Five Mile Creek Strategic Environmental Works Plan

Ecological management planning to support the Five Mile Creek Masterplan

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This work was produced by Geordie Scott-Walker.

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Cover image: viewing east across the proposed Black Gum Floodplain Restoration area on the northern floodplain of Five Mile Creek, Woodend (Mount Macedon visible in the background)

Acknowledgements

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Council also acknowledges local Aboriginal and/or Torres Strait Islander residents of Macedon Ranges for their ongoing contribution to the diverse culture of our community.

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Contents

1. Summary

An ecological assessment of Five Mile Creek, Woodend, has been undertaken to inform the development of a Masterplan for the area. Commissioned by the Macedon Ranges Shire Council in support of the initiative of Woodend Landcare Group, the masterplan aims to provide a blueprint for how public land along the creekline in and around Woodend township will be managed over the coming decade or more. The ecological assessment aims to identify the environmental values and threats present on the land and to identify clear ecological management objectives and restoration plans for the site.

The assessment used a range of assessment methods including desktop and field-based surveys to investigate the study site. A site management strategy is provided that considers the range of management issues and opportunities present at the land. Each priority project has a works plan to support the recommended restoration actions.

The site has undergone significant change over recent decades, owing to extensive successful community-led restoration in the form of weed control and revegetation. Most works have been completed by Woodend Landcare Group with funding support from various public land management agencies and the involvement of volunteer labour. Significant woody weed removal has been completed that includes major Willow removal, which were replaced with desirable indigenous vegetation.

The site is the epicentre of the Victorian distribution of the endangered Black Gum. Two other threatened flora species were recorded during the site assessment, Austral Crane's-bill and Floodplain Fireweed. Two Ecological Vegetation Classes are present that include Valley Grassy Forest and Swampy Riparian Woodland plus a suite of exotic-dominated vegetation states. The land has immense ecological values but all areas of remnant vegetation are degraded in some form, and the site is characterised by relatively young planted and naturally regenerated native vegetation with scattered large old remnant eucalypts. Understorey weed cover is particularly high throughout most areas of the site.

A range of management issues and constraints affect the land, due to competing land use activities, historic land management disturbances and the broader landscape context of the site. Public access and use is a major feature as this site includes walking trails that connect different areas of the township, and includes many off-lead dog walking areas and sections of mown turf. Large areas of the site are dominated by exotic pines and deciduous trees that in many places provide an historic, post-colonial character of the site that provides some shade and amenity values to the local community. These exotic species also contaminate the waterway with heavy leaf litter, they modify the stream profile and they are highly invasive in this ecosystem, evidently spread along local waterways and in nearby areas of bushland. The land is also constrained by its narrow form, hemmed into its urban setting with some private property boundaries hugging the creekline edge within a highly modified, predominantly cleared landscape. The upper and lower reaches of the Five Mile Creek outside the study site run through agricultural areas with little canopy connectivity along the watercourse.

General management recommendations are provided to support the maintenance and enhancement of the natural values throughout the site, while a more specific set of targeted restoration projects are included to be implemented over the coming 10 years or longer and if accepted, will be integrated into the site masterplan.

The objective of all environmental work here is to restore a representative example of the historic Ecological Vegetation Class for the area, and to provide habitat for local flora and fauna. Of particular emphasis is the need to protect and maintain the Black Gum population that is part of the charm and critical conservation importance within the Five Mile Creek study area. Three projects have been designed that provide restoration works across a large proportion of the site, which will increase the quality of native vegetation and habitats within the township in areas of high public use. The projects focus on weed control and revegetation with the removal of mowing from some areas to better conserve Black Gum habitat. Two other large scale projects are offered as preliminary designs to restore floodplain habitats across the vast western portion of site and do not include detailed work plans. These areas are highly modified from the original native vegetation and it will be costly to restore them but would make a significant biodiversity enhancement at the Five Mile Creek study area.

2. Introduction

The Macedon Ranges Shire Council commissioned the production of this ecological assessment to identify the environmental values, threats and key management objectives for the Five Mile Creek environs within the Woodend township. The Five Mile Creek has been the subject of extensive community-based restoration for over twenty years, led by Woodend Landcare Group with the support of Council and the North Central Catchment Management Authority.

The Five Mile Creek environs are of very high conservation significance. The creekline and nearby areas support the single Victorian location for Black Gum *Eucalyptus aggregata,* an endangered Eucalypt protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* Woodend Landcare has invested significant time and money into protection of the site for the Black Gum and a local private property has a conservation covenant in place to protect this species. Historic creekline restoration work includes a numerous plantings and significant weed control throughout the township. Large infestations of Willows have been removed and many past plantings have now reached a maturity but are still relatively young.

The assessment will provide one of a suite of components that will inform the development of the Woodend Five Mile Creek Masterplan. The masterplan is an initiative of Woodend Landcare Group that seeks to enhance areas of public land along the creekline over the next decade or more. Actions carried out in accordance with the assessment will also contribute to many of the objectives set out in the Macedon Ranges Biodiversity Strategy. Key objectives addressed by this report are: improve biodiversity; extend and connect native vegetation and fauna habitat; enhance the capacity of community groups to undertake conservation actions; and to specifically enhance riparian habitat and create a corridor of native vegetation within the *Campaspe River and Headwaters Waterway Biolink* (MRSC 2018).

Survey area

The study area includes all areas of public land along the Five Mile Creek corridor from Gregory Street to Romsey Road, Woodend, that includes the Gregory Street Leased Land. Along this stretch the creekline is approximately 3 km long but the assessable area totals more than 36 ha of public land that forms a narrow corridor that meanders through the Woodend township (Figure 1).

The assessment does not include the Woodend Racecourse Grassland Reserve which has an existing Environmental Management Plan. No areas of private land were included in the study.

Photo 1 and 2. A large remnant Black Gum in exotic pasture with Hemlock dominating the ground layer (left); and mature Black Gum buds and foliage (right).

