance to vegetation and habitat from trampling and inappropriate mowing frequency.

3.2.4 Weed management

Controlling weeds by preventing their establishment is the most effective way of managing their spread. Weed control protocols are provided in Appendix D and arrive clean – leave clean guidelines are provided in Appendix E.

Weed management can include various methods including herbicide use and mechanical/ physical removal. The methods considered the most appropriate at the campus are described below.

Herbicide use

Woody weeds should be treated with either cut and paint or stem injection rather than spraying. Spot spraying of grasses and herbaceous weeds should minimise off-target spray impacts to native species.

The recommended herbicide application methods for management of weeds within the study area is described below.

Cut and paint

Cut and paint method is used for shrubs such as Firethorn (*Crataegus* sp.) and Cotoneaster (*Cotoneaster* sp.). The plant stem should be cut horizontally as close to the ground as possible, using secateurs, loppers or a bush saw. Paint the stump painted undiluted herbicide (e.g., glyphosate) immediately following the cut (within 20-30 seconds). It is essential that the herbicide is applied in this timeframe before translocation to the to the underground structures of the plant ceases.

Stem injection or frilling with herbicide

Stem injection or frilling is a method that can be employed successfully in a number of situations to treat large mature woody weeds with a trunk diameter of more than 5 cm (e.g., Pine trees). This method also allows exotic trees to be left *in situ* to provide fauna habitat and decrease potential soil erosion (National Trust of Australia, 1999). The following outlines the appropriate method for stem injection, chipping and frilling:

- using a drill, chisel or saw make holes or a deep cut at a downward angle (45 degrees) into the sapwood at regular intervals of 5 cm apart around the tree in a circle
- do not ringbark the plant
- for multi stemmed plants drill or chip below the lowest stem or treat each stem individually
- apply herbicide into the hole or cuts at the recommended rate by the manufacturer
- reapply herbicide when the first application is absorbed into the plant.

Treatment of exotic tree species often leads to a high percentage of exotic species recruitment as a result of increase light availability to a large dormant exotic seed bank. As a result, secondary works should be scheduled prior stem injection or frilling.

Spraying

Foliar herbicide application is an option for the control of shrubs, herbs and grasses. However, due to the environmental values of the site, it is recommended that herbicide usage is minimised and restricted to spot spraying of grasses and herbaceous weeds. No broad scale spraying is to occur. Woody weeds should be treated with either cut and paint or stem injection rather than spraying (see above).

Spraying should be used to target ground cover species including Wild Oats (*Avena fatua*) , St John's Wort (*Hypericum* perforatum), Pattersons curse (*Echium plantagineum*) and Saffron Thistle.

Spot spraying should minimise off-target spray impacts to native species. Spraying can be conducted with a small volume hand operated backpack sprayer. When applying the foliar spray technique the following must be adhered to:

- only spray designated areas to avoid off target damage
- ensure that when spraying the whole plant is treated (100% foliar cover)
- only spray healthy and actively growing plants to ensure effective uptake of herbicide
- do not spray in windy conditions, excessively hot conditions, if plants are heavy with dew, or if rain is expected within four hours
- consider use of selective herbicides to minimise off-target kill, for example a monocot selective herbicide could be used for grassy weeds to minimise the risk of off-target damage to adjacent native plants.

3.2.4.1 Mechanical / physical removal

Hand removal or cultivation with small tools aims to remove and destroy the existing plants and prevent the plants from setting seed. Therefore, the timing of hand removal and cultivation is important as well as the technique. Hand removal and cultivation is best carried out before the plant sets seed, or if the plant is seeding, the fruits must be bagged and removed from site. Different cultivation methods may kill the existing plant depending on whether or not the plant can sucker and reproduce vegetatively, in which case the roots, tubers, and corms must be controlled as well as the stems (Ensbey and Johnson, 2009).

Biomass which does not contain propagules is able to be rafted (kept off the ground to prevent re-rooting) and left on site to decompose. This ensures soil and nutrients are not removed from the study unnecessarily. Vegetative matter which reproduce vegetatively and propagules from seeding plants require disposal or destruction. These species can be removed from site and disposed of a waste disposal centre equipped to handle green waste.

Hand weeding would be a useful method to utilise within sensitive areas to avoid off-target spray death. Species suitable for physical removal include Great Mullein (*Verbascum thapsus*), Prickly lettuce (*Lactuca serriola*), and Shortpod mustard *(Hirschfeldia incana).*

3.2.5 Habitat management

Rubbish bins should be located outside the retained vegetation areas and area regularly monitored and cleaned up of rubbish (including tree hollows and nest boxes). Opportunities for limiting litter generation in this area should be implemented including preventing eating in these areas.

Wood collection should be avoided except where required for bushfire hazard management.

Rocks within the area should be retained and left undisturbed.

Where tree removal is required for safety or bushfire management, the clearing protocol provided in Appendix F should be followed.

3.3 Educational and community engagement opportunities

Retained areas of native vegetation within the campus provide an opportunity for the school and wider to community to engage in recreation in nature, educational activities and conservation activities including:

- environmental science classes including involvement in monitoring activities
- outdoor learning opportunities, classes, story time, yarning
- nest box design and build in woodwork classes
- active restoration and management such as planting activities.

4 Monitoring, review, and improvement

4.1 Monitoring

The success of management actions should be monitored as part of this plan to assess its effectiveness and to determine the need for amendments or otherwise to the plan. The monitoring program should assess the effectiveness of the management actions in each management zone, focussing on the ecological values of these zones.

General inspections of the study area should also be conducted in addition to formal monitoring to enable opportunistic detection issues such as weed outbreaks, pest species, erosion, and disturbance. Identification of inappropriate management actions and options for improvement can also be determined through a general site inspection.

4.2 Review and improvement

Continual improvement of this plan will be achieved by the ongoing evaluation of environment management performance against the proposed mitigation and management strategies, environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continual improvement process will be designed to:

- identify areas of opportunity for improvement of environmental management and performance
- determine the cause or causes issues
- develop and implement a plan of corrective and preventative action to address
- verify the effectiveness of the corrective and preventative actions
- document any changes in management resulting from process improvement.

4.3 Reporting

Reporting of the outcomes of management actions is important in ensuring their effectiveness. Details of management actions undertaken within the study area should be recorded along with any subsequent outcomes.

All workers and contractors should report on all management actions completed. This information should include details of the area worked, the type of work carried out and any problems encountered.

A management and monitoring report should be prepared annually. The report should include details of management activities over the past year, any notable changes in condition from previous year's monitoring results, before and after photographs, and management recommendations for the coming year. This will allow for adaptive management whereby management activities and their outcomes can be continually assessed and improved to ensure the longevity of the biodiversity values within the study area.

