

Warrawee Conservation Area

Weed Management Plan



Prepared for:

Tasmania Parks and Wildlife Service

Plan prepared by:

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Plan completed August 2018.

Cover photo: View of the Warrawee Conservation Area entrance from Shale Road. Facing South, M.Rose, 06/08/18.

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Introduction

Natural State was approached by Tasmania Parks and Wildlife Service (PWS) to provide a weed management plan for the Warrawee Conservation Area; located near Latrobe, Tasmania.

The project brief sought the following information to be included in the plan:

- Document the current status of weed infestation/distribution throughout the site.
- Identify declared weeds in the context of relevant weed management legislation.
- Make recommendations for control of weeds, including:
 - Prioritise weed management areas;
 - Provide information on control methods;
 - Provide information on timing of control
- Document the surrounding vegetation communities and threatened species observations.
- Estimate the resources (labour and money) required to achieve realistic outcomes in the short term.

The recommendations in this plan cover a 5 year period, 2018-2023. The aim of this plan is to set realistic expectations for what can be achieved in the short term, based on the author's 20+ years' of experience in managing native vegetation.

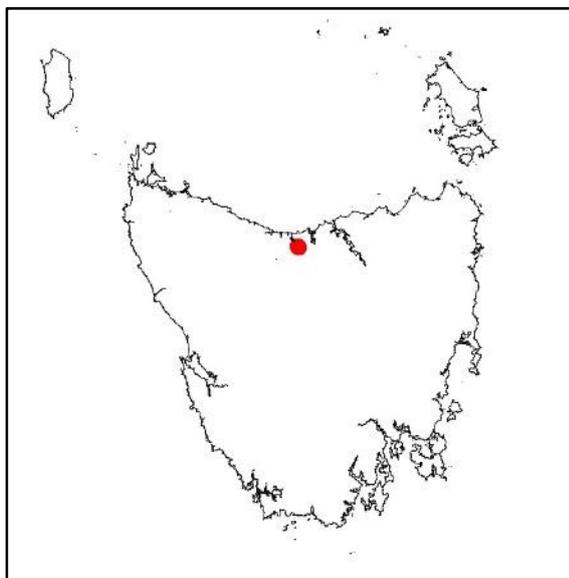
A total budget of around \$49,770 is recommended over the next 5 years.

Site location

The Warrawee Conservation Area is also known locally as the Warrawee Reserve. The Reserve is located at the end of Shale Road approximately 3.5 km south of the township of Latrobe, Tasmania.

The Warrawee Conservation Area is reserved land within the Tasmanian Reserve Estate and is currently managed by the Tasmania Parks and Wildlife Service. The Reserve was previously managed by Forestry Tasmania as the Warrawee Forest Reserve. The site is approximately 225 hectares in total size.

The Reserve has the Tenure ID 42314. The tenure is classified Conservation Area, under the Nature Conservation Act 2002. The Reserve is situated within the Latrobe Council local government area.



Weed species present

There are a variety of invasive environmental weeds growing in the reserve. Several of the weeds present are Declared Weeds in Tasmania and also Weeds of National Significance (WoNS).

The maturity of the weeds varies, from immature small seedlings, to mature plants spreading through seeding, via vegetative material, tubers or bulbs.

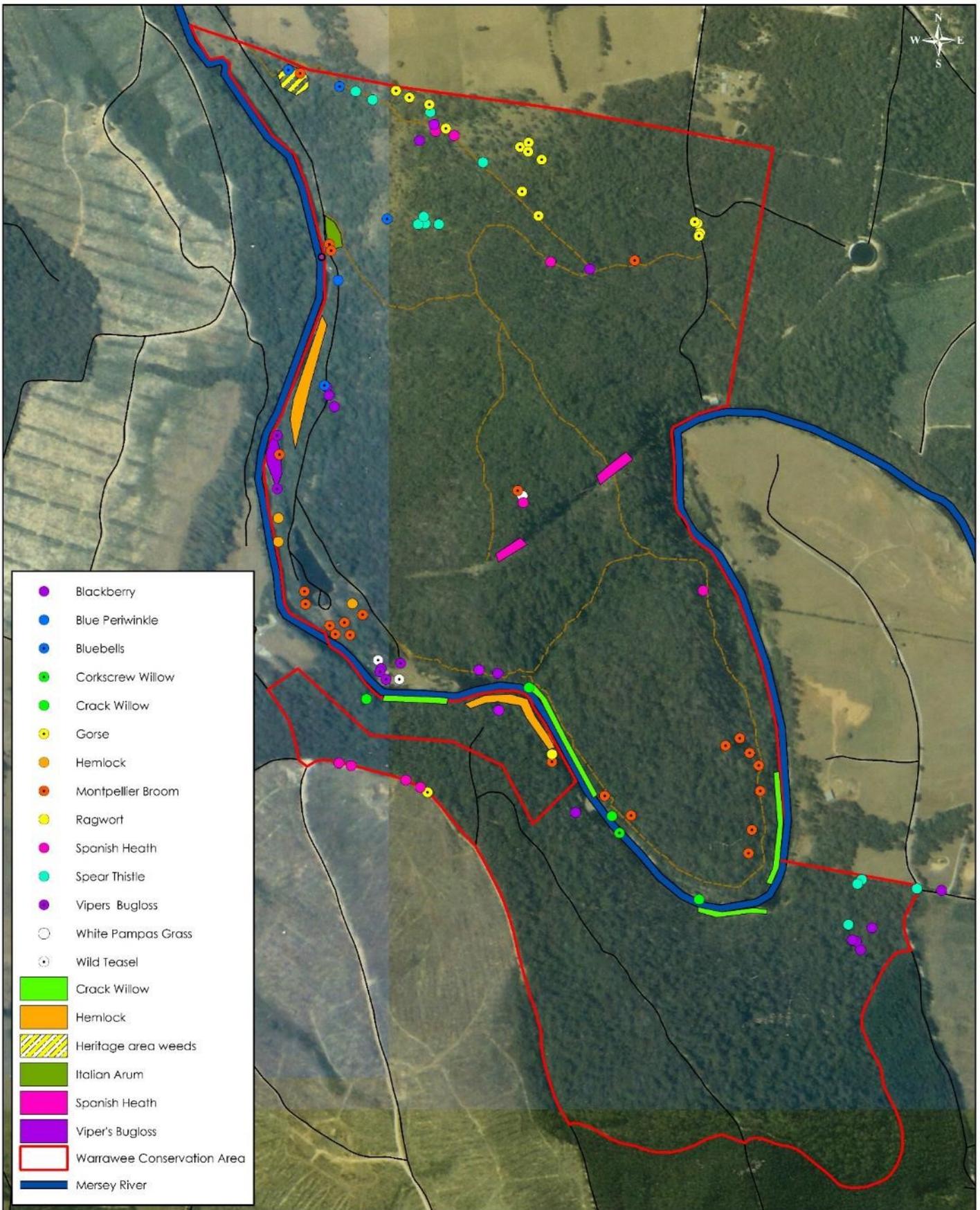
The density of each species also varies, from isolated plants, to almost a complete groundcover at times.

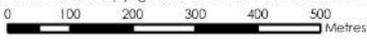
The main vectors for weed spread throughout the site are through animals (Blackberry), wind (Pampas Grass, Ragwort & Thistle), changes to hydrology (Cumbungi), disturbance events associated with floods (Crack Willow, Foxgloves, Hemlock), fire (Gorse, Montpellier Broom) and slashing when seeding (Spanish Heath). Future vectors will include disturbance induced germination associated with mountain bike track construction.

Table 1: Environmental weeds Warrabee Conservation Area

Scientific Name	Common Name	Declared weed in TAS	Weed of National Significance (WoNS)
<i>Arum italicum</i>	Italian Arum		
<i>Cirsium vulgare</i>	Spear Thistle		
<i>Conium maculatum</i>	Hemlock		
<i>Cortaderia selloana</i>	White Pampas Grass	YES - Zone A	
<i>Crataegus monogyna</i>	Hawthorn		
<i>Cyperus eragrostis</i>	Tall Umbrella Sedge		
<i>Digitalis purpurea</i>	Foxgloves		
<i>Dipsacus fullonum</i>	Wild Teasel		
<i>Echium vulgare</i>	Viper's Bugloss	YES - Zone A	
<i>Erica lusitanica</i>	Spanish Heath	YES - Zone B	
<i>Euphorbia lathyris</i>	Caper Spurge		
<i>Genista monspessulana</i>	Montpellier Broom	YES - Zone B	YES
<i>Hyacinthoides species</i>	Common Bluebells		
<i>Pinus radiata</i>	Radiata Pine		
<i>Polygonatum multiflorum</i>	Solomon's Seal		
<i>Prunus laurocerasus</i>	Cherry Laurel		
<i>Rubus fruticosus</i> var. <i>aggregate</i>	Blackberry	YES - Zone B	YES
<i>Salix x fragilis</i> nothovar. <i>fragilis</i>	Crack Willow	YES - Zone B	YES
<i>Salix matsudana</i>	Corkscrew Willow	YES - Zone A	YES
<i>Senecio jacobaea</i>	Ragwort	YES - Zone B	
<i>Typha species</i>	Cumbungi		
<i>Viburnum tinus</i>	Viburnum / Laurustinus		
<i>Vinca major</i>	Blue Periwinkle		
<i>Ulex europaeus</i>	Gorse	YES - Zone B	YES
<i>Zantedeschia aethiopica</i>	Arum Lily		

Warrawee Conservation Area - Environmental weeds



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Declared weeds and weed management legislation

In Tasmania, when a weed is declared under the Weed Management Act 1999, it is then classified into appropriate management zones for each Council area, Zone A - for eradication, or Zone B – for containment.