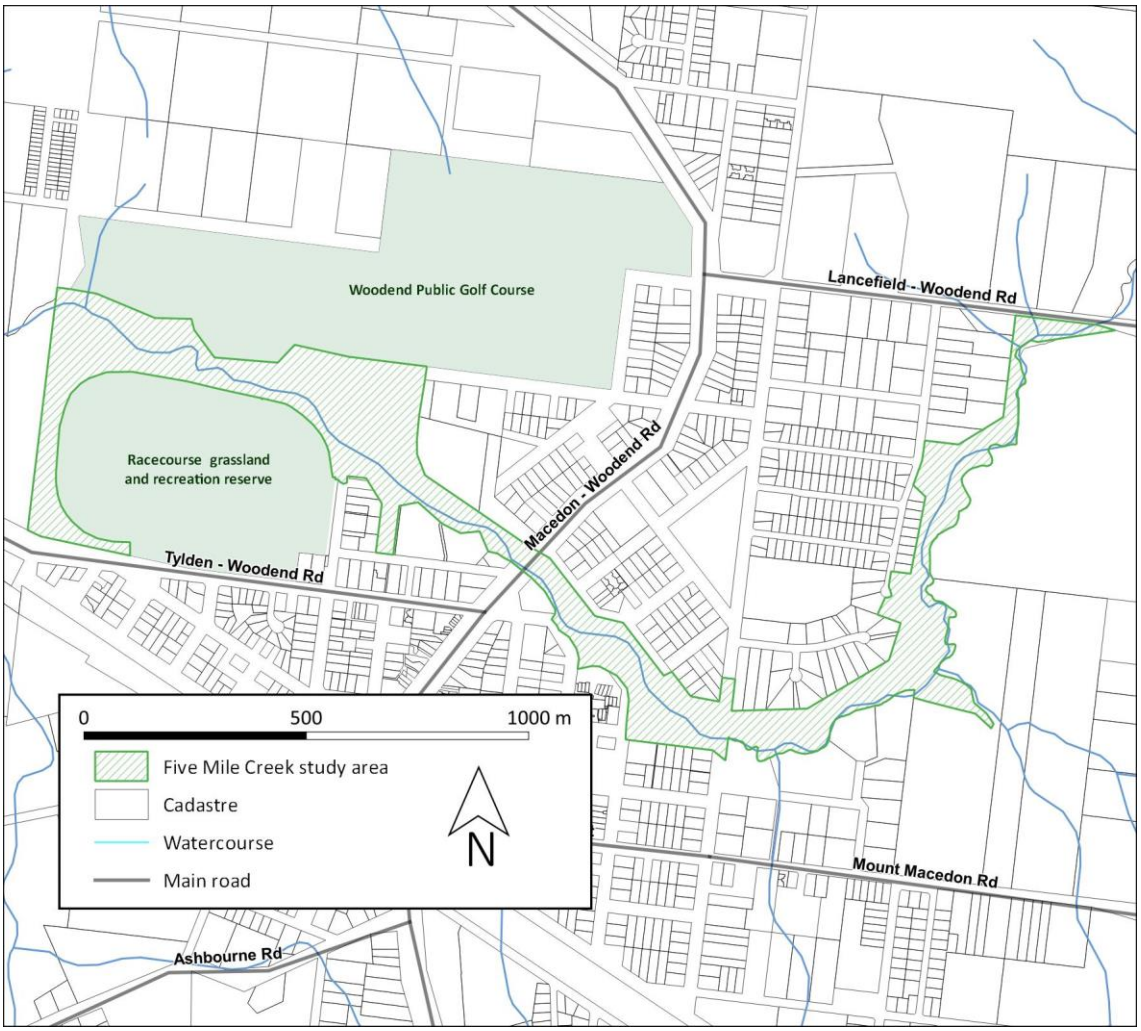


Figure 1. Study area location at Woodend, Victoria.

Catchment and landform

The study site is within the Macedon Ranges Local Government Area (LGA), the North Central Catchment Management Area and is on the custodial lands of the Dja Dja Wurrung Clans Aboriginal Corporation. The local landscape comprises gentle hills of palaeozoic (mainly sedimentary[1]) geology interspersed by broad, low relief floodplains that are seasonally waterlogged and subject to high flood risk under extreme conditions. This terrain is situated in the Central Victorian Uplands bioregion and the area has a montane climate with >700mm rainfall per annum and a high frequency of frosts around July each year (Singleton and Lorimer 1992).

1 Note the presence of Newer Volcanic basalts that cover a large part of the Woodend Public Golf Course along the northern boundary of the study site.

Five Mile Creek has an upper catchment area of nearly 70 km^2 that forms a significant tributary to the Campaspe River that drains 140 km north into the Murray River at Echuca (DELWP 2018a). The waterway condition for the Campaspe River catchment is rated as poor (MDBA 2020). The confluence between Five Mile Creek and the Campaspe River is 9 km downstream of the study site at Carlsruhe.

Five Mile Creek's upper catchment is a mix of forested land south-east of Woodend plus an extensive cleared agricultural landscape to the east/north-east of Woodend. The cleared landscape supports numerous creeks, streams and minor tributaries that dissect a series of low slopes and gentle hills and includes the Smokers Creek and the slopes of Hanging Rock. The forested headwaters include a mix of private and public land that includes Mount Macedon Regional Park 3 km south-east of the study site.

Topographic environment

The altitudinal limit of the study site is around 550 m at Gregory Street to around 570 m at Romsey Road, while elevated parts of Mount Macedon reach over 1000 m above sea level. The site profile grades almost imperceptibly from the lower to upper altitudinal limits, but within this area a variety of geomorphological features are present along the watercourse and connecting drainagelines.

Five Mile Creek is a relatively narrow, shallow creekline with extensive meanders and a few, small sections with relatively deep pools. In the western part of the study site the floodplain is a complex network of very faint, shallow drainagelines interspersed with relatively deep, off-creek meandering channels that join the creek. These channels are surrounded by flat to gently undulating plains with scattered depressions and after heavy inundation the floodplain substrate becomes saturated to the point where boggy areas emerge that support a range of plant species adapted to seasonally damp, waterlogged conditions.

The creekline and floodplain hydrology is affected by numerous farm dams located throughout the upper catchment. A series of surface drains also transport stormwater runoff from adjacent urban areas into the site, further modifying the historic, natural hydrology of the site. Traditionally, the creek banks and floodplain may have flooded more frequently than recent records indicate, with major recent events limited to years of exceptionally high rainfall such as experienced in the La Niña climatic event of 2010-11.

Areas of Aboriginal Cultural Heritage Sensitivity

The Five Mile Creek is an area of Aboriginal Heritage Sensitivity. 'Areas of cultural heritage sensitivity' are defined in the Aboriginal Heritage Regulations 2018 and relate to landforms and soil types where Aboriginal places are more likely to be located. This includes land within 200 metres of named waterways. This means a cultural heritage management plan may be required before any high impact activities are undertaken along the creeks.

3. Methods

A combination of desktop, field-based and post-survey analysis was completed to inform the findings of this report.

3.1. Desktop analysis

The Victorian Biodiversity Atlas was checked for historic flora and fauna records within and around the study area. Past survey reports and management plans were also reviewed prior to the field survey, that included the following documents:

- North Central CMA Waterway Action Plan for Five Mile Creek
- Woodend Landcare Recommended Planting List
- A history of plantings along Five Mile Creek by Woodend Landcare from 2004 to 2011

3.2. Field work

Site surveys were completed over four visits from October 2021 to January 2021. Members of the Woodend Landcare Group and Macedon Ranges Shire Council attended early meetings to provide an overview of the study site and give a background on past site management.

The following information was collected during the site assessment:

- All flora species including weeds and threatened species;
- Vegetation types (identified and mapped) and significant patches of vegetation or habitat;
- Management zone boundaries with photopoints; and
- Native vegetation cover and weed cover to inform the Vegetation condition assessment.

All mapping was completed by collecting georeferenced spatial data using a tablet with GPS functionality accurate to ±5m in average conditions. Map products contained in this report and any additional data supplied to Council were finalised in GIS software as part of post-production.

Flora and vegetation inventory

The plant names provided in this report follow the scientific and common names given in the Victorian Biodiversity Atlas but uses the taxonomy of the Royal Melbourne Botanic Gardens' VicFlora (RBGBV 2022). The conservation status of all plant species is based on the Victorian Flora and Fauna Guarantee Act 1988 Threatened List (DELWP 2021).

The description of vegetation types is based on the Victorian Ecological Vegetation Class (EVC) topology (DELWP 2022). EVCs are a regional-scale topology for classifying native vegetation using a range of attributes such as topography, soil, climate and geomorphology. An EVC comprises one or more floristic communities that are in some cases locally unique and support floristic qualities poorly recognised by EVC benchmarks.

Management zones

Identification of suitable management zones was based on a range of attributes, primarily vegetation continuity, vegetation and habitat type, landscape position, location, size, management context and historic management. Management zones strongly reflect the planning structure of this report and how the guidelines and recommendations apply to the relevant land managers.

Survey conditions and limitations

The survey was completed over a spring-summer period of relatively wet, La Niña climatic conditions (BOM 2022a). Monthly rainfall was significantly higher than the average for the survey period (BOM 2022b). Very heavy rain over June-July plus ongoing rainfall resulted in ideal conditions to see high flows along parts of Five Mile Creek. At key times, heavy rainfall combined with damaging winds resulted in storm damage along the creekline that in some cases toppled trees and eroded the creekbank (BOM 2021). Field surveys involved exploring the site on foot at times when access to some areas was severely constrained due to heavy inundation and boggy conditions.

Botanical surveys often fail to record all species due to survey timing and seasonal conditions. Further surveys over multiple seasons and a succession of years will provide the best means of attaining a 'complete' species inventory for the study site.

3.3.Vegetation condition assessment

Baseline assessment of vegetation condition was completed using a novel method recently developed for use on another local project. The method was originally designed to support Council's management of local conservation reserves by using *a single condition score* for each site to index all reserves within a prioritisation framework. The method was adapted and greatly simplified for use at Five Mile Creek to provide a vegetation condition score for each management zone where restoration works are recommended. For full detail of the method, see Scott-Walker 2021. Listed below are the guidelines for how the assessment was used on this project.

Each management zone was assessed against at least one of two decision trees that apply to riparian and non-riparian zones. Using this method, the riparian zone is classed as the areas that strictly follow the narrow-linear course of a waterway and any immediate low lying flood terraces clearly within the influence of the average streamflow condition (not major bank-breaching flood events). Non-riparian zones comprised all vegetation beyond the watercourse or drainage line such as slopes and floodplains characterised by a relatively dryland terrestrial flora and that are clearly missing aquatic vegetation.