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Appendix A

Species recorded

A1 Flora species recorded

Exotic	Family	Genus	Species name	Common name
	Sinopteridaceae	*Cheilanthes*	*austrotenuifolia*	Rock Fern
*	*Poaceae*	*Dactylis*	*glomerata*	Cocksfoot
	Poaceae	*Eragrostis*	*benthamii*	Lovegrass
	Poaceae	*Rytidosperma*	*tenuius*	Purplish Wallaby-grass
	Poaceae	*Austrostipa*	spp.	Speargrass
	Poaceae	*Bothriochloa*	*macra*	Red-leg Grass
*	*Poaceae*	*Bromus*	*hordeaceus*	Bull Grass
	Poaceae	*Elymus*	*scaber*	Common Wheat-grass
*	*Poaceae*	*Lolium*	*perenne*	Perennial Ryegrass
	Poaceae	*Themeda*	*triandra*	Kangaroo Grass
	Asteraceae	*Chrysocephalum*	*apiculatum*	Golden Everlasting
*	*Asteraceae*	*Hypochoeris*	*radicata*	Catsear
*	*Asteraceae*	*Onopordum*	*acanthium*	Scotch Thistle
*	*Asteraceae*	*Taraxacum*	*officinale*	Dandelion
*	*Clusiaceae*	*Hypericum*	*perforatum*	St Johns Wort
*	*Fabaceae*	*Medicago*	*lupulina*	Black Medic
*	*Fabaceae*	*Trifolium*	*arvense*	Haresfoot Clover
	Myrtaceae	*Eucalyptus*	*rubida*	Candlebark
	Myrtaceae	*Eucalyptus*	*stellulata*	Black Sallee
*	*Plantaginaceae*	*Plantago*	*lanceolata*	Ribwort Plantain
	Plantaginaceae	*Plantago*	*varia*	Variable Plantain
	Rosaceae	*Acaena*	*ovina*	Australian Sheep's Burr
*	*Rosaceae*	*Rosa*	*rubiginosa*	Briar Rose
*	*Rosaceae*	*Rubus*	*fruticosus agg.*	Blackberry
*	*Scrophulariaceae*	*Verbascum*	*thapsus*	Great Mullein

A2 Fauna species recorded

Exotic	Species name	Common name
Birds		
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Corvus coronoides	Australian Raven
	Corcorax melanorhamphos	White-winged Chough
	Eolophus roseicapilla	Galah
	Falco cenchroides	Nankeen Kestrel
	Grallina cyanoleuca	Magpie-lark
	Gymnorhina tibicen	Australian Magpie
	Haliastur sphenurus	Whistling Kite
	Hirundo neoxena	Welcome Swallow
	Lichenostomus chrysops	Yellow-faced Honeyeater
	Malurus cyaneus	Superb Fairywren
	Melithreptus brevirostris	Brown-headed Honeyeater
	Ocyphaps lophotes	Crested Pigeon
	Pachycephala rufiventris	Rufous Whistler
	Pardalotus striatus	Striated Pardolote
	Petrochelidon nigricans	Tree Martin
	Platycercus elegans	Crimson Rosella
	Rhipidura albiscapa	Grey Fantail
	Rhipidura leucophrys	Willie Wagtail
*	*Turdus merula*	Blackbird
Mammals		
	Chalinobus morio	Chocolate Wattled Bat
	Macropus giganteus	Eastern Grey Kangaroo
*	*Oryctolagus cuniculus*	European rabbit

Appendix B

Vegetation plot data

			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot 3	3/06/2021		**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
			27	**16**	3	1	4	7	0	1	**11**	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			145.7	**97.9**	40.4	1	45.3	11.1	0	0.1	**47.8**	0.2
Plantago lanceolata	1	100	EX								1	
Trifolium arvense	1	100	EX								1	
Salvia coccinea	45	1000	EX								45	
Echium plantagineum	0.1	1	EX								0.1	
Dactylis glomerata	0.1	1	EX								0.1	
Hirschfeldia incana	0.1	1	EX								0.1	
Hypochaeris radicata	0.1	10	EX								0.1	
Verbascum thapsus	0.1	10	EX								0.1	
Verbascum virgatum	0.1	10	EX								0.1	
Chrysocephalum apiculatum	10	200	FG					10				
Acaena ovina	0.4	50	FG					0.4				
Ammobium alatum	0.1	1	FG					0.1				
Hydrocotyle laxiflora	0.3	20	FG					0.3				
Senecio spp.	0.1	2	FG					0.1				
Geranium solanderi	0.1	10	FG					0.1				
Oxalis perennans	0.1	1	FG					0.1				
Themeda triandra	0.1	1	GG				0.1					
Austrostipa spp. (nrm)	45	1000	GG				45					
Eragrostis spp. (nrm)	0.1	5	GG				0.1					
Panicum effusum	0.1	1	GG				0.1					
Acetosella vulgaris	0.1	1	HT									0.1
Hypericum perforatum	0.1	1	HT									0.1
Desmodium varians	0.1	10	OG							0.1		
Bossiaea buxifolia	1	10	SG			1						
Eucalyptus rubida	30	20	TG		30							
Eucalyptus pauciflora	10	5	TG		10							
Acacia melanoxylon	0.4	1	TG		0.4							

			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot 3A	21/04/2022		**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
			26	**16**	2	1	7	6	0	0	**10**	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			94.7	**92.7**	6	1	65	20.7	0	0	**2.5**	0.2
Plantago lanceolata	1	100	EX								1	
Trifolium arvense	0.5	70	EX								0.5	
Salvia verbenaca	0.1	1	EX								0.1	
Echium plantagineum	0.1	1	EX								0.1	
Dactylis glomerata	0.2	5	EX								0.2	
Bothriochloa macra	1	50	GG				1					
Hypochaeris radicata	0.1	10	EX								0.1	
Verbascum thapsus	0.2	20	EX								0.2	
Rytidosperma spp.	2	100	GG				2					
Chrysocephalum apiculatum	20	200	FG					20				
Acaena ovina	0.1	10	FG					0.1				
Ammobium alatum	0.1	1	FG					0.1				
Hydrocotyle laxiflora	0.1	2	FG					0.1				
Elymus scaber	0.5	100	GG				0.5					
Geranium solanderi	0.3	30	FG					0.3				
Wahlenbergia multicaulis	0.1	4	FG					0.1				
Themeda triandra	1	100	GG				1					
Austrostipa scabra	40	1000	GG				40					
Anagallis arvensis	0.1	5	EX								0.1	
Panicum effusum	0.5	20	GG				0.5					
Acetosella vulgaris	0.1	100	HT									0.1
Hypericum perforatum	0.1	1	HT									0.1
Bossiaea buxifolia	1	10	SG			1						
Eucalyptus rubida	5	20	TG		1							
Eucalyptus pauciflora	20	5	TG		5							
Rytidosperma pallidum	0.5	100	GG				20					

			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot 5	3/06/2021		**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
			25	**15**	2	0	3	10	0	0	**10**	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			94	**82.9**	20	0	61	1.9	0	0	**11.1**	0.4
Plantago lanceolata	10	200	EX								10	
Salvia coccinea	0.1	20	EX								0.1	
Verbascum thapsus	0.1	1	EX								0.1	
Echium plantagineum	0.1	10	EX								0.1	
Trifolium arvense	0.1	10	EX								0.1	
Potentilla spp.	0.1	10	EX								0.1	
Hirschfeldia incana	0.1	10	EX								0.1	
Hypochaeris radicata	0.1	1	EX								0.1	
Geranium solanderi	0.1	20	FG					0.1				
Oxalis perennans	0.1	10	FG					0.1				
Vittadinia spp.	0.1	10	FG					0.1				
Swainsona behriana	0.1	1	FG					0.1				
Einadia nutans	0.1	10	FG					0.1				
Dichondra sp. A	0.1	20	FG					0.1				
Asperula conferta	0.1	20	FG					0.1				
Acaena ovina	0.1	2	FG					0.1				
Chrysocephalum apiculatum	1	100	FG					1				
Cymbonotus lawsonianus	0.1	2	FG					0.1				
Austrostipa spp. (nrm)	40	1000	GG				40					
Themeda triandra	20	100	GG				20					
Panicum effusum	1	50	GG				1					
Hypericum perforatum	0.1	10	HT									0.1
Cotoneaster spp.	0.3	1	HT									0.3
Eucalyptus rubida	10	1	TG		10							
Eucalyptus pauciflora	10	12	TG		10							