The Warrawee Conservation Area is located within the Latrobe Municipality. Landowners within the Latrobe Council area have legal responsibilities for managing the declared weeds Blackberry, Corkscrew Willow, Crack Willow, Gorse, Montpellier Broom, Pampas Grass, Ragwort, Spanish Heath and Viper's Bugloss.

Latrobe Council is classified as a Zone A municipality where eradication is the most appropriate management objective for Corkscrew Willow, Pampas Grass and Viper's Bugloss. The ultimate management outcome for Zone A municipalities is achieving and maintaining the total absence of Corkscrew Willow, Pampas Grass and Viper's Bugloss from within municipal boundaries.

Latrobe Council is classified as a Zone B municipality where containment is the most appropriate management objective for Blackberry, Crack Willow, Gorse, Montpellier Broom, Ragwort and Spanish Heath. The management outcome for Zone B municipalities is ongoing prevention of the spread of these weeds from existing infestations to areas free, or in the process of becoming free, of these species.

All weeds must be controlled, where they impact negatively upon any vegetation community, flora or fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, the Tasmanian Threatened Species Protection Act 1995, or the Tasmanian Nature Conservation Act 2002.

Blackberry, Crack Willow, Gorse and Montpellier Broom are classified as Weeds of National Significance. Weeds of National Significance or (WoNS) are weeds that are considered to require a national response for their management due to their degree of invasiveness, high potential to spread, and their high social, environmental and economic impacts. There are currently 32 species in Australia classed as WoNS; and each of these species has a National Strategy and Best Practice Management Guidelines.

The National Strategies and Best Practice Management Guidelines can be downloaded from the Weeds Australia website :

Blackberry	- http://www.weeds.org.au/WoNS/blackberry/
Gorse	- http://www.weeds.org.au/WoNS/gorse/
Montpellier Broom	- http://www.weeds.org.au/WoNS/brooms/
Willows	- http://weeds.nla.org.au/WoNS/willows/



Photos 1,2 & 3 : Some of the environmental weeds growing in the Warrawee Conservation Area. From left to right: Italian Arum, Montpellier Broom and Hemlock.

Vegetation communities present

A variety of native vegetation communities are represented in the Warrawee Conservation Area. The TASVEG Version 3.0 digital vegetation map of Tasmania, records the following vegetation communities within the Warrawee Conservation Area:

Table 2: Native vegetation communities present at the Warrawee Conservation Area

TASVEG code	Vegetation community description	Area ha
DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	50
DAM	<i>Eucalyptus amygdalina</i> forest on mudstone	7
DSC	<i>Eucalyptus amygdalina</i> - <i>Eucalyptus obliqua</i> damp sclerophyll forest	155
DVG	<i>Eucalyptus viminalis</i> grassy forest and woodland	5
FPE	Permanent easements – (Transmission lines)	3

The Permanent Easement mapping unit is vegetation which is managed under the transmission lines. The *Eucalyptus viminalis* grassy forest and woodland vegetation community which is shown in the TASVEG 3.0 mapping is not an accurate representation of the highly modified vegetation community which is now present.

Two additional vegetation communities were also recorded during the surveys.

Table 3: Additional native vegetation communities present at the Warrawee Conservation Area not recorded within the TASVEG 3.0 database.

TASVEG code	Vegetation community description	Area ha
GSL	Lowland grassy Sedgeland	0.25
WOB	<i>Eucalyptus obliqua</i> forest with broadleaf shrubs	5

None of the above mentioned vegetation communities are listed as threatened under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) or the Tasmanian Nature Conservation Act 2002.

The following general observations were recorded within each vegetation community:

DAC - Dry *Eucalyptus amygdalina* coastal forest and woodland – Large areas of forest with limited diversity of understorey species, poor natural regeneration, dominated by Bracken. Woody debris (logs) meets, and in many areas, exceeds the TASVEG benchmark for this community. Fire scarring is still evident on the *Eucalyptus* and *Allocasuarina* bark since the bushfire of 2006-07.

DAM - Dry *Eucalyptus amygdalina* forest on mudstone – Highly modified. Evidence of mining history, introduced garden plants, several environmental weed species present. Degraded understorey consisting of mostly introduced grasses

DSC - *Eucalyptus amygdalina* – *Eucalyptus obliqua* damp sclerophyll forest – The understorey tree and shrub layer is poorly represented in areas. Large areas of forest with limited diversity of understorey species, poor natural regeneration, dominated by Bracken. Woody debris (logs) meets, and in many areas, exceeds the TASVEG benchmark for this community. Fire scarring is still evident on the *Eucalyptus* and *Allocasuarina* bark since the bushfire of 2006-07.

DVG - *Eucalyptus viminalis* grassy forest and woodland – Highly modified vegetation community. A small patch of *Eucalyptus ovata* - Swamp Gum and *Melaleuca ericifolia* – Swamp Paperbark have adapted to the modified drainage around the old reservoir. Degraded understorey further away from the reservoir consisting of mostly introduced grasses. Very few *Eucalyptus viminalis* – White Gum present, the tree canopy is mostly *Eucalyptus amygdalina*.

GSL - Lowland Grassy Sedgeland – species diversity exceeds the TASVEG benchmark for this community. Introduced grasses are colonising and competing with the native grasses. A very small area represented within the reserve.

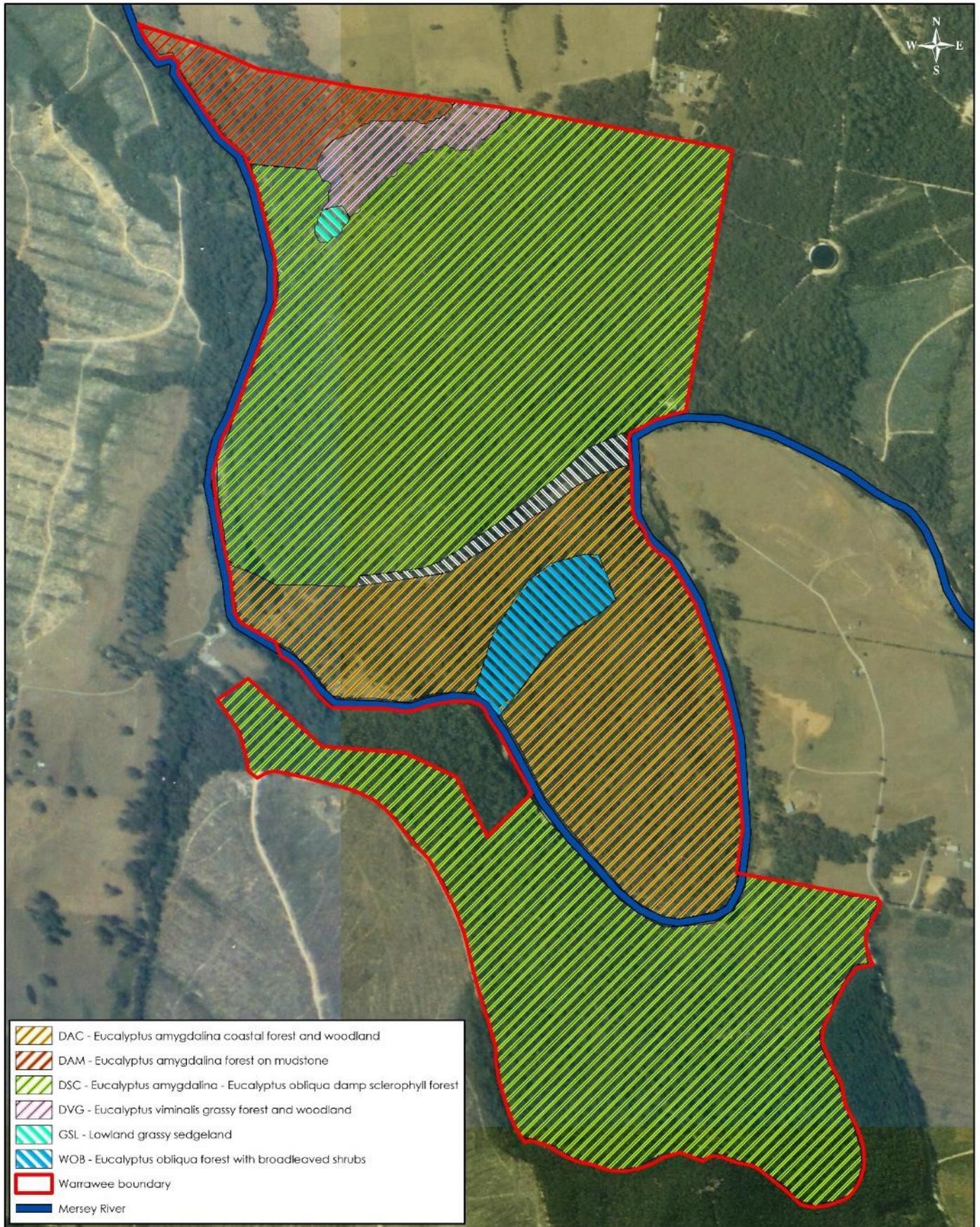
FPE – Permanent Easements – vegetation is managed to prevent interference with electricity supply lines. Modified vegetation zone with dense patches of mature Spanish Heath.