Table 1 and 2 outline the criteria used to assess the extent and composition of vegetation within riparian and non-riparian zones, respectively. The distinction between the rules of each decision tree is that riparian zones were always provided a minimum score of 0.25. This rule applies even when the waterway is dominated by weeds, to reflect the significant value of all vegetation within the riparian zone to support waterway functions such as nutrient filtration and trapping suspended sediments. In contrast the presence of weeds in non-riparian vegetation is considered a negative attribute.

In this assessment, a patch of native vegetation is any area of remnant or mid- to late-mature revegetation with >25% indigenous vegetation cover. This approach emphasises the high value of remnant vegetation patches, where apparent to the assessor, and the high value of older, landscape-scale revegetation that has resulted from decades of community-led waterway restoration.

The assessment scores from riparian and non-riparian zones are combined for a maximum value of 2. All management zones include an assessable non-riparian portion, however in some cases there is no clearly definable riparian zone. To enable an equitable comparison among the scores of all zones a standardiser was applied to any zones that are missing the riparian assessment component. Any dams set back from the creekline were treated as riparian zones due to the presence of distinctive aquatic vegetation and the associated wetland habitats.

3.4.Strategy development

Following the desktop analysis and field survey, further analysis was completed to identify appropriate management goals and aid the development of specific restoration projects. Spatial analysis involved the use of GIS to assess the landscape and site-wide context of the survey results and to finalise the definition of management zones. A SWOT analysis was used to explore biodiversity and land management issues for the site across small to large scales and with consideration of the range of social values and shared land uses of the Five Mile Creek public area.

Table 1. Assessment categories and scores for riparian vegetation

Assessment step	Result
1A. Native vegetation patches are present	Continue to step 2
1B. Native vegetation patches are absent	score 0.25; no further assessment
2A. Native vegetation patches occupy over 50% of the riparian corridor	Continue to step 3
2B. Native vegetation patches occupy less than 50% of the riparian corridor	score 0.5; no further assessment
3A. High threat weed cover is between 25-75% within the patches	score 0.75; no further assessment
3B. High threat weed cover is under 25% within the patches	score 1.0; no further assessment

Table 2. Assessment categories and scores for non-riparian vegetation

Assessment step	Result
1A. Native vegetation patches are present	Continue to step 2
1B. Native vegetation patches are absent	score 0; no further assessment
2A. Native vegetation patches occupy over 50% of the non-riparian extent of the zone	Continue to step 4
2B. Native vegetation patches occupy less than 50% of the non-riparian extent of the zone	Continue to step 3
3A. High threat weed cover is between 25-75% within the patches	score 0.25; no further assessment
3B. High threat weed cover is under 25% within the patches	score 0.5; no further assessment
4A. High threat weed cover is between 25-75% within the patches	score 0.75; no further assessment
4B. High threat weed cover is under 25% within the patches	score 1.0; no further assessment

4. Results

4.1. Flora species

A tally of 323 vascular plant species, subspecies or varieties were recorded from the field survey. Of these, 112 recorded taxa are indigenous to the site with a further fourteen species reintroduced during past restoration plantings and in some landscaped areas. A total of 116 exotic species were recorded plus 29 non-indigenous native species, some of which have become naturalised. Bog Gum, Buxton Gum and White Sallow-wattle have been planted extensively in some areas in the past, but are outside their natural range of central and eastern Gippsland. Two species are of uncertain origin under the advice of VicFlora (RBGDV 2022), that includes *Isolepis marginata* (Little Club-sedge) and *Cassinia sifton* (Drooping Cassinia).

Appendix 1 lists all flora species recorded from the study. The species list is available on the Victorian Biodiversity Atlas under project ID 6425.

Significant flora species

Six threatened flora species were recorded of which three are locally indigenous to the study site, which includes Black Gum *Eucalyptus aggregata*, Austral Crane's-bill *Geranium solanderi var. solanderi* and Floodplain Fireweed *Senecio campylocarpus* (Table 3). Table 3 also includes several species of regional or local significance.

Threatened flora species located near proposed restoration areas is provided in Figures 3, 4 and 5 contained in section 5.

Weeds

Table 4 lists ten exotic species recorded from the study site that are declared noxious weeds under the CaLP Act (Agriculture Victoria 2022). Declared noxious weeds are those species that must be controlled by land managers to avoid further growth and spread. Species listed as restricted are allowed to persist on the site but cannot be traded or spread onto other land.

All non-indigenous species present at the study site are considered environmental weeds. Many species are also recognised as High Threat weeds that cause significant degradation to some Victorian ecosystems and habitats. Some of the planted horticultural specimens found on site also pose an environmental weed risk even if they currently do not show signs of spreading, for example through hybridisation with closely related, locally indigenous species. Planted specimens also pose a future risk with changing environmental conditions, and may be difficult to control once established.

Appendix 2 lists all priority weeds recorded from the study site. For further information on the risk level of individual weeds and for appropriate methods for eradication, land managers are directed to the current *Advisory List of Environmental Weeds in Victoria* (DELWP 2018b) and the *Weeds at the Early Stages of Invasion* resources including the *Early Invader Manual* (Blood et al. 2019).

Table 3. Significant flora species recorded at Five Mile Creek, Woodend

Species	Common name	Status[#]	Occurrence notes
Eucalyptus aggregata	Black Gum	Vulnerable (EPBC, FFG)	Numerous and widespread in low lying areas near swampy zones but slightly elevated from creekline environs. The population is estimated at 50-200 mature trees; very few seedlings or young recruitment was observed.
Festuca asperula	Graceful Fescue	Regionally significant	1 location with <10 individuals shortly outside the study area; recorded from a weedy depression next to an informal trail near the Woodend Racecourse Grassland Reserve.
Geranium solanderi var. solanderi	Austral Crane's-bill	Endangered (FFG)	3 locations totalling an estimated 30-100 plants.
Olearia myrsinoides	Silky Daisy-bush	Regionally significant	2 locations on sedimentary geology with an estimated 10-30 plants.
Senecio campylocarpus	Floodplain Fireweed	Endangered (FFG)	15 location records; total site population size estimated at 50-100 plants. Widespread throughout the site along waterways and swampy areas.
Threatened species outside their natural range (these have no conservation significance at Five Mile Creek)			
Eucalyptus crenulata	Buxton Gum	Endangered	Used extensively in past plantings in swampy areas of zones 4, 5, 9 and 14 in Figure 2.
Eucalyptus kitsoniana	Bog Gum	Critically Endangered (FFG)	Used extensively in past plantings in swampy areas of zones 4, 5, 9 and 14 in Figure 2.
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle	Endangered (FFG)	Used in past plantings; throughout southern Victoria this species often becomes weedy and spreads into areas of natural bushland.

[#] **EPBC** – Environment Protection and Biodiversity Conservation Act 1999; **FFG** – Flora and Fauna Guarantee Act 1988

Table 4. Declared noxious weeds recorded at Five Mile Creek, Woodend

Species	Common name	Observations
Regionally controlled		
Rubus anglocandicans	Common Blackberry	Small plants are scattered throughout the site but no large infestations were observed
Ulex europaeus	Gorse	Scattered throughout the site in small patches; probably abundant in the soil seed bank
Regionally restricted		
Allium triquetrum	Angled Onion	Commonly found on the waterway margins along most riparian areas and on nearby damp areas
Carduus pycnocephalus	Slender Thistle	Uncommon
Cirsium vulgare	Spear Thistle	Uncommon
Conium maculatum	Hemlock	Widespread. Common in the western part of the study area
Cretaegus monogyna	Hawthorn	Large infestations are common in the western part of the study area
Cytisus scoparius	English Broom	Uncommon
Genista monspessulana	Montpellier Broom	Scattered throughout the site
Salix fragilis	Crack Willow	Scattered along watercourses; large infestations dominate lower reaches of the Five Mile Creek

4.2. Vegetation types

Two EVCs are present at the study site that include Valley Grassy Forest (EVC 47) and Swampy Riparian Woodland (EVC 83).