			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot 5A	21/04/2022		**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
			25	**14**	2	0	5	7	0	0	**11**	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			79.7	**68.3**	14	0	51.7	2.6	0	0	**11.4**	0.5
Plantago lanceolata	10	300	EX								10	
Salvia verbenaca	0.1	30	EX								0.1	
Verbascum thapsus	0.1	6	EX								0.1	
Echium plantagineum	0.2	5	EX								0.2	
Trifolium arvense	0.1	10	EX								0.1	
Potentilla recta	0.1	15	EX								0.1	
Hirschfeldia incana	0.1	10	EX								0.1	
Hypochaeris radicata	0.1	4	EX								0.1	
Geranium solanderi	0.1	20	FG					0.1				
Poa meionectes	0.5	40	GG				0.5					
Enneapogon nigricans	0.2	10	GG				0.2					
Malva neglecta	0.1	2	EX								0.1	
Einadia nutans	0.1	5	FG					0.1				
Dichondra sp. A	0.1	20	FG					0.1				
Asperula conferta	0.1	10	FG					0.1				
Acaena ovina	0.1	3	FG					0.1				
Chrysocephalum apiculatum	2	250	FG					2				
Cymbonotus lawsonianus	0.1	4	FG					0.1				
Austrostipa spp.	35	1000	GG				35					
Themeda triandra	15	100	GG				15					
Panicum effusum	1	50	GG				1					
Hypericum perforatum	0.1	8	HT									0.1
Cotoneaster spp.	0.4	1	HT									0.4
Eucalyptus rubida	8	1	TG		8							
Eucalyptus pauciflora	6	12	TG		6							

Appendix C

Species recommended for planting

Species	Growth form
Acacia melanoxylon	Tree
Eucalyptus pauciflora	Tree
Eucalyptus rubida	Tree
Eucalyptus stellulata	Tree
Austrostipa bigeniculata	Grass
Austrostipa scabra	Grass
Bothriochloa macra	Grass
Carex inversa	Grass
Chloris truncata	Grass
Chloris ventricosa	Grass
Enneapogon nigricans	Grass
Eragrostis brownii	Grass
Eragrostis setifolia	Grass
Panicum effusum	Grass
Poa labillardierei	Grass
Poa meionectes	Grass
Poa sieberiana	Grass
Rytidosperma pallidum	Grass
Rytidosperma tenuius	Grass
Themeda triandra	Grass
Acaena ovina	Forb
Ajuga australis	Forb
Ammobium alatum	Forb
Asperula conferta	Forb
Calotis scabiosifolia	Forb
Chrysocephalum apiculatum	Forb
Crassula sieberiana	Forb
Cullen microcephalum	Forb
Cymbonotus lawsonianus	Forb
Einadia nutans	Forb
Epilobium billardierianum	Forb
Geranium solanderi	Forb
Hydrocotyle laxiflora	Forb

Species	Growth form
Oxalis perennans	Forb
Pseudognaphalium luteoalbum	Forb
Rumex brownii	Forb
Swainsona behriana	Forb
Swainsona monticola	Forb
Vittadinia muelleri	Forb
Wahlenbergia multicaulis	Forb

Appendix D

Weed and pathogen control methodology

D1 Weed and pathogen control methodology

Weeds within the site would be controlled according to control plans and measures recommended in the *NSW Weed Control Handbook* (DPI 2018). If weeds or pathogens are introduced to the site by the project, the aim would be eradication from the site.

D1.1 Manual control

- Weeds requiring hand or mechanical removal, including contaminated topsoil, would require disposal by encapsulation (deep burying) or to an approved waste management facility.
- Carry out mechanical means of control (such as mowing or slashing) where feasible in proximity to waterways and aquatic environments.
- Machinery involved in weed management activities require deep cleaning to remove any plant material or soil, prior to commencement of construction.

D1.2 Chemical (pesticide) control

- Only registered pesticides should be used for their registered use..
- Avoid applying pesticides:
  - on hot days when plants are stressed
  - after the seed has set
  - within 24 hours of rain or when rain is imminent
  - when winds will cause drift of pesticides into non-target areas.
- Keep a record of pesticide application. This must be maintained by the contractor and must include the following:
  - who applied the pesticide
  - date of pesticide application
  - details of pesticide used (full product names)
  - where the pesticide was applied (to what weed and in what location)
  - amount of pesticide used (total amount use, rate of application, area covered)
  - weather conditions during pesticide application.

D1.3 Minimising spread of weeds and pathogens

The following three steps should be followed to reduce spread of weeds and/or pathogens

1 **Check**

- Check personnel, clothing, footwear, backpacks and equipment for soil, plant material and other debris.
- Check exterior and interior of vehicles and machinery for soul, plant material and other debris.

2 **Clean**

- Remove all soil, plant material and other debris using a brush and clean water.
- If dirty, wash hands with soap and water.
- Remove seeds from clothing, footwear, tools and equipment by hand. Seeds that are difficult to remove can sometimes be scraped off clothing with a sharp tool but use caution. Where possible, have a co-worker double-check that you have removed all seeds.

- Remove all soil, plant material and other debris from the interior of vehicle and machinery using vacuum or dustpan and brush. Place debris in a bag and dispose of at an offsite licensed facility.
- If Myrtle Rust is detected on site, disinfect equipment and exterior of vehicles with disinfectant.

3 **Dry**

- Where practical, ensure hands, clothing, footwear, vehicles, machinery and equipment are dry before proceeding.

D1.4 Disposal of weeds

- All weed plant material and topsoil containing weed plant material should be disposed of at an offsite licensed facility.
- Securely cover loads of weed-contaminated material to prevent weed plant material falling or blowing off vehicles between site and disposal location.

Appendix E

Arrive clean – leave clean

Australian Government

Department of the Environment

Arrive Clean, Leave Clean

Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems

The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

Images
(front cover) John Baker and the Department of the Environment
(back cover) Nick Rains

Arrive Clean, Leave Clean

Help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems

When working in the bush, it's important to remember:

- Any activity in the bush has the potential to spread invasive species, including environmental restoration activities such as weeding and revegetation.
- Revegetation carries a particularly high risk as it involves the introduction of plants and soil. This risk increases through the use of dirty tools and equipment or plants and materials that are not certified to be free of pathogens and weeds.
- Clothing, hats, footwear, tools, equipment, machinery and vehicles can transport invasive species like *Phytophthora cinnamomi*, myrtle rust (*Puccinia psidii*), insects and weeds into our bushland.
- Even your skin and hair, as well as glasses, phones, watches, wallets and other pocket items can carry myrtle rust spores.
- Once these pathogens and weeds invade our bushland, eradication is often impossible. Follow these guidelines to help prevent their spread.

Photos: (left) Wildflowers on Mondurup Peak, Stirling Range before Phytophthora dieback (Robert Olver), (right) Mondurup Peak, Stirling Range after Phytophthora dieback (Department of Parks and Wildlife WA)

Phytophthora cinnamomi

What is *Phytophthora cinnamomi*?

Phytophthora cinnamomi is a soil-borne plant pathogen that attacks the roots of susceptible plants—destroying the root system and reducing the ability of the plant to absorb water and nutrients. This causes symptoms referred to as 'dieback' which can lead to plant death.

Under favourable conditions *Phytophthora* spp. can spread easily and quickly, destroying plants and plant communities. These guidelines to help minimise the risk of spreading *Phytophthora cinnamomi* also apply to other species of *Phytophthora* present in Australia, as the management of those species is similar.