WOB - Eucalyptus obliqua forest with broadleaf shrubs – vegetation community located within the protected Fern Gully and along the adjoining part of the Mersey River. Good condition, natural regeneration providing sufficient groundcover, several large trees have fallen over the Fern Gully Track.



Photo 4 & 5: The main Platypus viewing pond showing the natural regeneration within 18 months after the initial weed control targeting Hemlock, Thistle & Foxglove.

Warrawee Conservation Area - Vegetation communities



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Threatened species observations

The Warrawee Conservation Area contains several threatened fauna and flora species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the Tasmanian Threatened Species Protection Act 1995 (TSP Act).

Threatened fauna

Some of the threatened fauna species recorded within the site are nocturnal. The probability of recording observations during the daytime surveys was very unlikely.

Burrowing Crayfish stacks were recorded within several of the creeks. As the surrounding areas have suitable habitat, and the threatened species Central North Burrowing Crayfish is known to occur within 1 km from this site, it is highly likely that the stacks are also from this species. As no animals were actually sighted during the surveys, further research may be required to confirm the species of burrowing crayfish.

The tables below combine the threatened species observations made during previous field surveys and observations recorded within the NVA database.

Table 4: Threatened fauna species observed within the Warrawee Conservation Area

Scientific Name	Common Name	TSP Act status	EPBC Act status
<i>Accipiter novaehollandiae</i>	Grey Goshawk	Endangered	
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Rare	Vulnerable
<i>Engaeus granulatus</i>	Central North Burrowing Crayfish	Endangered	Endangered
<i>Prototroctes maraena</i>	Australian Grayling	Vulnerable	Vulnerable
<i>Sarcophilus harrisii</i>	Tasmanian Devil	Endangered	Endangered
<i>Tyto novaehollandiae</i>	Masked Owl	Endangered	Vulnerable

Table 5: Threatened fauna species likely to utilise the Warrawee Conservation Area

<i>Aquila audax subsp. fleayi</i>	Wedge-tailed Eagle	Endangered	Endangered
<i>Alcedo azurea subsp. diemenensis</i>	Azure Kingfisher	Endangered	Endangered
<i>Astacopsis gouldi</i>	Giant Freshwater Crayfish	Vulnerable	Vulnerable
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	Vulnerable	
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically Endangered
<i>Perameles gunnii</i>	Eastern Barred Bandicoot		Vulnerable

Threatened flora

Four threatened flora species have been recorded within the Warrawee Conservation Area.

A population of *Gynatrix pulchella* - Fragrant Hempbush was recorded during the recent site surveys in August 2018.

The two orchid species were not able to be located whilst conducting the field surveys due to the time of year.

Table 6: Threatened flora species within the Warrawee Conservation Area

Scientific Name	Common Name	TSP Act status	EPBC Act status
<i>Caladenia caudata</i>	Tailed Spider-Orchid	Vulnerable	Vulnerable
<i>Caladenia tonellii</i>	Robust Fingers	Endangered	Critically Endangered
<i>Gynatrix pulchella</i>	Fragrant Hempbush	Rare	
<i>Pimelea curviflora</i> var. <i>gracilis</i>	Slender Curved Riceflower	Rare	

Mitigation strategies to avoid impacts to threatened species

Where work sites are near known populations of threatened or conservation significant species, risk mitigation measures should be implemented. Practical solutions to avoid impacts to the local threatened species include:

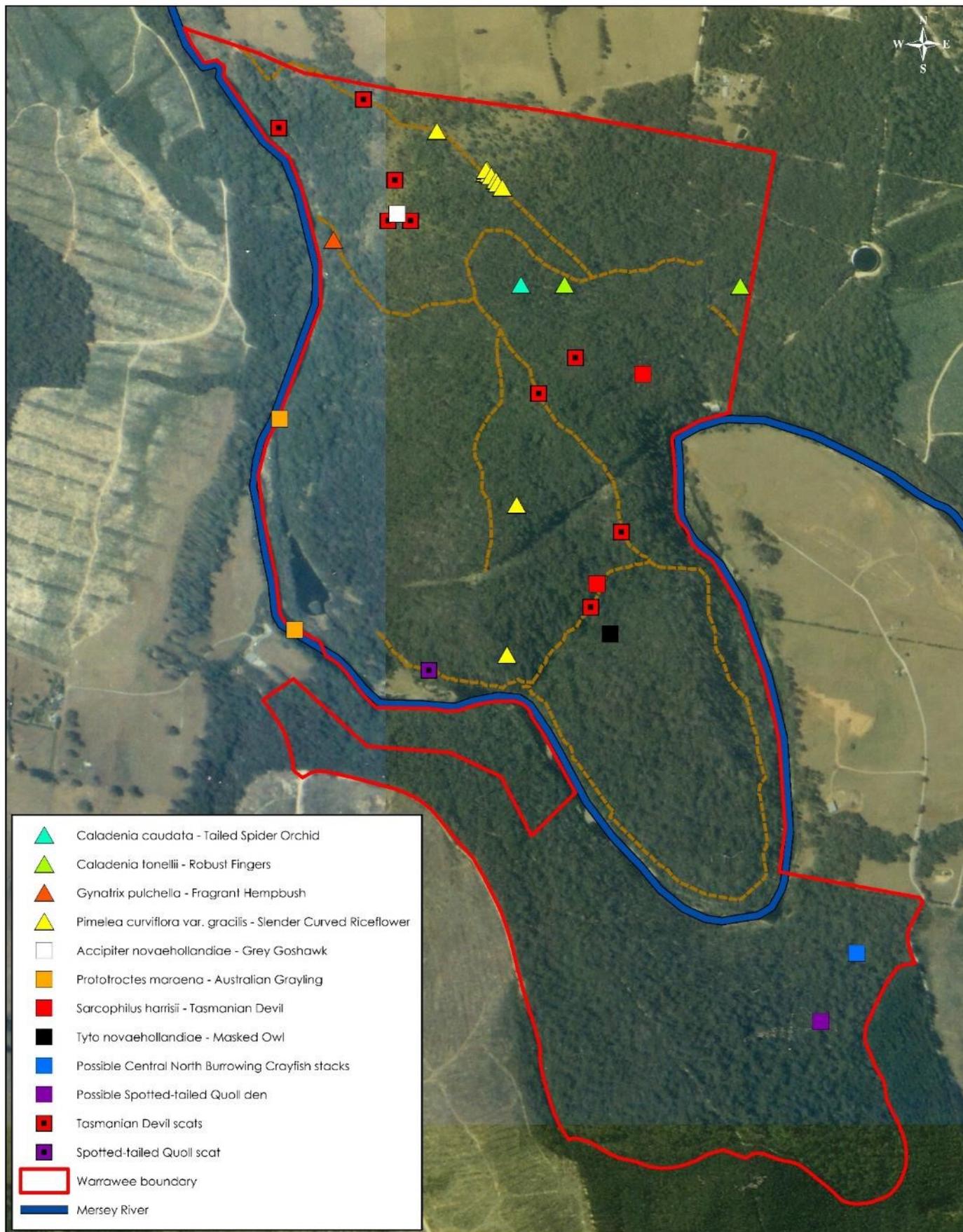
- engaging contractors who have previous experience working amongst threatened species.
- building capacity of local contractors or volunteers through onsite identification training or initial supervision, where relevant.
- using the most appropriate methodology for the situation e.g. cut / paint, hand pull or spot spraying.
- careful and diligent use of herbicides following best practice guidelines and relevant Codes of Practice referenced on pp.25-26.
- aiming to use herbicides with no Withholding Period, particularly relevant for Tasmanian Devil & Spotted-Tailed Quoll.
- avoid spraying during wet or windy conditions or when rain is forecast.
- avoid using surfactants or marker dyes near waterways.

If these steps are followed, potential impacts to any threatened species nearby can be avoided.



Photos 6 & 7: Threatened flora species growing alongside existing walking tracks. Left: *Pimelea curviflora* var. *gracilis* – Slender Curved Riceflower. Right: *Gynatrix pulchella* – Fragrant Hempbush.

Warrawee Conservation Area - Threatened species observations



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Project logistics

Biosecurity procedures

Vehicles and machinery are common vectors for weed & disease dispersal. This can easily be managed through system controls such as rigorous field hygiene procedures. Contractors should comply with the 'Weed and Disease Planning and Hygiene Guidelines (DPIPWE, 2015)' and 'Keeping it Clean field hygiene manual (DPIPWE, 2010)' as minimum standards. *Phytophthora cinnamomi* and Chytrid fungi are potential pathogens to be avoided.

Workplace safety

Workplace Health and Safety legislation requires Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA) to be completed before commencing weed control work. Risk management measures will need to cover the job tasks, potential hazards, and hazard controls to be implemented, communications plans, public safety, first aid provisions, Personal Protective Equipment (PPE) requirements, and working on steep, or in remote areas.

Engaging contractors

Where contractors are engaged they should have a current Commercial Operators License issued by DPIPWE, hold current public liability insurance cover for at least \$10,000,000, and should be qualified, competent and experienced in the services being offered. If the contractors employ staff, they will also need Workers Compensation Insurance.

Traffic management qualifications are required for work on roadsides. The minimum qualifications required are 'Traffic Control with a Stop/Slow Bat' and 'Implement Traffic Management Plan'. This extra responsibility may add further costs to the estimated budgets due to the traffic management requirements.

There are a limited number of qualified and licensed contractors available in North West Tasmania that can be called upon to provide these services and deliver effective results, when needed. Scheduling contractors in to do the work can require a lead up time of at least several months' notice.