Valley Grassy Forest is eucalypt-dominated open forest with a diverse ground flora of lilies, grasses, sedges and herbs that occupies well-drained colluvial or alluvial soils on gently undulating lower slopes and valley floors (Oates and Taranto 2001). At the study site Valley Grassy Forest is restricted to sedimentary slopes that are set back from the creek or, less commonly where these slopes form a steep embankment against the creekline. Although remnants at the study site are under immense pressure from weeds, particularly Radiata Pine *Pinus radiata* and Hawthorn *Cretaegus monogyna,* some areas support patches of intact ground flora and high structural complexity.

Valley Grassy Forest is listed as vulnerable within the Central Victorian Uplands bioregion.

Swampy Riparian Woodland is a characteristic vegetation of high rainfall, low energy stream systems and broad drainage lines on heavy alluvial soils and in this environment it is closely associated with wetland systems such as channels, ponds and associated flood terraces. The vegetation is open eucalypt-dominated woodland with a variably shrubby understorey with distinctive riparian elements such as aquatic herbs mixed with reeds, sedges, rushes and tussock grasses. Swampy Riparian Woodland was once common but has been extensively altered by drainage for agriculture (Oates and Taranto 2001). At the study site this EVC is restricted to highly modified examples present along Five Mile Creek that now carry a mixture of planted vegetation, remnant trees and aquatic vegetation but support a range of valuable habitat attributes.

Swampy Riparian Woodland is listed as endangered within the Central Victorian Uplands bioregion.

Exotic vegetation states

Large areas of the study site do not support native vegetation. The most extensive areas of exotic vegetation include the open space patches of regularly mown turf that support scattered, large deciduous trees and pines, plus an extensive exotic woodland in the western third of the study site. This western section supports a novel ecosystem dominated by several clearly definable ecological states characterised by exotic woody weeds with a species-poor, disturbed understorey. Clear examples of distinct ecological states in this area include:

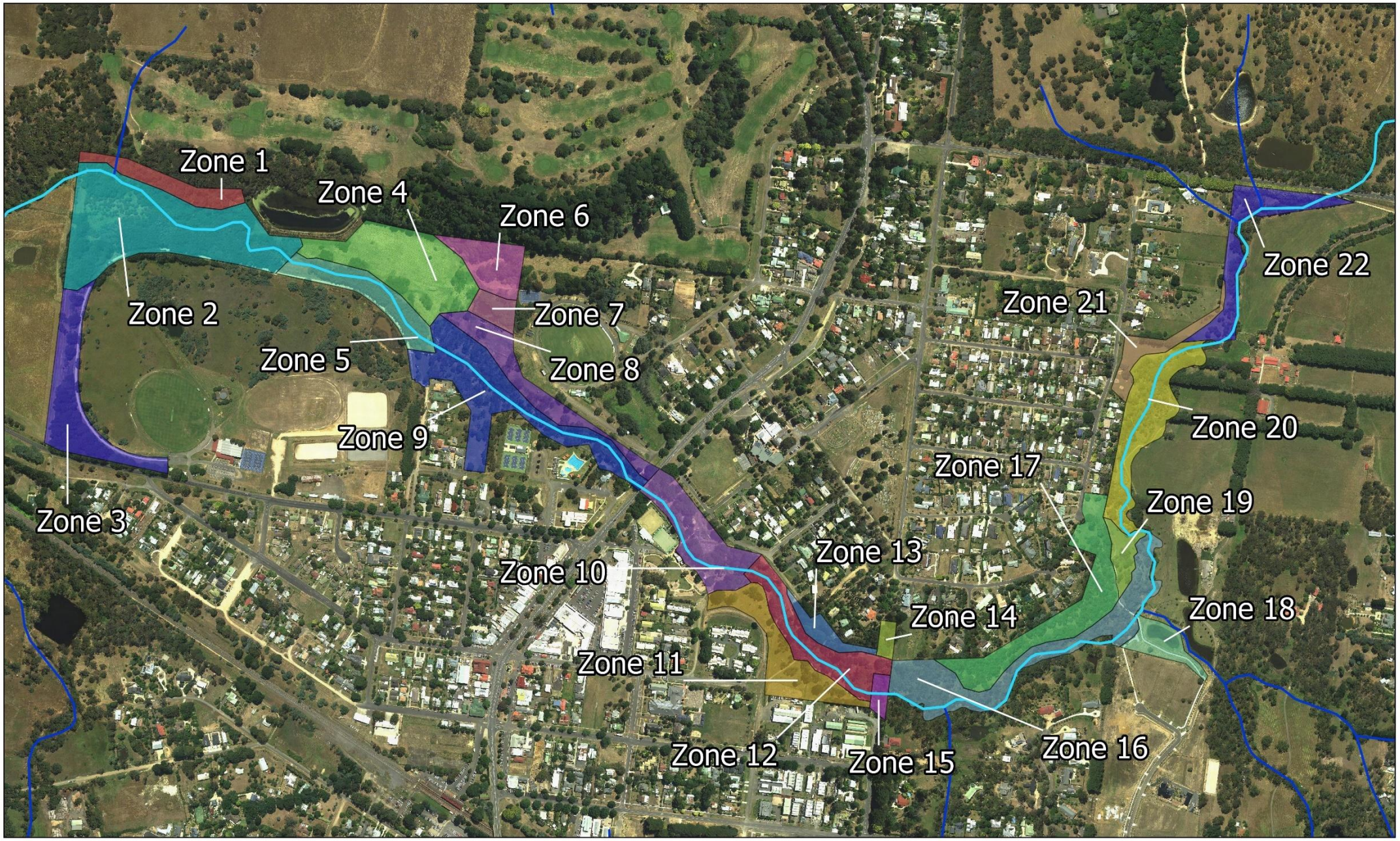
- A riparian woodland of Crack Willow **Salix fragilis* along the Five Mile Creek corridor;
- A woodland of White Popular *Populus alba* on damp depressions between the creekline and the Woodend Racecourse walking trail
- An open shrubland of Hawthorn, pasture grasses and sedges adjacent to the Gregory Street easement;
- Groves of Radiata Pine and Cypresses on the verge of the racecourse walking trail along the Gregory Street easement; and
- A large, swampy grassland of exotic pasture grasses north of the creek, west of Gilbert Gordon Oval (south of the Woodend Golf Course).

4.3.Site condition assessment

The study site has three main precincts that include western, central and eastern areas. However, baseline vegetation condition is based on 21 assessment zones across the site, each of which are shown in Figure 2. The attributes of each assessment zone are listed in Table 5. Each zone comprises one or more land uses and vegetation types but comprise a clearly delineated area. Each zone is appropriate to manage based on the layout and the suite of management issues that apply to the land.

The delineation of 21 assessment zones will provide three main benefits to management of the study site:

1. Classification of the range of current land uses, management history and topographic conditions present at the site;
2. Provide meaningful boundaries for individual projects that are manageable and appropriate to the management context; and
3. Offer conceptual guidance to land managers and community members in terms of the complexities and challenges inherent to ecological management within diverse social and environmental settings where land use planning must recognise, acknowledge and resolve practical management issues associated with competing land uses and any conflict among decision makers.



Minor watercourse
Five Mile Creek

Scale 1:6500 (print to A3)
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

N

0 250 500 750 1000 m

Aerial photograph from 7 February 2017

Figure 2. Assessment zones at the Five Mile Creek study area

Table 5. Qualities of 22 land management zones assessed at Five Mile Creek, Woodend