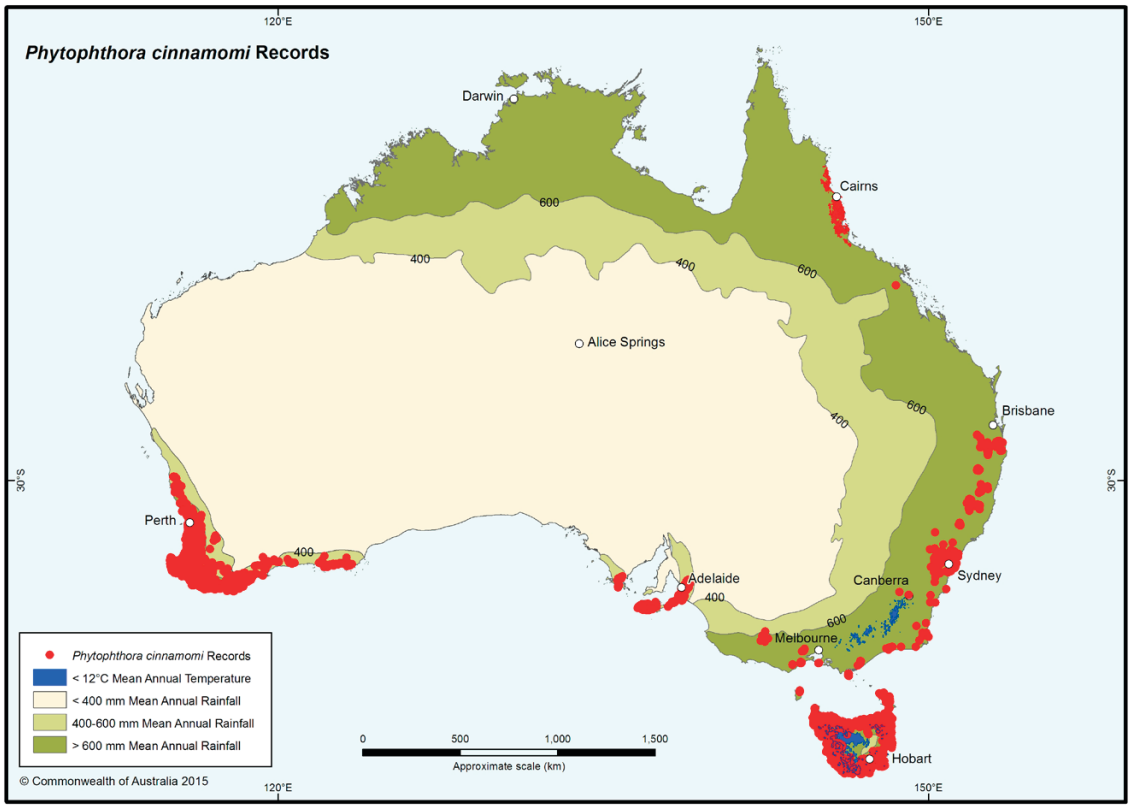
Photo: Impact of *Phytophthora cinnamomi* at Dwellingup, WA (Department of Parks and Wildlife WA)

What does *Phytophthora cinnamomi* threaten?

Thousands of Australian native plant species are susceptible to *Phytophthora cinnamomi*, and several of those species may be at risk of extinction due to its impacts. The dramatic impact of *Phytophthora* spp. infestations on plant communities may also lead to major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources.

Where is *Phytophthora cinnamomi* found?

Phytophthora cinnamomi thrives in warm, moist conditions with temperatures between 15°C and 30°C, and with rainfall greater than 400 millimetres a year. Its impact is greatest in Western Australia, Victoria, Tasmania and South Australia. The Northern Territory remains the only jurisdiction unaffected, as its environmental conditions are generally unfavourable to the pathogen.



Map: *P. cinnamomi* isolations, records of impact and broad climatic envelope of *P. cinnamomi* susceptibility in Australia.

This map was published in the *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi* in 2014. It does not represent the precise distribution of the pathogen in Australia and is for general information only.

How does *Phytophthora cinnamomi* spread?

Phytophthora cinnamomi spreads through soil, water and organic matter. It can remain dormant for long periods during dry weather and is impossible in most situations to eradicate from infested areas, which means limiting further spread is critical. Any activity that moves soil, water or plant material can spread the disease. This includes soil on tools, footwear and vehicles.

To help to prevent the spread of this plant disease:

- arrive clean, leave clean: ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of mud, soil and organic matter before entering and exiting bushland
- ensure any soil, plants or other materials entering the site are certified free of weeds and pathogens. You can do this by purchasing from Nursery Industry Accreditation Scheme Australia (NIASA) accredited businesses, and by ensuring that materials conform to Australian Standards—for example, *AS3743–2003 Potting mixes* or *AS4454–2012 Composts, soil conditioners and mulches*.

Myrtle rust

What is myrtle rust?

Myrtle rust is a disease caused by the fungus *Puccinia psidii*, initially identified as *Uredo rangelii*. It affects trees and shrubs in the Myrtaceae plant family—attacking young, soft, actively-growing leaves, shoot tips and young stems, as well as fruits and flower parts.

The first signs of rust infection are tiny raised spots or pustules on infected leaves. After a few days, the pustules erupt into distinctive bright yellow spore masses. Left untreated, the disease can cause deformed leaves, heavy defoliation of branches, dieback, stunted growth and plant death.

Photo: Myrtle rust pustules on scrub turpentine (*Rhodamnia rubescens*) fruit (R.O. Makinson)

What does myrtle rust threaten?

Plants susceptible to myrtle rust are those in the Myrtaceae family, which includes bottle brush (*Callistemon* spp.), tea tree (*Melaleuca* spp. and *Leptospermum* spp.), lilly pillies (*Syzygium* spp.) and eucalypts (*Eucalyptus* spp., *Angophora* spp. and *Corymbia* spp.). The Myrtaceae family in Australia is ecologically important, accounting for about 10% of Australia's native flora, with many Australian plant communities dominated by myrtaceous species.

Knowledge of the impacts of myrtle rust on Australian biodiversity is still limited. Myrtle rust infection may cause significant mortality among younger plants and therefore reduce the number of plants capable of maturing and reproducing. This may contribute to the decline of species, including threatened species, leading to potential impacts on the structure and function of ecosystems dependent on Myrtaceae. At the time of writing, nearly 350 native species are known to be susceptible to myrtle rust infection, some severely. The host list (see **References and resources** below) is expected to grow. However, all Myrtaceae are potentially susceptible and potential hosts for the disease.

Photo: Myrtle rust pustules on scrub turpentine (*Rhodamnia rubescens*) leaves (R.O. Makinson)

Where is myrtle rust found?

Myrtle rust was first detected in Australia in 2010 on the New South Wales central coast. It is now established along the east coast of Australia from southern New South Wales to far north Queensland, mostly east of the Great Escarpment. It is also present in Victoria, mainly at production nurseries and wholesale outlets in and around metropolitan Melbourne. The first detection of myrtle rust in Tasmania was in February 2015 at a property near Burnie on the north-west coast. At the time of writing, myrtle rust has not been detected in the Australian Capital Territory, the Northern Territory, South Australia, Western Australia or on Lord Howe Island or Christmas Island, but moister regions and vegetation types in all these jurisdictions are at risk of myrtle rust establishment. Domestic import restrictions apply for non-infested jurisdictions.

How does myrtle rust spread?

Myrtle rust spores can spread easily via contaminated clothing, hats, footwear, equipment or vehicles. It can also be spread by infected plant material, insects and other animals, or the wind. Even your skin and hair, as well as watches, wallets and other pocket items can carry myrtle rust spores. It is impossible to eradicate myrtle rust from infested bushland, so limiting further spread is critical.