Weather

The ideal conditions for spraying are dry weather, with little to no wind. Constant analysis of long term weather forecasting to monitor wind speed and direction will help to maximise efficiency when planning any spraying work. Early morning starts are often necessary to make the most of the suitable conditions.

Timing

Every effort should be made to control the more invasive weeds Blackberry, Corkscrew & Crack Willow, Italian Arum, Gorse, Montpellier Broom, Pampas Grass, Ragwort, Spanish Heath, Spear Thistle & Viper's Bugloss to prevent further spread.

The best time for control work will be between Spring and Autumn. It is often necessary to undertake a primary treatment in Spring and then follow up during Autumn throughout the first few years to get the sites to a more manageable level. An annual monitoring and follow up regime can then be expected from years 3 -5.

Access

Vehicle and machinery access points are mostly adequate for implementing weed control work for the Management Areas, however, some equipment will need to be carried in up to 1.5Km. Where this is necessary, at least two people should work together to address safety requirements.

Recommendations for weed management areas

Weed management is urgently required within the proposed Management Areas for the following objectives: to adhere to statutory obligations, prevent further spread and degradation of the native vegetation condition, to encourage natural regeneration & to improve the aesthetics for visitors.

Although weed management activities at these sites will be an ongoing medium term proposition, significant progress can be achieved through a targeted allocation of resources over the next 5 years.

An adaptive approach is required to respond to disturbance events such as floods, fire & track construction, to reduce the future weed burden. A great example of this is the PWS response to the June 2016 flood event which induced a mass germination of Hemlock, Foxgloves and Thistle along the "floodplain". This area was controlled by Natural State in April 2017 and has significantly reduced the density of coloniser weeds and provided a greater opportunity for natural regeneration to cover the bare ground.

One of the major threats to the success of this project will be ongoing follow up control.

The recommended weed control methodologies include a combination of the cut and paint technique, spot spraying, and where appropriate, digging out or hand pulling.

Annual costs associated with the works have been estimated, as a guide, for each management area, over a 5 year period. The actual budgets required will be subject to the effectiveness of treatments, level of weed regrowth, disturbance events and germination.

The cost estimates in this plan provide a guide only to assist with allocating budgets for engaging contractor or volunteer labour, the herbicide expenses, and allocating PWS staff labour. For comparison, in the case where an annual budget is not available, the PWS staff time required to do the same activity has been conservatively estimated in consultation with local PWS staff.

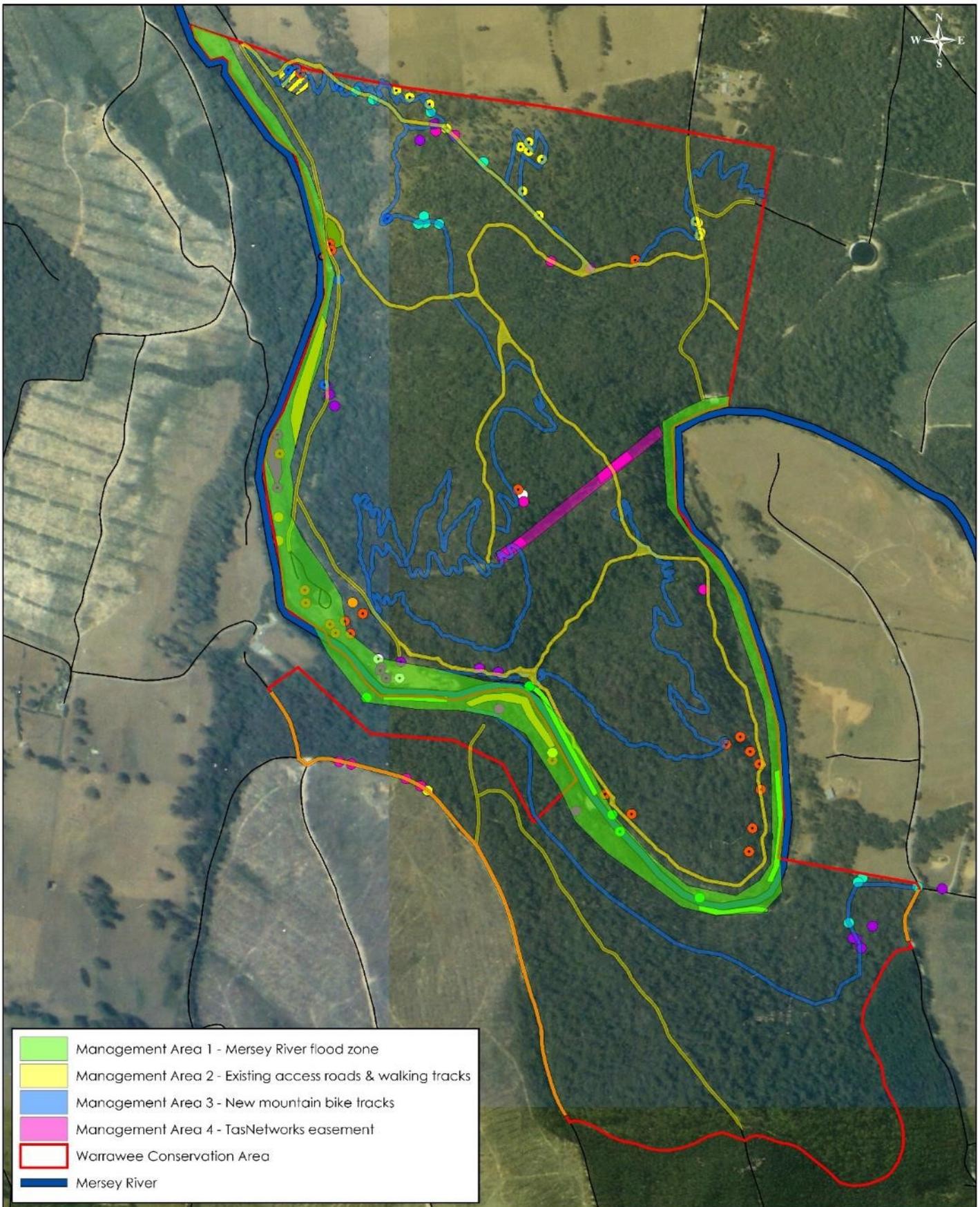
The contractor labour and herbicide costs are estimated at the current market rates as of August 2018, and may increase over time. Spraying rates have been calculated at \$100 per hour for an 8 hour day. Cut and paint, knapsack spot spraying & hand pulling / digging rates have been calculated at \$65 per hour for an 8 hour day.

The costs shown exclude Goods and Services Tax (GST) and are a guide only. Quotes for works should be sought before confirming budgets.

The recommendations suggest the time of year to conduct the weed control, and the herbicides registered for controlling specific weeds. This information is referenced from the Department of Primary Industries, Parks, Water and Environment (DPIPWE), Invasive Species, Weeds website.

Please note: The mention of a specific product brand name in this document is not, and should not be construed as an endorsement or as a recommendation for the use of that particular product, it is intended to be for example purposes only.

Warrawee Conservation Area - Recommended Management Areas



	Management Area 1 - Mersey River flood zone
	Management Area 2 - Existing access roads & walking tracks
	Management Area 3 - New mountain bike tracks
	Management Area 4 - TasNetworks easement
	Warrawee Conservation Area
	Mersey River

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Management Area 1 – Mersey River flood zone

Total area: 24 hectares.

Target species: Blackberry, Caper Spurge, Corkscrew & Crack Willow, Cumbungi, Hemlock, Foxgloves, Montpellier Broom, Spear Thistle & Viper's Buglose.

Timing for control: Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides: Broadleaf selective for woody weeds (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl. For Crack Willow & Cumbungi use (Weedmaster Duo) – Glyphosate. For Hemlock & Thistles use (Lontrel) – Clopyralid, or (KambaM) – MCPA. Foxgloves & Viper's Bugloss use (Brushoff) – Metsulfuron methyl.