Zone	Main features	Topography and geology	Target EVC	Management issues	Significant vegetation values	Key opportunities	Quality (max. 2)
1	Remnant Valley Grassy Forest with intact canopy of Manna Gum and Candlebark; ground flora/understorey values	Moderate to steep slope on sedimentary geology	47	Weeds; rabbits	Intact understorey - potential significant species	Improve understorey condition in concert with restoration of remnants directly upslope within the Golf Course	1.5
2	A mix of poplars, willows and hawthorn; Gregory St road easement follows the western edge	Low relief plain with a complex drainage profile; seasonally waterlogged or inundated	83	Weeds; altered hydrology	Indigenous ground flora scattered throughout the area; *Senecio campylocarpus*	Ecological restoration	0.25
3	Dominated by pine trees; Gregory St road easement follows the western edge	Flat to slightly sloping plain on sedimentary geology	47	Weeds	Eucalyptus radiata on road reserve	Ecological restoration (requires significant reduction to exotic tree cover)	0.5
4	Dominated by exotic pasture grasses with several copses of remnant eucalypts and revegetated areas	Low relief plain on alluvium; seasonally waterlogged soils	83	Weeds; altered hydrology	*Eucalyptus aggregata; Senecio campylocarpus*; Planted native vegetation patches	Ecological restoration	0.5
5	Dominated by mixed native eucalypts planted >20 years ago by the CMA; remnant trees occasional	Stream channel, banks and low relief plain with complex drainage patterns on alluvium; seasonally waterlogged or inundated	83	Weeds; minor gap in creekline woody vegetation	*Eucalyptus aggregata;* Continuous woody vegetation cover	Improve understorey condition	1.5
6	Remnant Valley Grassy Forest; mown pasture between woody vegetation patches	Moderate slope on sedimentary geology	47	Weeds	*Geranium solanderi var. solanderi* Remnant vegetation	Replace woody weeds with native vegetation; in-fill mown areas with native vegetation (requires minor reduction to open space)	1.5
7	Open water body with large willows, emergent aquatic vegetation and weed dominated banks	Modified terrain on a broad, low relief plain on alluvium near the boundary with sedimentary geology to the north	83	Weeds	Extensive indigenous aquatic vegetation	Woody weed removal (willows)	0.5

Zone	Main features	Topography and geology	Target EVC	Management issues	Significant vegetation values	Key opportunities	Quality (max. 2)
8	Turf with scattered mostly deciduous exotic trees with small areas of indigenous ground-layer herbaceous vegetation and woody plantings	Low relief plain on alluvium; seasonally waterlogged soils	83	Low structural diversity (mown areas)	Planted native vegetation patches	Widen native vegetation corridor (requires significant reduction to open space)	0.5
9	Remnant and planted native vegetation; scattered large old exotic trees; the southern flats form a gradient to areas with sedimentary geology	Low relief plain on alluvium with an incised stream channel, connecting drainagelines and shallow stormwater channels	47/83	Weeds including non-indigenous plantings; soil compaction caused by regular mowing; stormwater runoff from residential areas	*Eucalyptus aggregata; Senecio campylocarpus;* Extensive planted vegetation; creekline remnant vegetation	Improve understorey condition; widen native vegetation corridor (requires minor reduction to open space); discontinue mowing in some areas	1.5
10	Dominated by exotic trees, built environment and trail network	Stream channel and banks on alluvium; highly modified urbanised environment	83	Weeds; significant gap in creekline connectivity	-	Ecosystem restoration (requires significant reduction to exotic tree cover)	0.5
11	Turf with scattered, mostly exotic trees; trail network, clumps of planted woody vegetation patches	Low releif plain on alluvium with several shallow stormwater channels from urban and industrial areas	47/83	Weeds; industrial effluent; low structural diversity (mown areas)	*Senecio campylocarpus* Extensive planted vegetation; creekline remnant vegetation	Widen native vegetation corridor (requires significant reduction to open space)	1
12	Revegetated creekline; remnant trees; intact streamline vegetation	Stream channel and banks on alluvium with several steep banks	83	Weeds; urban stormwater and industrial effluent	*Eucalyptus aggregata; Senecio campylocarpus* Planted native vegetation patches	Improve understorey condition	1.75
13	Dominated by pine trees and pine leaf litter; degraded Valley Grassy Forest remnant	Moderate to steep slope on sedimentary geology	47	Weeds (pine trees notable)	*Geranium solanderi var. solanderi, Olearia myrsinoides*	Ecological restoration (requires significant reduction to exotic tree cover)	0.5
14	Weed regrowth along a government road easement with overhead powerlines	Moderate to steep slope on sedimentary geology	47	Overhead powerline constraints; weeds	*Olearia myrsinoides*	Ecological restoration without tree canopy	0.5
15	Weed regrowth along a government road easement with overhead powerlines and stormwater drainage from nearby road	Broad, low slope with depressions on alluvium	83	Weeds; industrial effluent and roadside stormwater runoff	*Eucalyptus aggregata*	Ecological restoration	0.5

Zone	Main features	Topography and geology	Target EVC	Management issues	Significant vegetation values	Key opportunities	Quality (max. 2)
16	Revegetated creekline with remnant trees and intact streamline vegetation	Extensive low relief creek flats and shallow, meandering creekline on alluvium that fringes sedimentary banks on the northern edge	83	Weeds; effluent/sewage leaks and drainage outflows	*Eucalyptus aggregata*; extensive planted vegetation; very high quality remnant vegetation	Improve understorey condition; ecological cool burn high quality remnant vegetation	1.75
17	Remnant woodland with extensive native plantings; turf and trail network	Moderate to steep slope on sedimentary geology	47	Weeds (non-indigneous plantings); urban stormwater and domestic effluent; soil compaction caused by frequent mowing	*Senecio campylocarpus*; extensive planted vegetation; remnant vegetation	Monitor or remove non-indigenous plantings; improve understorey condition; reduce mowing frequency	1.5
18	Open water body and open space with trails	Modified terrain on a broad, low relief plain on alluvium	47/83	High edge-to-interior ratio (narrow land parcel); existing trails limit revegetation opportunities	Dam dominated by native aquatic vegetation; *Eucalyptus aggregata* on neighbouring land	Habitat corridor east to remnants on private land with discontinuous connectivity to Macedon RP.	1
19	Remnant trees and turf; dog off-lead area; mown areas support native and exotic ground-flora	Low relief creek terrace on alluvium that grades to the west with the low slope near the edge of sedimentary geology	47/83	Low structural diversity (mown areas); soil compaction caused by regular mowing	*Eucalyptus aggregata* Remnant vegetation (with understorey values)	Discontinue mowing; improve understorey condition	0.5
20	Remnant woodland with extensive native plantings; intact in-stream vegetation with a disused causeway along the waterway	Low relief creek flats and shallow, meandering creekline on alluvium	83	Private land boundary on the eastern creek bank; narrow woody vegetation corridor; weeds	*Eucalyptus aggregata;* Extensive planted vegetation; creekline remnant vegetation	Improve understorey condition	1.75
21	Trail network and turf with native plantings	Low relief creek terrace and riparian corridor on alluvium	47/83	Low structural diversity (mown areas)	Small planted patches of native vegetation	Widen native vegetation corridor (requires significant reduction to open space)	0
22	Planted and remnant vegetation; small dams; two tributaries enter the site from private land north/north-west; mature exotic trees along the northern site boundary (Lancefield-Woodend road reservation)	Low relief creek terrace and riparian corridor on alluvium	83	Private land boundary on the eastern creek bank; narrow woody vegetation corridor; weeds	*Eucalyptus aggregata;* Extensive planted vegetation; creekline remnant vegetation	Widen native vegetation corridor (requires minor reduction to open space)	1.75

5. Site management and restoration plan

This section describes five restoration projects to be completed at the study site over coming decades. A significant level of investment is required to restore the site to a very high level of ecological function and there are many ways to tackle the management issues present at this land. Many different types of projects could be developed to restore the land, however the limited scope of this assessment meant only a small number could be developed for the immediate future.

To help develop individual project areas and works the range of threats and weaknesses of the site have to be considered. The major constraints on restoration of the Five Mile Creek environs include the following key issues:

- large scale and high cost of works required to achieve large-scale restoration outcomes;
- long-term, ongoing pressure of weed invasion, particularly the threat of invasive garden escapes, widely dispersed common but high impact weeds, pasture grasses, vigorous herbs and climbers and aquatic weeds;
- threats associated with urban and industrial environments, such as point-source pollution, litter, errant pets and predatory or otherwise invasive wildlife (e.g. introduced birds) that thrive in these settings and place enormous pressure on native species and ecosystems;
- limited up and down-stream riparian vegetation cover along the creek outside the study area, and the low landscape-scale vegetation cover across agricultural areas of the Five Mile Creek upper catchment;
- Historic land use disturbances that have altered soil and nutrient conditions that are difficult and costly to remediate;
- Floodplain and creek hydrology changes due to landscape-scale drainage and water diversion for agriculture and flood protection;
- Competing land uses including accessible public spaces provided by walking paths, mown areas, dog off-lead zones and the summer shade and other amenity values provided by historic plantings of exotic trees;
- Physical limits to widening the existing patches of native vegetation caused by neighbouring private land and the need to maintain public open space; and
- Significant physical gaps along the creekline due to powerlines (zone 5) and exotic trees (zone 9 & 10).