To help to prevent the spread of myrtle rust:

- arrive clean, leave clean:
  - Wash all clothing, hats and gloves between site visits—using warm or hot machine wash with detergent.
  - Ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of mud, soil and organic matter before entering and exiting bushland.
  - Use a solution of 70% ethanol or methylated spirits in 30% water to disinfect items that may be contaminated (including hats, footwear, tools, equipment, machinery, vehicles, walking sticks, tent pegs, phones, glasses, watches, wallets and other personal items).
- ensure any soil, plants or other materials entering the site are certified free of weeds and pathogens. You can do this by purchasing from Nursery Industry Accreditation Scheme Australia (NIASA) accredited businesses, and by ensuring that materials conform to Australian Standards—for example, *AS3743–2003 Potting mixes* or *AS4454–2012 Composts, soil conditioners and mulches*.
- monitor plants carefully as nurseries and plant maintenance facilities may provide ideal conditions for myrtle rust (see Australian Nursery Industry myrtle rust management plan 2012 in **References and resources** below).

Photo: Myrtle rust spores on clothing after chance contact with an infected shrub (R.O. Makinson)

Weeds

What is a weed?

A weed is any plant that has a negative impact on our economy, environment, health and surroundings. Weeds are generally species which are not native to Australia. However, some native species growing outside of their native range can also become invasive. Many weeds are species which have escaped cultivation and become naturalised—that is, they have begun reproducing without human assistance.

What do weeds threaten?

Many weed species are able to invade natural areas and cause disturbance to bushland ecosystems. They can alter plant and animal community composition, cause changes to nutrient cycles, change natural fire regimes, outcompete native species for resources, impact threatened species and threaten biodiversity.

Where are weeds found?

The diversity of weed species recorded in Australia means that most terrestrial and aquatic ecosystems are vulnerable to weed invasion. Weeds have characteristics that help them grow well in many environments—from our towns and cities through to our coasts, deserts and alpine areas.

How do weeds spread?

Weeds typically spread easily by producing large numbers of seeds or reproducing vegetatively. They are often excellent at surviving and reproducing in disturbed environments and are commonly the first species to colonise and dominate in these conditions. Seeds and other plant material can spread into natural and disturbed environments via wind, animals, waterways and people (including contaminated clothing, hats, footwear, tools, equipment, machinery and vehicles).

To help to prevent the spread of weeds:

- arrive clean, leave clean: ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of weed seeds, mud, soil and organic matter before entering and exiting bushland.
- ensure any soil, plants or other materials entering the site are certified free of weeds and pathogens. You can do this by purchasing from Nursery Industry Accreditation Scheme Australia (NIASA) accredited businesses, and by ensuring that materials conform to Australian Standards—for example, *AS3743–2003 Potting mixes* or *AS4454–2012 Composts, soil conditioners and mulches*.
- if revegetating, select indigenous plants that occur naturally in your local area. Undertake weed control work well in advance to minimise the weed seed bank before you start planting. At the very least, slash the flower heads of weed species before they go to seed.

Before beginning a project

Undertake a risk assessment:

- Identify any planned activities with the potential to spread pathogens and weeds. This includes movement of people, equipment, vehicles and materials to/from/through infected or potentially infected areas.
- Determine the project site's pathogen and weed risks through liaison with land managers (for example government agencies, traditional owners, Indigenous Protected Area managers etc.).
- Consult sources of advice and expertise for contingent risks (for example state/territory departments of primary industry, pathology/weed identification services at botanic gardens).

Develop a hygiene management plan:

- Use your risk assessment to determine which hygiene procedures are necessary to prevent the spread of pathogens and weeds, and how and where to apply them.
- Ensure all materials taken onto the site—such as seedlings, mulch, soil, gravel, rock and sand—are certified free of weeds and pathogens. You can do this by purchasing from Nursery Industry Accreditation Scheme Australia (NIASA) accredited businesses, and ensuring materials conform to Australian Standards—for example, *AS3743–2003 Potting mixes* or *AS4454–2012 Composts, soil conditioners and mulches*.
- Create a checklist of hygiene procedures for project managers and participants to use.

Consider the following during project planning:

- Limit the number of sites you visit to one per day. If this is not possible, visit clean sites before infested sites.
- Provide training or briefing to all participants on the risks of spreading pathogens and weeds and risk mitigation strategies. If available, provide maps to participants with the location of infested and clean areas and wash-down points.
- Ensure that rigorous inspections and quality checks are built into the management of the entire supply chain for materials and plant material when carrying out revegetation or translocation activities where pathogens are a potential concern (see Australian Nursery Industry myrtle rust management plan 2012 in **References and resources** below). This is particularly important when working in areas where threatened species and threatened ecological communities are found.
- Where there is the risk of Phytophthora dieback (a plant disease caused by the pathogen *Phytophthora cinnamomi*), schedule activities for the dry season as it spreads more easily in wet and muddy conditions. If necessary, postpone activities and reschedule for a day when the soil is dry and doesn't stick to footwear, equipment and tools.
- If working in a weedy area, try to schedule activities for when the weed species are not in seed.
- Avoid taking vehicles into bushland. If a vehicle is necessary, ensure it is clean and dry on entry and exit, and restrict movement to hard, dry surfaces, formed roads and designated parking areas—avoid driving through puddles and mud. Where myrtle rust is a risk, avoid parking near myrtaceous plants—for example bottle brushes, tea trees, lilly pillies and eucalypts—and thoroughly clean vehicles inside and out between site visits.
- Avoid polystyrene boxes and tools with wooden or cracked handles. Use equipment that can be cleaned easily and thoroughly.
- Minimise the number of personal items you carry. Where myrtle rust is a risk, clean all items—such as GPS devices, glasses, phones, watches, wallets and other items kept in your pockets—with alcohol wipes before entering and leaving sites.

One site per day

Before entering or leaving a site

- Be aware of what plants look like when infected with myrtle rust and Phytophthora dieback (see images above).
- Remove all weed seeds, mud, soil and organic matter from clothing, footwear, tools, equipment, machinery, vehicles, boxes, backpacks, walking sticks, tent pegs and anything else that touches plants or the ground. Stay as clean as possible while in the bush.
- If you are entering clean bushland or have come from an area that is infested with *Phytophthora* spp. or myrtle rust, ensure everything with you is cleaned and disinfected with a solution of 70% ethanol or methylated spirits in 30% water. This includes footwear, tools, equipment, machinery, vehicles, backpacks, walking sticks, tent pegs and personal items.

Disinfecting clothing, footwear, equipment and other personal items

i. Carry a hard brush and a spray bottle of disinfectant—made up of a solution of 70% ethanol or methylated spirits in 30% water. If you are able to carry more, assemble a simple hygiene kit—see Appendix A.

ii. Set up a wash-down area for participants to wash and dry their face and hands and clean their footwear before entering and exiting the site.

iii. To clean footwear, first use a hard brush or stick to remove as much mud, soil and organic matter as possible before disinfecting with a solution of 70% ethanol or methylated spirits in 30% water—applied through a spray bottle or a footbath.

iv. Seal all personal rubbish in a bag and spray the outside of the bag with a solution of 70% ethanol or methylated spirits in 30% water before responsible disposal offsite.

v. Collect all removed mud, soil and organic matter in a bag or bucket, and keep it out of clean bushland.

Disinfecting vehicles and machinery

i. Use a wash-down facility for vehicles and machinery if available, or wash-down on a hard, well-drained surface, for example a road, and on ramps if possible. See **References and resources** below for links to online wash-down guidelines.

ii. Pay particular attention to cleaning mud flaps and tyres.

iii. Dispose of wash-down water so that it drains back into a low area of the infested zone away from waterways. If this is not possible, empty it into a waste container for responsible disposal offsite.

iv. Don't allow wash-down water to drain into clean bushland.

v. Don't drive through wash-down water.