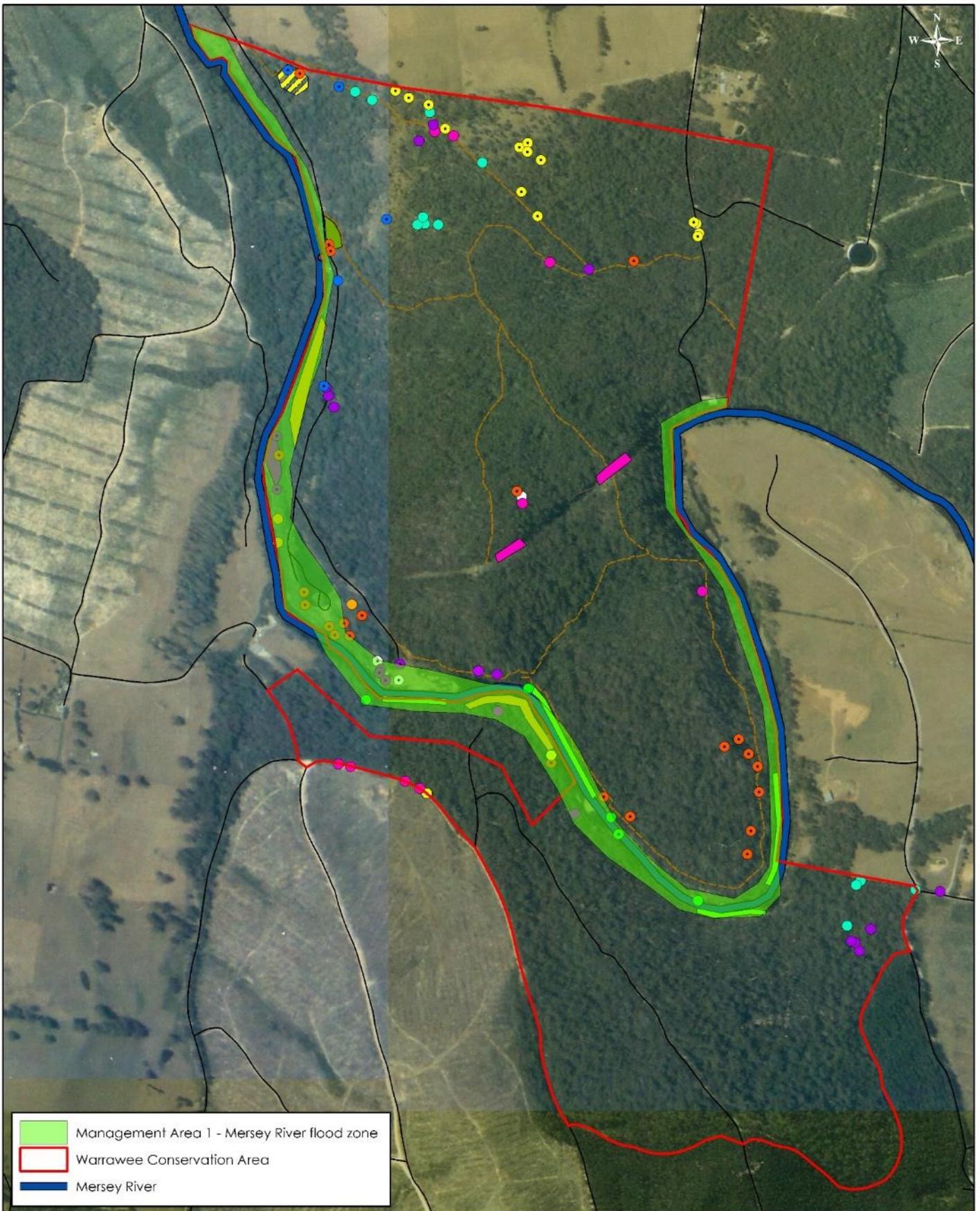
Where appropriate, the use of a surfactant and marker dye can improve the efficiency of herbicide application, however, they should not be used in close proximity to waterways.

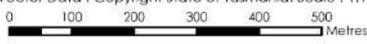
Table 7: Recommendations for Management Area 1 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	PWS staff labour	Annual cost
1	Control target weeds. <u>Methodology</u> – Control through a combination of spot spraying, cut / paint and hand pull.	8 Hrs x \$100/hr = \$800 112 Hrs x \$65/hr = \$7,280	\$1,000	120 Hrs	\$9,080
2	Monitor and follow-up control works. <u>Methodology</u> – Control through a combination of spot spraying, cut / paint and hand pull.	72 Hrs. x \$65/hr. = \$4,680	\$500	72 Hrs	\$5,180
3	Monitor and follow-up control works. <u>Methodology</u> – Control through a combination of spot spraying, cut / paint and hand pull.	56 Hrs. x \$65/hr. = \$3,640	\$500	56 Hrs	\$4,140
4	Monitor and follow-up control works. <u>Methodology</u> – Control through a combination of spot spraying, cut / paint and hand pull.	56 Hrs. x \$65/hr. = \$3,640	\$500	56 Hrs	\$4,140
5	Monitor and follow-up control works. <u>Methodology</u> – Control through a combination of spot spraying, cut / paint and hand pull.	56 Hrs. x \$65/hr. = \$3,640	\$500	56 Hrs	\$4,140
TOTAL COST over 5 years for weed management at this site		\$23,680	\$3,000	360 Hrs	\$26,680

Further information: The Cumbungi can be controlled using a combination of hand pull, cut & paint, & spot spraying with Glyphosate during summer when the pond dries out, or cutting the leaves as low as possible below the water level at other times. The Willows can be controlled using a combination of cut & paint, ringbarking and spot spraying, where appropriate.

Warrawee Conservation Area - Management Area 1



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Management Area 2 – Existing access roads and walking tracks

Total area: 11.5 hectares. 5m either side of the existing access roads and walking tracks.

Target species: Blackberry, Hemlock, Gorse, Italian Arum, Montpellier Broom, Periwinkle, Ragwort, Spanish Heath & Spear Thistle.

Timing for control: Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides: Broadleaf selective for woody weeds (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl. For Hemlock, Ragwort & Thistles use (Lontrel) – Clopyralid, or (KambaM) – MCPA. For Italian Arum use (Brushoff) – Metsulfuron methyl.

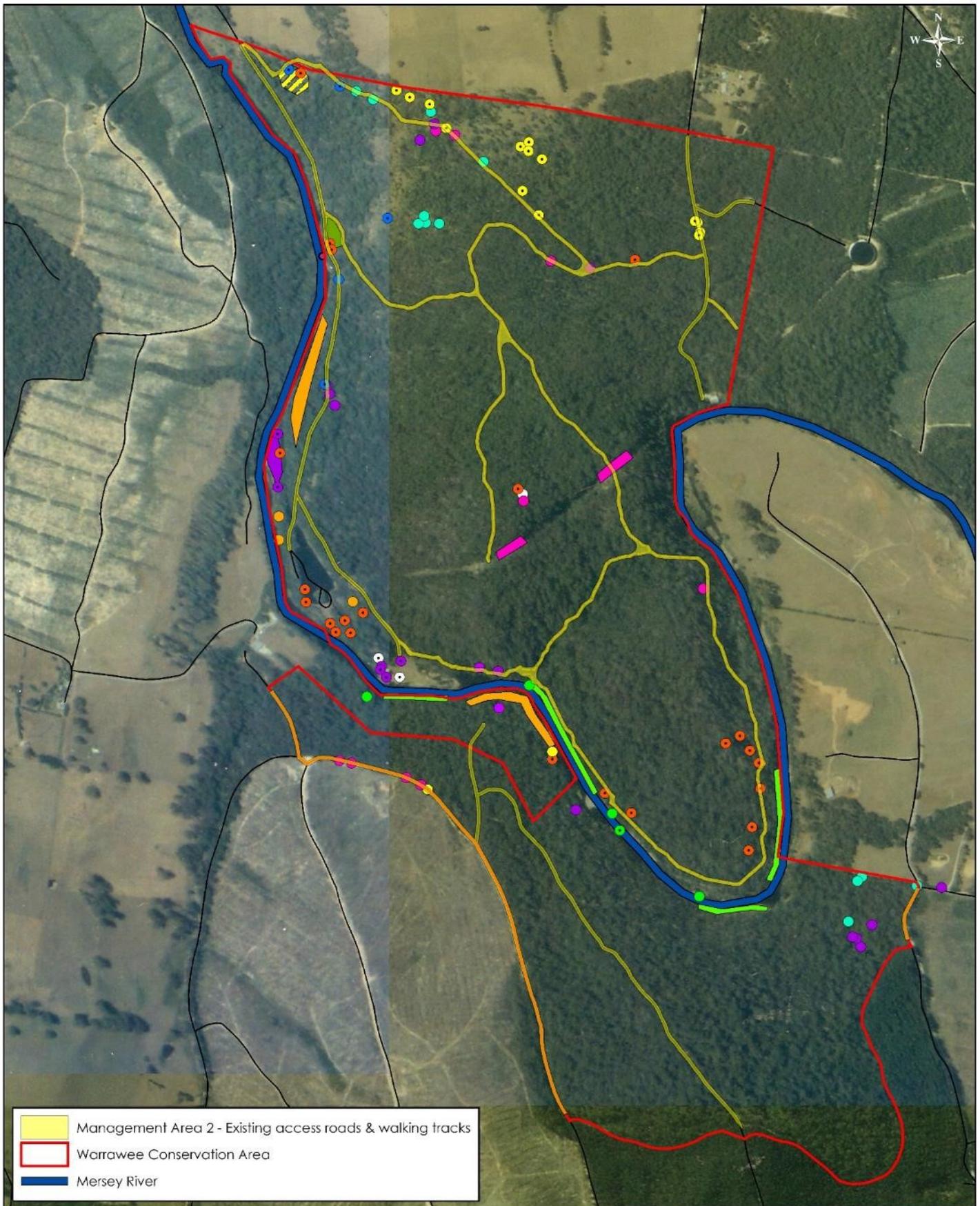
Where appropriate, the use of a surfactant and marker dye can improve the efficiency of herbicide application, however, they should not be used in close proximity to waterways.

Table 8: Recommendations for Management Area 2 over the next 5 years.

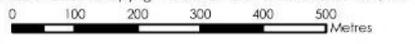
Year	Description of activities	Contractor labour cost	Herbicide cost	PWS staff labour	Annual cost
1	Control target weeds. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	8 Hrs x \$100/hr = \$800 24 Hrs x \$65/hr = \$1,560	\$500	32 Hrs	\$2,860
2	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	4 Hrs x \$100/hr = \$400 24 Hrs x \$65/hr = \$1,560	\$0	28 Hrs	\$1,960
3	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$300	24 Hrs	\$1,860
4	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$0	24 Hrs	\$1,560
5	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$300	24 Hrs	\$1,860
TOTAL COST over 5 years for weed management at this site		\$9,000	\$1,100	132 Hrs	\$10,100

Additional information: Solarisation is an effective control option for Periwinkle, where black plastic is used to smother and dehydrate the plant over a number of years. The Italian Arum can be a persistent weed requiring a combination of digging out & bagging the bulbils, cut & paint and spot spray.