Fire risk and community fire safety

In addition to the issues above, fire risk is a major consideration for all land management planning throughout the Macedon Ranges LGA. The focus of this plan is to guide the design and delivery of ecological restoration to enhance ecological management outcomes. Further to this, several key land management objectives are the protection of biodiversity and waterway values. Therefore, fire management is integral to these objectives and outcomes and has been considered during the preparation of the plan.

All works proposals included in this report will need to be assessed by Council for compliance with the relevant Municipal Fire Management Plan and planning overlays related to the State bushfire planning policy (section 13.02-1S of the Macedon Ranges Planning Scheme). No part of the study area is subject to the Bushfire Management Overlay under the Macedon Ranges Planning Scheme, however the waterway environs are part of an extensive zone designated as *Bushfire Prone Area*. It is acknowledged under the current Municipal Fire Management Plan (MRSC 2020) that the fire environment is changing due to climate change effects, and so fire management will also change in order to adapt to future conditions.

The fire risk associated with works recommended in this plan are likely to be relatively low and possibly only a contentious issue for some sites where vegetation management occurs close to private residences. In these cases, existing unmanaged weed infestations and tall (unslashed) grass biomass along private property boundaries pose a greater overall hazard than would be present if these areas were restored using native herbaceous species that have lower overall biomass and offer summer growth (e.g. warm-season grasses like Kangaroo Grass). However, all vegetation management proposals should be evaluated with consideration for any associated fuel hazard risks and for compliance with relevant regulations and guidelines.

5.1. General guidelines for site restoration

To maintain a practical approach to site management the five recommended restoration projects offer between them a variety of opportunities to maintain, enhance and expand biodiversity at key locations along the creekline. The major exclusions include assessment zones 1, 3, 6, 7, 8, 10, 11, 13, 17, 18 and 21 mainly because these zones present less significant opportunities, are somewhat constrained by their current condition or land use, and due to project limits. However, excluded zones are no less appropriate for extending the restoration methods being used generally at the site.

Restoration projects are described in detail in the sections that follow, and key work sites are shown in Figures 3 to 6. The first three projects are each provided with a general works plan to guide project planning and budgeting. The last two restoration projects cover relatively large areas that require further planning to assess their viability and carry out further site analysis. A detailed work plan is not provided for the Black Gum Floodplain Restoration. However, NCCMA has provided costings for the extensive weed control required for the Floodplain Woodland Reclamation project, and so this project has been given further consideration in the plan.

Weed control and planting management standards are based on the current guidelines used for Victorian *Management standards for native vegetation offset sites* (DELWP 2019). Planting densities are based on the standards set out in the Victorian *Native vegetation gain scoring manual* (DELWP 2017). Table 5 outlines appropriate planting densities for understorey species at all revegetation sites except in situations where the local conditions require a variation.

Appendix 3 and 4 list plant species suitable for use in revegetation within Valley Grassy Forest and Swampy Riparian Woodland respectively.

5.2. Planting guidelines

All tubestock plantings should be provided with stakes and guards to offer frost protection and make plants more visible to aid their maintenance during the first few years. Guards can be removed as soon as plants are established. Macropods and rabbits may damage plantings at any time but while plants remain small they are at greater risk of death from herbivores and other disturbances.

All plantings should be watered-in twice at planting and regularly for at least several weeks afterwards, unless sufficient rainfall is observed or watering risks waterlogging the soil. Most importantly, any plantings in spring require reliable summer watering to combat the risk of plant failure during summer drought.

Mulch is generally not required around plantings but could be utilised in certain situations. High density planting of ground layer species will not be appropriate to mulch because of the planting density but mulch can be applied to woody tree and shrub plantings.

Plantings are expected to reach a survivorship of >75% at the completion of each project and the nominal planting density or total number of plants should factor this into the design of each planting area. For example, plant out 125% of the intended survivorship number to account for typical rates of attrition, or plan to carry out supplementary in-fill planting on a case-by-case basis.

Canopy species

Overstorey (tree) planting densities:

- 50 plants per hectare for Swampy Riparian Woodland (EVC 83)
- 100 plants per hectare for Valley Grassy Forest (EVC 47)

Higher tree planting densities may be appropriate in some situations to provide dense areas of understorey using canopy species. In these areas some form of ecological thinning should be provided in later years to promote the overstorey development, in which case the thinnings should be retained on site to provide ground-layer coarse woody debris.

Understorey species

Table six provides density guidelines for planting tubestock or hiko cells of understorey species.

Understorey plantings can include other, smaller lifeforms such as herbs, small and medium graminoids, ground ferns and prostrate shrubs. The use of small-statured plants in revegetation projects has an inherently high risk of failure and should be assessed for each planting project on a case-by-case basis and supported by higher maintenance requirements to justify the investment.

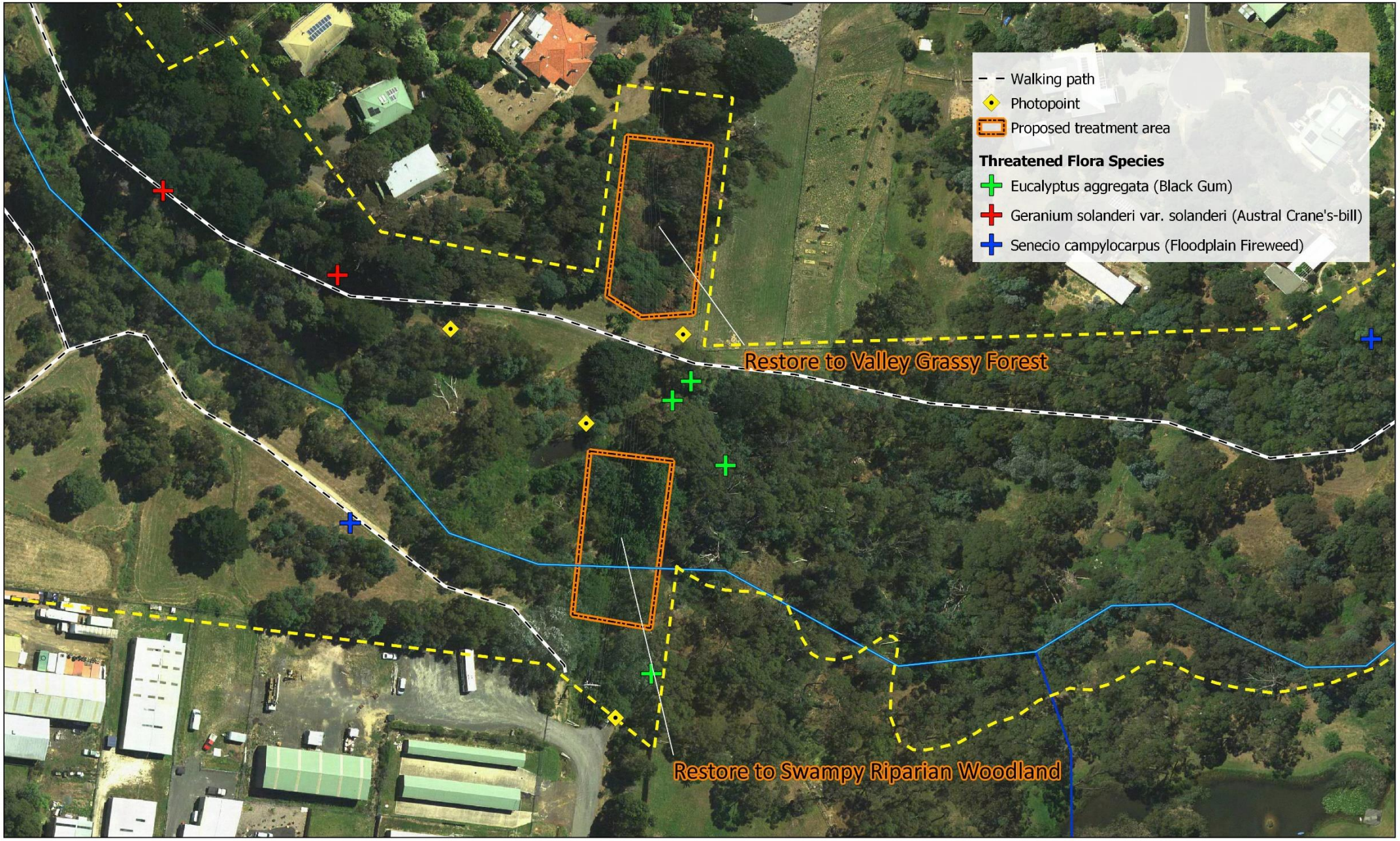
Planting densities for small statured plants will vary by plant size and habit. Species with a tufted habit that don't spread vegetatively should be planted in dense clumps of 5-10 plants/m^2. To meet minimum viable population size requirements the reintroduction of any small understorey lifeforms should be supported by plantings of >1,000 individuals per species. Seeds and other propagation materials should be sourced from diverse and geographically broad genetic base that focuses on large source populations rather than smaller ones, in order to maximise their evolutionary potential.