Photo: Wash-down point (Department of Parks and Wildlife WA)

Photo: Truck undercarriage wash-down (South Coast Natural Resource Management, WA)

Additional considerations where myrtle rust is present

- Disposable overalls and caps may be worn over clothing upon entering a site, and removed when leaving the site. However, in high-risk cases, also shower and change into clean clothes (including hats, gloves and footwear).
- Wash all clothing, hats and gloves between site visits using warm or hot machine wash with detergent.
- Do **NOT** remove any plant material from sites infested with myrtle rust. Dispose of plant waste by burial on site. If this is not possible, seal the waste in a plastic bag, seal the bag in a second bag and spray the outside of the bag with a solution of 70% ethanol or methylated spirits in 30% water before responsible disposal offsite.

Revegetation

Where weeds and other disturbances are controlled, natural regeneration can assist the bushland to revegetate over time. Where revegetation activities are necessary, the following steps will help stop the spread of invasive species:

- Arrive clean, leave clean—ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of weed seeds, mud, soil and organic matter before entering and exiting bushland.
- Liaise with land managers and relevant plant specialist stakeholders (for example Australian Network for Plant Conservation, Greening Australia, Landcare groups, botanic gardens, seed banks etc.) to collaborate on the revegetation strategy.
- Select indigenous plants that occur naturally in your local area wherever possible.
- Avoid species with the potential to become weeds of the environment or agriculture.
- If the site is infested with *Phytophthora* spp. or myrtle rust, select species resistant to the disease, or seed from more tolerant individuals of susceptible plant species.
- Consult the Australian Network for Plant Conservation translocation guidelines 2004 (see **References and resources** below). These focus on threatened species but many of the techniques and considerations also apply to non-threatened species.
- Consider a combination of revegetation techniques such as seed production areas, direct sowing and enhancement of natural sites to assist natural regeneration. Many of these will be lower risk than the use of seedlings.
- If using seedlings, purchase them from a supplier that can guarantee high standards of hygiene—such as NIASA-accredited businesses. For added certainty, ensure the supplier allows testing of a random sample of seedlings and soil for *Phytophthora* spp. 3–6 weeks before acceptance of the seedlings. If the pathogen is present, the batch must be rejected.
- Check plants on receipt and at intervals during any holding period. Seek specialist advice if any suspect symptoms appear (for example coloured pustules, leaf necrosis).
- If propagating, maintain high standards of hygiene—see the section on propagation below.
- Plant when the soil is moist but not wet.
- Use mains or disinfected water to irrigate plants.
- If you are aware of a plant pathogen infestation, begin revegetation in the clean part of the bushland before moving to the infested area. Ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are clean before leaving the infested area.

Weed management

When conducting weed management activities, the following steps will help stop the spread of invasive species:

- Arrive clean, leave clean—ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of weed seeds, mud, soil and organic matter before entering and exiting bushland.
- Schedule weeding for dry soil conditions where possible.
- Use techniques that minimise soil disturbance. For example, mow or slash or use an appropriate herbicide in preference to digging or grading.
- Ensure transport and disposal of plant material does not introduce weeds to new areas. In sites free of myrtle rust, place weeds into a bag or container immediately for removal. Always cover trailers when transporting plant material to prevent anything from falling off. Some weeds can reproduce vegetatively—from leaves, bulbs or other plant material—while others use seeds, and some may require heat or cold treatment before composting, mulching or disposal.
- If a site is infested with myrtle rust, do **NOT** remove any plant material. Dispose of plant waste by burial on site. If this is not possible, seal the waste in a plastic bag, seal the bag in a second bag and spray the outside of the bag with a solution of 70% ethanol or methylated spirits in 30% water before responsible disposal offsite.
- If you are aware of a plant pathogen infestation, begin weeding in the clean part of the bushland before moving to the infested area. Clean all clothing, hats, footwear, tools, equipment, machinery and vehicles before leaving the infested area.

Propagation

The following steps will help stop the spread of invasive species during propagation activities:

- Ensure all benches, equipment, pots and containers are clean and disinfected.
- While using implements such as cutting knives or secateurs, wash them regularly with a solution of 70% ethanol or methylated spirits in 30% water.
- Steam-air pasteurise soil mixes for 30 minutes at 60°C, or select materials that conform to Australian Standard *AS3743–2003 Potting mixes* or *AS4454–2012 Composts, soil conditioners and mulches*. These standards require the materials to be free from plant pathogens, pests, harmful chemicals and weeds.
- Avoid bringing soil on boots and equipment into the nursery areas.
- If possible, keep pots on raised wire-mesh benches at least 30 centimetres off the ground. Otherwise, keep them on free-draining blue metal.
- Keep the whole nursery area clean and free of dead plant material and rubbish.

References and resources—general

Guidelines for the translocation of threatened plants in Australia—Second edition	2004	Vallee L, Hogbin T, Monks L, Makinson B, Matthes M and Rossetto M; Australian Network for Plant Conservation, Canberra	https://www.anbg.gov.au/anpc/publications/translocation.html
Leave no trace Australia		Web resources	www.lnt.org.au/resources/biosecurity/bio-security.html www.lnt.org.au/resources/skills-ethics-series.html

References and resources—wash-down procedures

Vehicle and machinery checklists—clean-down procedures	2014	Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry; State of Queensland	https://www.daff.qld.gov.au/__data/assets/pdf_file/0011/58178/IPA-Cleandown-Procedures.pdf
Weed out the seeds—How to clean down your vehicle and machinery to help prevent the spread of weed seeds	2011	Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry; State of Queensland	https://www.youtube.com/watch?v=dTNDecjTVfI
A guide for machinery hygiene for civil construction	2011	Civil Contractors Federation, State of Victoria, Department of Primary Industries, Department of Sustainability and Environment, VicRoads and the Association of Land Development Engineers	www.civilcontractors.com/Uploads/files/LR%20CCF%20Machinery%20Hygiene%20Bklt%2040pp.pdf
Keeping it clean: A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens	2010	NRM South, Tasmania	dpipwe.tas.gov.au/Documents/15130802_52keepingitcleanspreadswe.pdf
Biosecurity videos		NRM South, Tasmania	www.nrmsouth.org.au/biosecurity/
Field hygiene kits for landholders or community groups in Tasmania—available for purchase		NRM South, Tasmania	Landholders www.nrmsouth.org.au/wp-content/uploads/2014/08/Biosecurity-kits-sales-flyer-2015-Landholders.pdf Community groups www.nrmsouth.org.au/wp-content/uploads/2014/08/Biosecurity-kits-sales-flyer-2015-community.pdf

References and resources—seed production areas

Sowing seeds: bridging the gap between ex situ collections and reintroduction	2012	Guja L, North T, Taylor D and McAuliffe J; Australasian Plant Conservation 21(3)	www.anbg.gov.au/anpc/apc/21-3_guja.html
Developing seed production areas for native plants—Corangamite region guidelines	2008	Heyes S, Butler M, Gartlan C and Ovington A; Corangamite Seed Supply and Revegetation Project	www.florabank.org.au/files/documents/seedproductionareas/Corangamite%20Seed%20Production%20Area%20Guidelines08%20P1.pdf
Introducing seed production areas: an answer to native seed shortages	2008	Vanzella B; Greening Australia	www.florabank.org.au/files/newsattachments/SPA%20handout_%20master%20GACR%20Bindi%20Vanzella%20March08.pdf

References and resources—*Phytophthora cinnamomi*

Managing Phytophthora dieback—Guidelines for local government	2000	Dieback Working Group	https://www.dwg.org.au/images/dieback_publications/Managing_Phytophthora_Dieback_guidelines.pdf
Managing Phytophthora dieback in bushland—A guide for landholders and community conservation groups	2008	Dieback Working Group	https://www.dwg.org.au/images/dieback_publications/Managing_Phytophthora_Dieback_in_Bushland.pdf
Resistant native plant species—A list of resistant native plant species from Western Australia from the Centre of Phytophthora Science and Management at Murdoch University		Dieback Working Group	https://www.dwg.org.au/images/dieback_publications/Western_Australian_Natives_Resistant.pdf
Susceptible native plant species—A list of susceptible native plants species from Western Australia from the Centre of Phytophthora Science and Management at Murdoch University		Dieback Working Group	https://www.dwg.org.au/images/dieback_publications/Western_Australian_natives_susceptible.pdf