Warrawee Conservation Area - Management Area 2



	Management Area 2 - Existing access roads & walking tracks
	Warrawee Conservation Area
	Mersey River

Project: Warrawee Weed Management Plan	Drawn by: Matt Rose	 NATURAL STATE PO Box 139, Ulverstone TAS 7315 Mobile: 0437 971 144 E: matt@naturalstate.com.au www.naturalstate.com.au	Acknowledgements: Raster Data : Base image Copyright State of Tasmania. Vector Data : Copyright State of Tasmania. Scale : 1:11,000 
Client: Tasmania Parks & Wildlife Service	Date: 09/08/2018		

Management Area 3 – New mountain bike tracks and disturbance footprint

Total area: 15 hectares. 5m either side of the new mountain bike tracks and areas of recent ground disturbance.

Target species: Blackberry, Gorse, Montpellier Broom, Pampas Grass, Ragwort, Spanish Heath & Spear Thistle.

Timing for control: Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides: Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl. For Pampas Grass use (Weedmaster Duo) – Glyphosate. For Hemlock, Ragwort & Thistles use (Lontrel) – Clopyralid, or (KambaM) – MCPA.

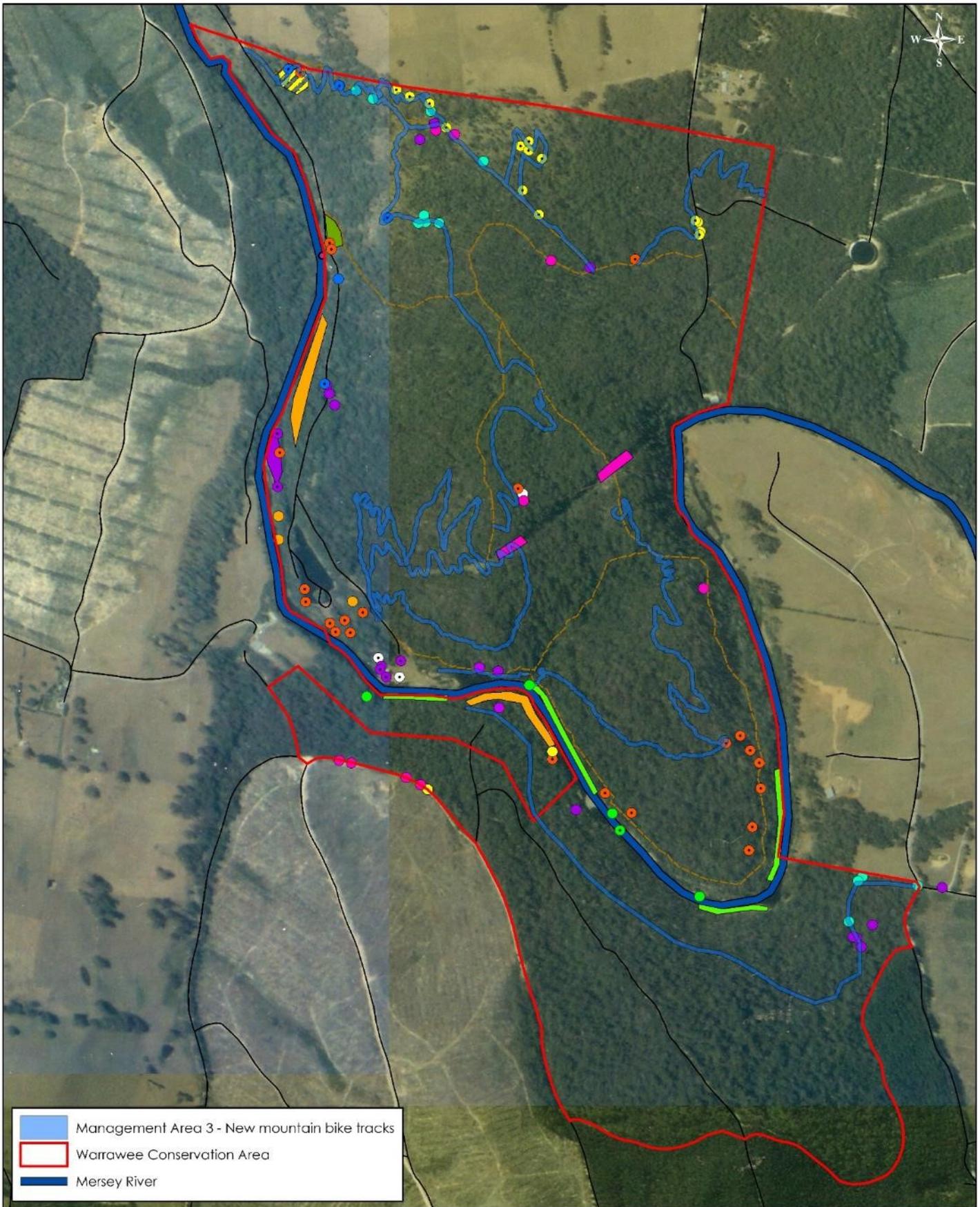
Where appropriate, the use of a surfactant and marker dye can improve the efficiency of herbicide application, however, they should not be used in close proximity to waterways.

Table 9: Recommendations for Management Area 3 over the next 5 years.

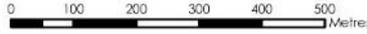
Year	Description of activities	Contractor labour cost	Herbicide cost	PWS staff labour	Annual cost
1	Control target weeds. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	32 Hrs x \$65/hr = \$2,080	\$500	32	\$2,580
2	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$0	24	\$1,560
3	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$300	24	\$1,860
4	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hrs x \$65/hr = \$1,560	\$0	24	\$1,560
5	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying, cut / paint and hand pull.	24 Hr x \$65/hr = \$1,560	\$300	24	\$1,860
TOTAL COST over 5 years for weed management at this site		\$8,320	\$1,100	128 Hrs	\$9,420

Recommendations: Primary control should be undertaken before mountain bike trail construction commences. The actual extent of the weed regrowth and colonisation will depend on the disturbance footprint and seasonal conditions. Ongoing monitoring and adaptive management will be necessary.

Warrawee Conservation Area - Management Area 3



	Management Area 3 - New mountain bike tracks
	Warrawee Conservation Area
	Mersey River

Project: Warrawee Weed Management Plan	Drawn by: Matt Rose	 NATURAL STATE PO Box 139, Ulverstone TAS 7315 Mobile: 0437 971 144 E: matt@naturalstate.com.au www.naturalstate.com.au	Acknowledgements: Raster Data : Base Image Copyright State of Tasmania. Vector Data : Copyright State of Tasmania. Scale : 1:11,000
Client: Tasmania Parks & Wildlife Service	Date: 09/08/2018		

Management Area 4 – The TasNetworks easement

Total area: 1.25 hectares.

Target species : Spanish Heath.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl.

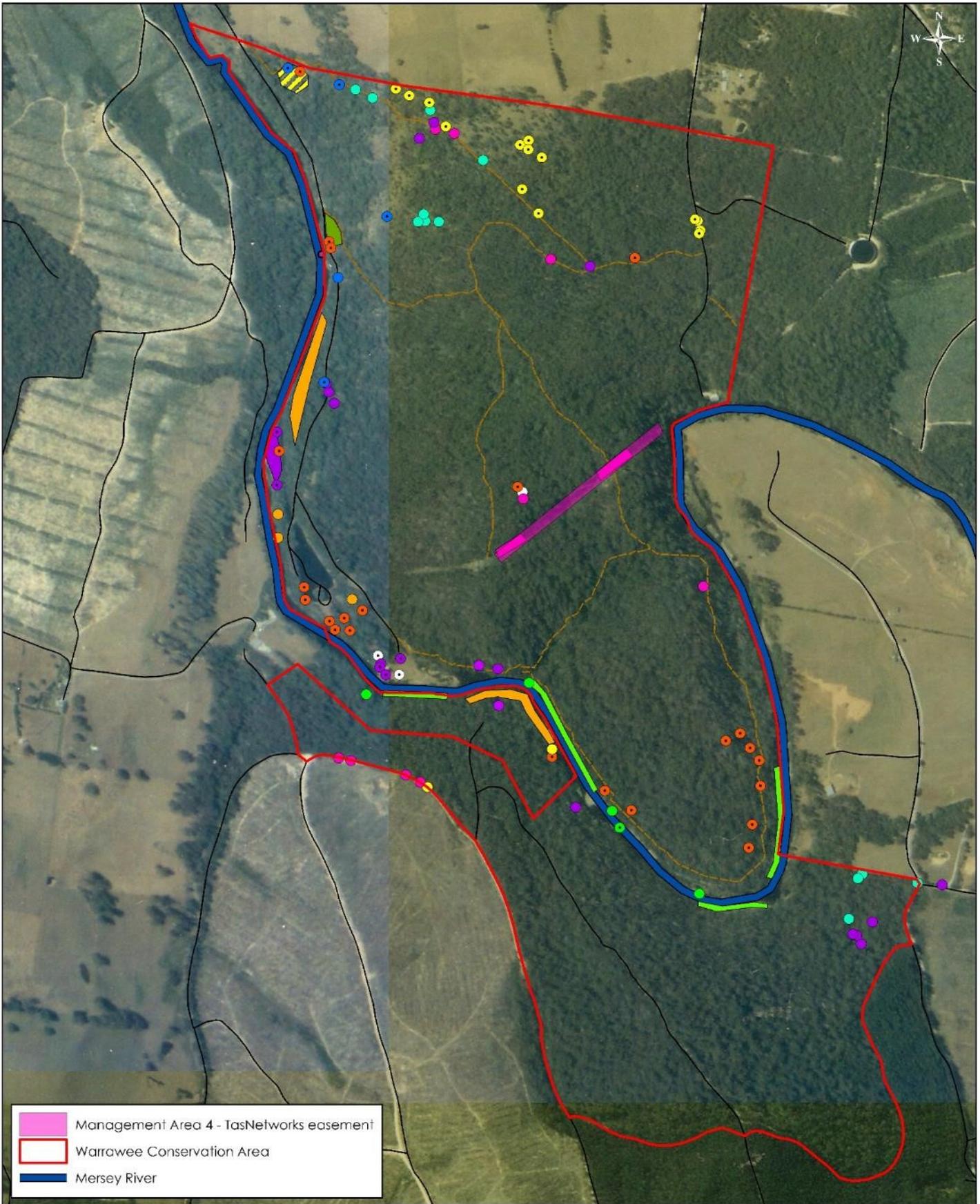
The use of a surfactant and marker dye will improve the efficiency of the herbicide application at this site.