Table 6. Understorey planting densities for revegetation at Five Mile Creek (based on DELWP 2017).

Lifeform#	Plants per unit area for each 5% cover in EVC benchmark	Benchmark cover by EVC
Understorey tree (T)	50/ha	EVC 83: 10 % EVC 47: 10 %
Medium shrub (MS)	200/ha	EVC 83: 5 % EVC 47: 10 %
Small shrub (SS)	500/ha	EVC 83: 1 % EVC 47: 5 %
Large tufted graminoid (LTG)	500/ha	EVC 83: 10 % EVC 47: 10 %

the plant species recommended for use in Appendices 3 and 4 are assigned to lifeforms that also include other lifeform categories for smaller plant species not covered by this table.

Figure 3. Eastern parts of the Black Gum Woodland Enhancement areas



Study area boundary
Five Mile Creek
Minor watercourse

Scale 1:1000 (print to A3)
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 50 100 150 200 m

N

Aerial photograph from 7 February 2017
© Macedon Ranges Shire Council

Figure 4. Bowen Street Vegetation Enhancement areas at the Five Mile Creek study area

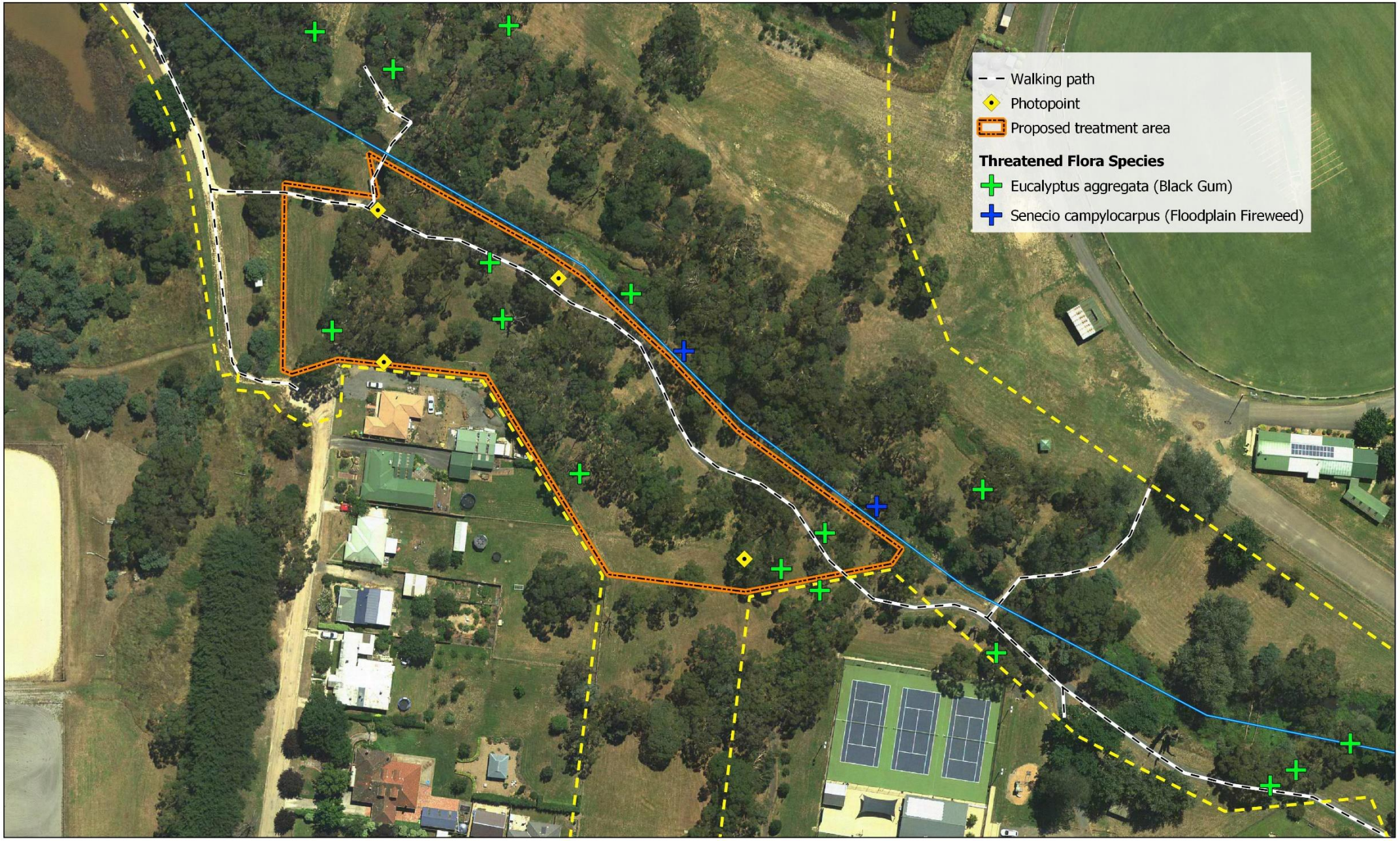


Figure 5. Western parts of the Black Gum Woodland Enhancement areas

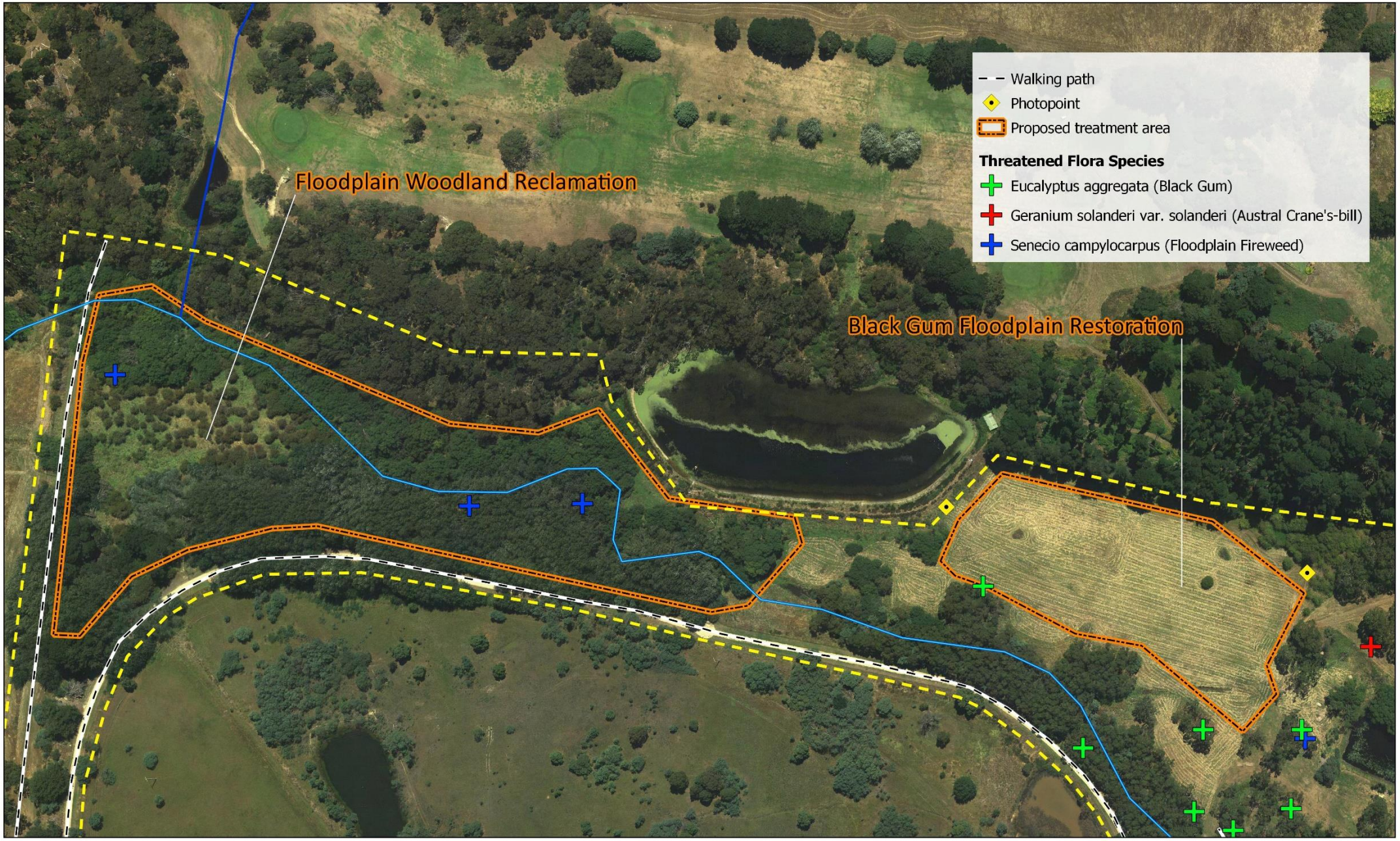


Figure 6. Black Gum Floodplain Restoration and Floodplain Woodland Reclamation areas

5.3. Black Gum Woodland Enhancement

Location and area: central and eastern areas of the study site across assessment zones 9 and 19, up to 2 ha (see figures 3 and 5).

Key objectives: Remove mowing from key areas to improve Black Gum habitat quality and the vegetation understorey condition.

Major benefits: Reduce soil compaction with a potential increase to Black Gum longevity; promote Black Gum recruitment; significantly improve understorey habitat condition; improve water quality inflows to Five Mile Creek; and provide community engagement opportunities.

Significant risks: community dissatisfaction due to site management changes; increased weed cover and maintenance cost - Council would need to provide a contingency plan if cessation or reduced mowing frequency creates a major weed management issue.

Priority works: community engagement; reduce or stop regular site mowing – install signage or mower exclusion barriers; allow build-up of natural leaf litter, fallen timber and understorey regeneration; monitor weeds and natural recruitment and provide appropriate management responses.

Goals: Remove regular mowing from lawned Black Gum remnants and within ten years re-establish complex understorey vegetation to the general guide of EVC 83 Swampy Riparian Woodland. This should include at least one of the three key recommended locations and maintain a low cover <5% of high priority weeds and achieve active seedling recruitment of Black Gum. Enhance weed control outcomes by planting understorey species into weed treatment areas to enhance weed management outcomes.

Key tasks:

- Early consultation and planning: consult with Council's open space department and the local community about the proposed site changes;
- Delineate mowing exclusion zones, install site-based signage and notify local residents about the project;
- Carry out regular site monitoring to assess vegetation development and identify Black Gum recruitment – include community volunteers where possible;
- Supplementary works: Control high priority weeds and significant pasture grass infestations;
- Supplementary works: Revegetate in areas treated for weeds;
- Project evaluation after the final monitoring in year five.

Duration: five years including four years of active management and a final year of monitoring with project evaluation; the project could be replicated in other areas of the site and modified with improvement to the project design over time. This project provides an opportunity for community monitoring of Black Gum recruitment.

Cost: Very low; $1-5K, mainly for community engagement, monitoring and minor site maintenance unless supplementary weed control and revegetation is required (included in the works plan).

Priority: High; this project is not overly complex but requires some community engagement to give it the best chance of success, particularly if dog off-lead areas are affected.

Monitoring: photopoints; species lists for each project area, with the option of quadrat-based monitoring; counts of Black Gum recruitment; ongoing assessments of weed cover.

Table 7. Work plan for Black Gum Woodland Enhancement

Works period	Task	Target	Cost range
Year 1	Early project planning – consult with Open Space, local community and set up monitoring schedule.	Prepare a project plan documenting all actions agreed	-
	Mark out mowing exclusion areas and install interpretive signage	Markers/fences established; signs located at key access points	<$2K