Management of *Phytophthora cinnamomi* for biodiversity conservation in Australia: Part 1—A review of current management.	2005	O'Gara E, Howard K, Wilson B and Hardy GEStJ—a report by the Centre for Phytophthora Science and Management, Murdoch University, Western Australia funded by the Australian Government Department of the Environment and Heritage	www.environment.gov.au/biodiversity/invasive-species/publications/management-phytophthora-cinnamomi-biodiversity-conservation
Management of *Phytophthora cinnamomi* for biodiversity conservation in Australia: Part 2—National best practice guidelines. Appendix 1—*Phytophthora cinnamomi* Appendix 2—The rationale of current management options Appendix 3—Areas vulnerable to disesase caused by *Phytophthora cinnamomi* Appendix 4—The responses of native Australian plant species to *Phytophthora cinnamomi*	2005	O'Gara E, Howard K, Wilson B and Hardy GEStJ—a report by the Centre for Phytophthora Science and Management, Murdoch University, Western Australia funded by the Australian Government Department of the Environment and Heritage	www.environment.gov.au/biodiversity/invasive-species/publications/management-phytophthora-cinnamomi-biodiversity-conservation
Management of *Phytophthora cinnamomi* for biodiversity conservation in Australia: Part 3—Risk assessment for threats to ecosystems, species and communities: A review	2005	Wilson B, Howard K, O'Gara E and Hardy GEStJ—a report by the Centre for Phytophthora Science and Management, Murdoch University, Western Australia funded by the Australian Government Department of the Environment and Heritage	www.environment.gov.au/biodiversity/invasive-species/publications/management-phytophthora-cinnamomi-biodiversity-conservation
Management of *Phytophthora cinnamomi* for biodiversity conservation in Australia: Part 4—Risk assessment models for species, ecological communities and areas.	2005	Centre for Phytophthora Science and Management—a report by the Centre for Phytophthora Science and Management, Murdoch University, Western Australia funded by the Australian Government Department of the Environment and Heritage	www.environment.gov.au/biodiversity/invasive-species/publications/management-phytophthora-cinnamomi-biodiversity-conservation

Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*	2014	Australian Government Department of the Environment	www.environment.gov.au/resource/threat-abatement-plan-disease-natural-ecosystems-caused-Phytophthora-cinnamomi
Background: Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*	2014	Australian Government Department of the Environment	www.environment.gov.au/resource/threat-abatement-plan-disease-natural-ecosystems-caused-Phytophthora-cinnamomi
Response of selected South Australian native plant species to *Phytophthora cinnamomi*	2012	Kueh KH, McKay SF, Facelli E, Facelli JM, Velzeboer RMA, Able AJ, Scott ES	onlinelibrary.wiley.com/doi/10.1111/j.1365-3059.2012.02593.x/full
Infection of native plants by *Phytophthora cinnamomi*—key threatening process listing	2002	New South Wales Government Office of Environment and Heritage	www.environment.nsw.gov.au/determinations/PhytophthoraKTPListing.htm
Stamp out the spread of Phytophthora dieback		Royal Botanic Gardens Sydney	www.rbgsyd.nsw.gov.au/__data/assets/pdf_file/0008/106937/Phytophthora_brochure.pdf
Are you a carrier? Phytophthora dieback is a silent plant killer		Royal Botanic Gardens Sydney	www.rbgsyd.nsw.gov.au/__data/assets/pdf_file/0007/106936/Phytophthora_flyer.pdf
Management of *Phytophthora cinnamomi* in production forests	2009	Tasmanian Government Forest Practices Authority	www.fpa.tas.gov.au/__data/assets/pdf_file/0004/58054/Flora_technical_note_8_Phytophthora.pdf
Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects Guide 7: Pathogen management	2011	NSW Roads and Maritime Services	www.rms.nsw.gov.au/documents/about/environment/biodiversity_guidelines.pdf

References and resources—myrtle rust

Look out for myrtle rust	2010	New South Wales Department of Primary Industries	www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/364870/myrtle-rust-brochure.pdf
Identification of myrtle rust	2010	New South Wales Department of Primary Industries	www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/337374/identification-myrtle-rust.pdf
Preventing spread of myrtle rust in bushland	2010	New South Wales Department of Primary Industries	www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/362096/preventing-spread-Myrtle-Rust-bushland.pdf
New South Wales Department of Primary Industries myrtle rust resources page		New South Wales Department of Primary Industries	www.dpi.nsw.gov.au/biosecurity/plant/myrtle-rust/resources
Australian Nursery Industry myrtle rust management plan	2012	Nursery and Garden Industry Australia	www.ngia.com.au/Folder?Action=View%20File&Folder_id=135&File=Myrtle%20Rust%20Management%20Plan%202012%20Final%20V2.pdf
Myrtle rust—current information including national and international host lists; bibliography.	2014	The Australian Network for Plant Conservation	https://www.anbg.gov.au/anpc/resources/Myrtle_Rust.html
Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects Guide 7: Pathogen management	2011	NSW Roads and Maritime Services	www.rms.nsw.gov.au/documents/about/environment/biodiversity_guidelines.pdf
Current Biosecurity Threats		Biosecurity Tasmania, Department of Primary Industries, Parks, Water and Environment	dpipwe.tas.gov.au/biosecurity/current-biosecurity-threats

References and resources—weeds

Australian Weeds Strategy—A national strategy for weed management in Australia	2006	Natural Resource Management Ministerial Council, Australian Government Department of the Environment and Water Resources	www.environment.gov.au/biodiversity/invasive/weeds/publications/strategies/pubs/weed-strategy.pdf
Weeds in Australia web pages		Australian Government Department of the Environment	www.weeds.gov.au
Weeds of National Significance (WoNS) web pages		Australian Weeds Committee	www.weeds.org.au
Vehicle and machinery checklists—clean-down procedures	2014	Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry; State of Queensland	https://www.daff.qld.gov.au/__data/assets/pdf_file/0011/58178/IPA-Cleandown-Procedures.pdf
Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects Guide 6: Weed management	2011	NSW Roads and Maritime Services	www.rms.nsw.gov.au/documents/about/environment/biodiversity_guidelines.pdf

Appendix A

Example checklists

Risk assessment checklist

Determine all risks associated with the potential transfer of pathogens or weeds to/from/through the project site (consider all participants handling plant material and equipment, from collection to site through to on-site works and clean-up).

Liaise with the project site's land managers to determine the presence of:

☐ *Phytophthora* spp.

☐ Myrtle rust

☐ Weeds

Liaise with the project site's land managers to determine the presence of:

☐ Vulnerable native plant communities

☐ Species susceptible to *Phytophthora* spp. or myrtle rust

☐ Threatened species or communities listed under Commonwealth or state/territory legislation

Identify any planned activities with the potential to introduce or spread pathogens or weeds:

☐ Introduction of plant material to a site (seedlings, seeds, mulch etc.)

☐ Introduction of other materials to a site (soil, gravel, rock, sand etc.)