Table 10: Recommendations for Management Area 4 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	PWS staff labour	Annual cost
1	Control target weeds. <u>Methodology</u> - Control through a combination of spot spraying & cut / paint.	16 Hrs x \$65/hr = \$1,040	\$300	16	\$1,340
2	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying & cut / paint.	8 Hrs x \$65/hr = \$520	\$0	8	\$520
3	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying & cut / paint.	8 Hrs x \$65/hr = \$520	\$0	8	\$520
4	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying & cut / paint.	8 Hrs x \$65/hr = \$520	\$150	8	\$670
5	Monitor and follow-up control works. <u>Methodology</u> - Control through a combination of spot spraying & cut / paint.	8 Hrs x \$65/hr = \$520	\$0	8	\$520
TOTAL COST over 5 years for weed management at this site		\$3,120	\$450	48 Hrs	\$3,570

Recommendations: approach TasNetworks to discuss options for integrating weed management resources in this easement.

Warrawee Conservation Area - Management Area 4



	Management Area 4 - TasNetworks easement
	Warrawee Conservation Area
	Mersey River

Project: Warrawee Weed Management Plan	Drawn by: Matt Rose		NATURAL STATE PO Box 139, Ulverstone TAS 7315 Mobile: 0437 971 144 E: matt@naturalstate.com.au www.naturalstate.com.au	Acknowledgements: Raster Data : Base image Copyright State of Tasmania. Vector Data : Copyright State of Tasmania. Scale : 1:11,000 
Client: Tasmania Parks & Wildlife Service	Date: 09/08/2018			

Registered herbicides and mix rates

The registered herbicides (and mix rates) for use in Tasmania for the Declared Weeds recorded are available in detail on the DPIPWE Invasive Species website. For more information, or future reference, a web link for each species is provided below:

Herbicides for Blackberry control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/blackberry/blackberry-herbicides-for-control>

Herbicides for Gorse control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/gorse/gorse-herbicides-for-control>

Herbicides for Montpellier Broom control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/broom/broom-herbicides-for-control>

Herbicides for Pampas Grass control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/pampas/pampas-herbicides-for-control>

Herbicides for Ragwort control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/ragwort/ragwort-herbicides-for-control>

Herbicides for Spanish Heath control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/spanish-heath/spanish-heath-herbicides-for-control>

Herbicides for Viper's Bugloss control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/patersons-curse-and-vipers-bugloss/patersons-curse-herbicides-for-control>

Herbicides for Willow control

<http://dPIPWE.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/willows/willows-herbicides-for-control>

Permits required for off-label herbicide use

Some herbicides are not registered for certain uses in Tasmania, which will not be mentioned on product labels. The herbicides recommended in this plan require copies of the following Australian Pesticides and Veterinary Medicines Authority (APVMA) Permits to be kept to allow off-label herbicide use : APVMA Permit PER 8949, PER 10741 & PER 13160.

For more information visit the APVMA website - <http://apvma.gov.au/>.

Please note: at the time of writing this document these permits and other relevant permits for weed control in bushland or non-crop situations have expired. They are currently in the process of being renewed by DPIPWE.

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Appendix A: Summary table of estimated costs required for weed management works over 5 years.

Table 11: Estimated costs required for weed management works over 5 years.

Site	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Management Area 1	\$9,080	\$5,180	\$4,140	\$4,140	\$4,140	\$26,680
Management Area 2	\$2,860	\$1,960	\$1,860	\$1,560	\$1,860	\$10,100
Management Area 3	\$2,580	\$1,560	\$1,860	\$1,560	\$1,860	\$9,420
Management Area 4	\$1,340	\$520	\$520	\$670	\$520	\$3,570
TOTAL	\$15,860	\$9,220	\$8,380	\$7,930	\$8,380	\$49,770

Appendix B: Additional photos



Photo 8: Established Blackberry growing near the entrance of the existing Shale Trail walking track and proposed Mountain Bike Trail.



Photo 9: A range of potential environmental weeds are growing near the Historic Area on the Shale Trail. Ongoing monitoring and selective control of several invasive species will be necessary to prevent spread.



Photo 10: Cumbungi – *Typha* species growing in the main Platypus pond. Local volunteer Bill Shepard has controlled this patch by combining spot spraying with Glyphosate during summer when the pond dried out and cutting the leaves below the water level.



Photo 11: Crack Willows growing on the banks of the Mersey River.



Photo 12: Hemlock is growing in dense patches sporadically throughout Management Area 1.



Photo 13: Introduced *Cyperus eragrostis* – Tall Umbrella Sedge is scattered throughout the flood zone. Due to the local abundance of this species, the only realistic management option is to focus on control where it will buffer the threatened flora species *Gynatrix pulchella* – Fragrant Hembush.



Photo 14: Viper's Bugloss – *Echium vulgare* rosettes recovering from recent herbicide application.



Photo 15: Successfully treated Viper's Bugloss patch controlled by local volunteer Bill Shepard.



Photo 16: Mature Spanish Heath growing under the power lines within the TasNetworks easement.



Photo 17: Isolated patches of Gorse, like this one, should be controlled ASAP to contain the potential spread.

Appendix C. Indigenous flora observed

Please note this is not a complete list of all flora species found throughout the reserve. This species list combines observations made during previous field surveys and observations recorded within the NVA database. For a more comprehensive assessment of the indigenous flora present, several surveys should be conducted at different times of the year to account for seasonal variables and active growing seasons.

Table 12: Indigenous flora species Warrawee Conservation Area

Scientific Name	Common Name	Endemic	TSP Act status	EPBC Act status
<i>Acacia dealbata</i>	Silver Wattle			
<i>Acacia leprosa</i>	Varnish Wattle			
<i>Acacia melanoxylon</i>	Blackwood			
<i>Acacia myrtifolia</i>	Redstem Wattle			
<i>Acacia stricta</i>	Hop Wattle			
<i>Acacia terminalis</i>	Sunshine Wattle			
<i>Acacia verticillata</i>	Prickly Moses			
<i>Acaena novae-zelandiae</i>	Buzzy			
<i>Acianthus caudatus</i>	Mayfly Orchid			
<i>Acianthus pusillus</i>	Small Mosquito Orchid			
<i>Acrotriche serrulata</i>	Ants Delight			
<i>Adiantum aethiopicum</i>	Maidenhair Fern			
<i>Ajuga australis</i>	Australian Bugle			
<i>Allocasuarina littoralis</i>	Black Sheoak			
<i>Amperea xiphoclada</i>	Broom Spurge			
<i>Aristotelia peduncularis</i>	Heart Berry	YES		
<i>Asplenium flabellifolium</i>	Necklace Fern			
<i>Astroloma humifusum</i>	Native Cranberry			
<i>Austrostipa mollis</i>	Soft Spear Grass			
<i>Banksia marginata</i>	Silver Banksia			
<i>Bedfordia salicina</i>	Tasmanian Blanketleaf	YES		
<i>Beyeria viscosa</i>	Pinkwood			
<i>Billardiera mutabilis</i>	Green Appleberry			
<i>Blechnum nudum</i>	Fishbone Fern			
<i>Blechnum wattsii</i>	Hard Water Fern			
<i>Bossiaea prostrata</i>	Creeping Bossiaea			
<i>Brachyscome decipiens</i>	Field Daisy			
<i>Bursaria spinosa</i>	Prickly Box			
<i>Caladenia carnea</i>	Dusky Fingers			
<i>Caladenia caudata</i>	Tailed Spider-orchid	YES	Vulnerable	Vulnerable
<i>Caladenia dilitata</i>	Green Spider-orchid			
<i>Caladenia tonellii</i>	Robust Fingers	YES	Endangered	Critically Endangered
<i>Calochlaena dubia</i>	Rainbow Fern			
<i>Carex appressa</i>	Tall Sedge			
<i>Cassinia aculeata</i>	Dolly Bush			
<i>Cassytha melantha</i>	Large Dodderlaurel			
<i>Cassytha pubescens</i>	Downy Dodderlaurel			
<i>Chiloglottis grammata</i>	Small Bird Orchid	YES		
<i>Chiloglottis reflexa</i>	Autumn Bird Orchid			
<i>Clematis microphylla</i>	Small-leaf Clematis			
<i>Clematis aristata</i>	Old Man's Beard			
<i>Comesperma volubile</i>	Blue Love Creeper			
<i>Coprosma quadrifida</i>	Native Currant			
<i>Coronidium scorpioides</i>	Button Everlasting			
<i>Correa lawrenceana</i> var. <i>Lawrenceana</i>	Mountain Correa	YES		

Scientific Name	Common Name	Endemic	TSP Act status	EPBC Act status
<i>Cryptostylis subulata</i>	Large Tongue-orchid			
<i>Cyathea australis</i>	Rough Tree Fern			
<i>Cyperus lucidus</i>	Leafy Flat-sedge			
<i>Davesia latifolia</i>	Hop Bitterpea			
<i>Davesia ulicifolia</i>	Yellow Spiky Bitter Pea			
<i>Dianella revoluta</i>	Black Anther Flaxlily			
<i>Dianella tasmanica</i>	Forest Flaxlily			
<i>Dichondra repens</i>	Kidney Weed			
<i>Dicksonia antarctica</i>	Soft Treefern			
<i>Diplarrena latifolia</i>	Western Flag Iris	YES		
<i>Diplarrena moraea</i>	White Flag Iris			
<i>Dipodium roseum</i>	Rosy Hyacinth Orchid			
<i>Drosera peltata ssp. auriculata</i>	Tall Sundew			
<i>Drymophylla cyanocarpa</i>	Turquoise Berry			
<i>Eleocharis sphacelata</i>	Tall Spike-sedge			
<i>Epacris franklinii</i>	Western Riverheath	YES		
<i>Epacris impressa</i>	Common Heath			
<i>Eucalyptus amygdalina</i>	Black Peppermint	YES		
<i>Eucalyptus obliqua</i>	Messmate Stringybark			
<i>Eucalyptus ovata</i>	Swamp Gum			
<i>Eucalyptus viminalis</i>	White Gum			
<i>Exocarpus cupressiformis</i>	Native Cherry			
<i>Gahnia grandis</i>	Cutting Grass			
<i>Galium australe</i>	Tangled Bedstraw			
<i>Geranium solanderi</i>	Solander's Geranium			
<i>Gleichenia dicarpa</i>	Pouched Corallfern			
<i>Glossodia major</i>	Waxlip Orchid			
<i>Glycine clandestina</i>	Twining Glycine			
<i>Gonocarpus tetragynus</i>	Common Raspwort			
<i>Gonocarpus teucroides</i>	Forest Raspwort			
<i>Goodenia lanata</i>	Trailing Native Primrose			
<i>Goodenia ovate</i>	Hop Native Primrose			
<i>Goodia lotifolia</i>	Native Broom			
<i>Gynatrix pulchella</i>	Fragrant Hempbush		Rare	
<i>Hymenophyllum cupressiforme</i>	Common Filmyfern			
<i>Hystiopteris incisa</i>	Batswing Fern			
<i>Indigofera australis</i>	Native Indigo			
<i>Juncus pallidus</i>	Pale Rush			
<i>Juncus procerus</i>	Great Rush			
<i>Kennedia prostrata</i>	Running Postman			
<i>Lachnagrostis species</i>	Blown Grass			
<i>Lepidosperma elatius</i>	Tall Sword Sedge			
<i>Lepidosperma ensiforme</i>	Arching Sword Sedge			
<i>Lepidosperma inops</i>	Fan Sedge	YES		
<i>Leptomeria drupacea</i>	Erect Currantbush			
<i>Leptospermum scoparium</i>	Manuka			
<i>Leptospermum lanigerum</i>	Woolly Teatree			
<i>Leptospermum glaucescens</i>	Smoky Teatree			
<i>Leucopogon virgatus</i>	Twiggy Beardheath			
<i>Lindsaea linearis</i>	Screw Fern			
<i>Linum marginale</i>	Native Flax			
<i>Lomandra longifolia</i>	Sagg			
<i>Lomatia tinctoria</i>	Guitar Plant	YES		
<i>Luzula spp.</i>	Wood Rush			
<i>Lycopodium deuterodensum</i>	Bushy Clubmoss			
<i>Melaleuca ericifolia</i>	Swamp Paperbark			
<i>Melaleuca squarrosa</i>	Scented Paperbark			

Scientific Name	Common Name	Endemic	TSP Act status	EPBC Act status
<i>Microlaena stipoides</i>	Weeping Grass			
<i>Microsorium pustulatum</i>	Kangaroo Fern			
<i>Microtis species</i>	Onion Orchid			
<i>Monotoca glauca</i>	Goldey Wood			
<i>Notelaea ligustrina</i>	Native Olive			
<i>Nothofagus cunninghamii</i>	Myrtle Beech			
<i>Notogrammitis heterophylla</i>	Gypsy Fern			
<i>Olearia argyphylla</i>	Musk			
<i>Olearia lirata</i>	Forest Daisy			
<i>Oxalis perennans</i>	Native Woodsorrel			
<i>Pimelea curviflora</i> var. <i>gracilis</i>	Slender Curved Riceflower		Rare	
<i>Pimelea drupacea</i>	Cherry Riceflower			
<i>Pimelea humilis</i>	Common Riceflower			
<i>Pimelea linifolia</i>	Slender Riceflower			
<i>Pimelea nivea</i>	Bushmans Bootlace	YES		
<i>Pittosporum bicolor</i>	Cheesewood			
<i>Poa labillardieri</i>	Silver Tussock Grass			
<i>Polystichum proliferum</i>	Mother Shield Fern			
<i>Pomaderris apetala</i>	Common Dogwood			
<i>Pratia pedunculata</i>	Star Creeper			
<i>Pteridium esculentum</i>	Bracken			
<i>Pterostylis pedunculata</i>	Maroon Greenhood			
<i>Pterostylis nutans</i>	Nodding Greenhood			
<i>Pultenaea daphnoides</i>	Heart Leaf Bush Pea			
<i>Pultenaea gunnii</i>	Golden Bush Pea			
<i>Pultenaea juniperum</i>	Prickly Beauty			
<i>Rubus parvifolius</i>	Native Raspberry			
<i>Rumohra adiantiformis</i>	Leathery Shield Fern			
<i>Rytidosperma racemosum</i> var <i>racemosum</i>	Striped Wallaby Grass			
<i>Stackhousia monogyna</i>	Forest Candles			
<i>Stellaria pungens</i>	Prickly Starwort			
<i>Sticherus tener</i>	Silky Fan Fern			
<i>Stylidium graminifolium</i>	Narrowleaf Triggerplant			
<i>Tasmannia lanceolata</i>	Mountain Pepper			
<i>Tetradthea pilosa</i>	Black Eyed Susan			
<i>Thelymitra</i> spp.	Sun Orchid			
<i>Themeda triandra</i>	Kangaroo Grass			
<i>Todea Barbara</i>	Austral Kingfern			
<i>Viola hederacea</i>	Native Violet			
<i>Wahlenbergia stricta</i>	Tall Bluebell			
<i>Zieria arborescens</i>	Stinkwood			

EPBC Act = Commonwealth Environment Protection and Biodiversity Conservation Act 1999

TSP Act = Tasmanian Threatened Species Protection Act 1995

Appendix D. Introduced flora observed

Table 13: Introduced flora species Warrawee Conservation Area

Scientific Name	Common Name	Declared weed in TAS	Weed of National Significance (WoNS)
<i>Anagallis arvensis</i>	Scarlet Pimpernel		
<i>Arum italicum</i>	Italian Arum		
<i>Cardamine hirsute</i>	Hairy Bittercress		
<i>Centaurium erythraea</i>	Common Centaury		
<i>Chaenomeles japonica</i>	Japanese Quince		
<i>Cirsium vulgare</i>	Spear Thistle		
<i>Conium maculatum</i>	Hemlock		
<i>Cortaderia seloana</i>	White Pampas Grass	YES - Zone A	
<i>Crataegus monogyna</i>	Hawthorn		
<i>Cupressus macrocarpa</i>	Monterey Pine		
<i>Cyperus eragrostis</i>	Tall Umbrella Sedge		
<i>Digitalis purpurea</i>	Foxgloves		
<i>Dipsacus fullonum</i>	Wild Teasel		
<i>Echium plantagineum</i>	Paterson's Curse	YES - Zone A	
<i>Erica lusitanica</i>	Spanish Heath	YES - Zone B	
<i>Euphorbia lathyris</i>	Caper Spurge		
<i>Galium aparine</i>	Cleavers		
<i>Genista monspessulana</i>	Montpellier Broom	YES - Zone B	YES
<i>Hyacinthoides species</i>	Common Bluebells		
<i>Lotus angustissimus</i>	Slender Birds-foot Trefoil		
<i>Narcissus jonquilla</i>	Jonquil		
<i>Philadelphus species</i>	Mock Orange		
<i>Pinus radiata</i>	Radiata Pine		
<i>Polygonatum multiflorum</i>	Solomon's Seal		
<i>Prunus laurocerasus</i>	Cherry Laurel		
<i>Rubus fruticosus</i> var. <i>aggregate</i>	Blackberry	YES - Zone B	YES
<i>Salix x fragilis</i> nothovar. <i>fragilis</i>	Crack Willow	YES - Zone B	YES
<i>Salix matsudana</i>	Corkscrew Willow	YES - Zone A	YES
<i>Senecio jacobaea</i>	Ragwort	YES - Zone B	
<i>Viburnum tinus</i>	Viburnum / Laurustinus		
<i>Vicia sativa</i>	Common Vetch		
<i>Vinca major</i>	Blue Periwinkle		
<i>Ulex europaeus</i>	Gorse	YES - Zone B	YES
<i>Zantedeschia aethiopica</i>	Arum Lily		