☐ Vehicle or machinery access to a site

☐ Any potential soil disturbance

Hygiene management plan checklist

To prevent the risks having an impact:

☐ Plan to visit only one site per day

☐ Schedule activities for the right conditions

☐ Use equipment that can be cleaned easily and thoroughly

☐ Minimise personal items that can carry pathogens

☐ Include training sessions so participants are aware of why hygiene is necessary, how to arrive clean, stay clean and leave clean

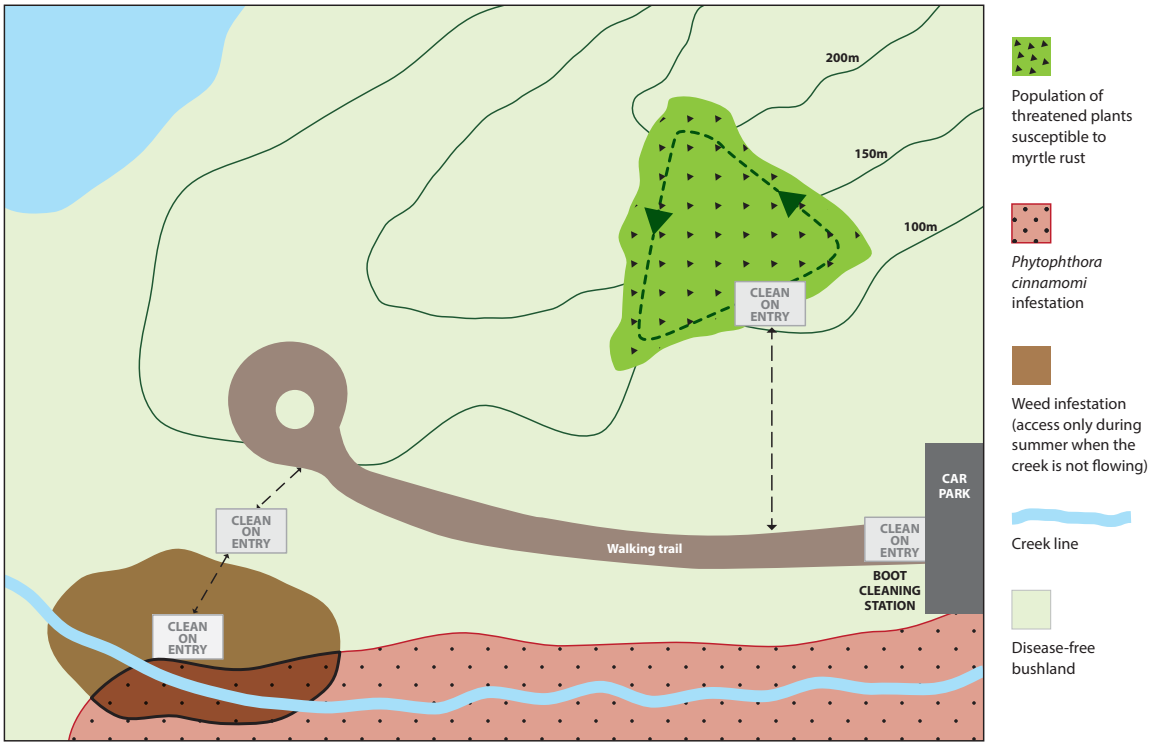
☐ Establish access controls including routes of access and timing on a management map

☐ Establish hygiene controls including hygiene procedures, hygiene infrastructure, clean on entry locations and wash-down points on a management map

☐ Maintain wash-down facilities and hygiene infrastructure

☐ Record and monitor site for any accidental spread of pathogens or weeds

Example hygiene management map



A large area within the project site is disease-free bushland, including a population of threatened plants susceptible to myrtle rust. This population must be monitored regularly during and after the project for any indications of disease.

There is an infestation of the weed arum lily (*Zantedeschia aethiopica*) limited to a small area on either side of the creek. Part of this area is also infested with *Phytophthora cinnamomi* which is present along much of the creek line. To avoid the spread of *Phytophthora cinnamomi*, all weed control activities should be scheduled during the dry season when the creek is not flowing.

'Clean on entry' access to the site is via a boot cleaning station at the car park entrance. From the walking trail there is one pathway of access to the population of threatened plants and another to the arum lily population. At both of these 'clean on entry' points there will be hygiene kits containing hard brushes, spray bottles of disinfectant and alcohol wipes.

Biosecurity hygiene kit: assemble a simple kit with the following items:

☐ Plastic tub with a lid (to carry items and to use as a footbath)

☐ Stiff brush

☐ Newspaper to cover the footwell of a vehicle (replace with clean newspaper regularly)

☐ Dustpan and brush; possibly also a long-handled broom

☐ Plastic bag for sweepings and dirty newspaper

☐ Drum of water and some disinfectant, for example a solution of 70% ethanol or methylated spirits in 30% water; or 20% household bleach (with 5% active ingredient) in 80% water; or quaternary ammonium disinfectant diluted according to manufacturer's directions.

☐ Spray bottle with a solution of 70% ethanol or methylated spirits in 30% water

☐ Alcohol wipes or gel for hands and personal items

Photo: Biosecurity hygiene kit (Department of Parks and Wildlife WA)

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Appendix F

Tree removal protocol

If tree removal is required for safety, the following protocol should be implemented to prevent injury and mortality of fauna.

The tree should be inspected for the presence of a hollow or nest. An experienced and licensed wildlife carer and/or ecologist will be present to capture and relocate fauna where required. The tree removal protocol as outlined below will be followed.

A chainsaw is preferable to heavy machinery for tree removal. The protocol depends on the whether the tree to be removed is a habitat tree (i.e., has hollow and/or nests) or lacks these features (non-habitat tree).

Non habitat tree removal

When vegetation, that may provide habitat for native fauna, is proposed to be removed the area will be surveyed immediately (proceeding night & day of clearing) prior to clearing, to:

- obtain updated information on fauna and fauna habitat resources present; and
- capture and relocate non-mobile fauna, such as reptiles and frogs and key habitat features such as active bird nests or scare animals away.

Following clearing, re-check after clearing to ensure no animals have become trapped or injured during clearing operations.

Habitat tree removal

Any habitat trees (hollow –bearing or with nests) proposed to be felled will be 'bumped and shaken' and remain for up to 24–48 hours or as per Ecologist(s) recommendations as to allow any potential fauna time to relocate from the tree.

When removing hollow-bearing trees:

- an ecologist/wildlife handler (spotter) should be present at each tree to be removed to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with plant operators
- the operator will be skilled in removing habitat trees and the two-stage clearing procedure. The ecologist will discuss the method of felling (i.e., orientation, equipment etc.) with the operator to ensure animal welfare is considered
- prior to clearing hollow-bearing trees, an excavator or loader is to hit the trunk as high up the tree as possible several times. Wait at least 30 seconds. Repeat this process several times
- where possible, habitat trees are to be knocked with an excavator bucket or other machinery used for clearing to create only enough disturbance to encourage any remaining fauna to move from the tree, or at least show themselves prior to felling. Excessive knocking of the tree must not take place
- the tree is to be left for several minutes before being felled as gently as possible
- once the hollow-bearing limb or hollow-bearing tree is on the ground, it will be inspected carefully by an ecologist and fauna would be captured, processed and, if healthy, relocated. before the next limb/tree is removed
- if taking the tree down in stages, remove non-hollow-bearing limbs first. Then remove hollow-bearing limbs.
- injured fauna will be taken to a local vet for treatment or WIRES or similarly-qualified and licensed personnel will be contacted to collect and treat any injured individuals.

Handling wildlife:

- direct contact with any wildlife should be avoided wherever possible
- fauna mortality as well as rescued and relocated fauna will be recorded
- if the animal is not injured or stressed, it may be released nearby in an area that is not to be disturbed by the Project construction, in accordance with the following:
  - sites identified as suitable release points by the Project Ecologist or WIRES rescuer
  - release will be into similar habitat as close to the original area as possible
  - if the species is nocturnal, release will be carried out at dusk; and
  - release would generally not be undertaken during periods of heavy rainfall.

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