	Monitoring for vegetation change – include community volunteers where practical *Council's project officer will need to also complete inspections to assess the need to provide supplementary weed control and revegetation	Locate and record any Black Gum seedlings (GPS and counts) – recheck these annually Assess vegetation structural change using photopoints Collect a species list for each mowing exclusion area with the option of establishing quadrats for inclusion to the VBA/ALA as a project	<$3K
	Supplementary: Weed control for high priority weeds (see Appendix 2), exotic perennial grasses and herbs as appropriate to ensure project success.	Target weed cover in treatment areas <5%	TBA
	Supplementary: Source propagation material for revegetation – e.g. seed collection sites or order materials through an appropriate nursery	Commission plant production due for planting in the next appropriate planting season Focus on understorey species to allow Black Gum seedlings to potentially recruit onto planting areas	TBA
Year 2	Monitoring	As per year 1	<$3K
	Supplementary: Revegetate Year 1 weed control areas	Install 5-10 plants/m^2 within target areas; do no mulch unless critical to limit weed re-establishment and protect plantings	TBA
	Supplementary: Weed control for high priority weeds (see Appendix 2), exotic perennial grasses and herbs as appropriate to ensure project success.	As per year 1	TBA
	Supplementary: Source propagation material for revegetation – e.g. seed collection sites or order materials through an appropriate nursery	As per year 1	TBA
Year 3	Monitoring	As per year 1	<$3K
	Supplementary: Revegetate Year 1 weed control areas	Install 5-10 plants/m^2 within target areas; do no mulch unless critical to limit weed re-establishment and protect plantings	TBA
	Supplementary: Weed control for high priority weeds (see Appendix 2), exotic perennial grasses and herbs as appropriate to ensure project success.	As per year 1	TBA
	Supplementary: Source propagation material for revegetation – e.g. seed collection sites or order materials through an appropriate nursery	As per year 1	TBA
Year 4	Monitoring	As per year 1	<$3K
	Supplementary: Revegetate Year 1 weed control areas	Install 5-10 plants/m^2 within target areas; do no mulch unless critical to limit weed re-establishment and protect plantings	TBA
	Supplementary: Weed control for high priority weeds (see Appendix 2), exotic perennial grasses and herbs as appropriate to ensure project success.	As per year 1	TBA
	Supplementary: Source propagation material for revegetation – e.g. seed collection sites or order materials through an appropriate nursery	As per year 1	TBA

Works period	Task	Target	Cost range
Year 5	Monitoring	As per year 1	<$3K
	Project evaluation and reporting – compile all previous project monitoring data and reports and prepare an overview of the project outcomes, lessons learned and improvements for the future	Project evaluation report completed	$2-5K

5.4. Bowen Street Vegetation Enhancement

Location and area: the easement separating central and eastern areas of the study site across that include assessment zones 14 and 15, up to 1 ha (see figure 4).

Key objectives: Restore Valley Grassy Forest and Swampy Riparian Woodland; prevent weed reinvasion. Note the government road easement has previously been groomed for woody weeds with no revegetation plan for the site to date.

Major benefits: Increase the extent and quality of EVCs under and near the powerline easement; improve water quality inflows to Five Mile Creek; enhanced protection for Austral Crane's-bill and Silky Daisy-bush; small community engagement opportunities.

Significant risks: community dissatisfaction due to site management changes (Pine tree or oak removal); high weed management cost; limited effectiveness due to difficult terrain; a constrained restoration outcome due to overhead powerlines or the need to retain oak or pine trees; ongoing vegetation lopping by powerline authorities (this is manageable if effective stakeholder engagement is completed); native canopy tree decline may result as a short-term impact of large pine tree removal (due to altered canopy dynamics).

Priority works: site preparation; source propagation material; planting; site maintenance.

Goals: Treat re-establishing weeds and revegetate slopes and flats and revegetate a mixed shrubby-grassy-herb-rich indigenous understorey vegetation to the general guides of EVC 47 and 83. This requires maintenance of a low cover (<5%) of high priority weeds for the duration of the five year active management period and extensive revegetation to establish a dense cover of desirable species.

Key tasks:

- Site-wide treatment of weed regrowth for a minimum of twelve months prior to planting
- Source propagation material for revegetation, e.g. wild collected seed or nursery grown plants
- Revegetate extensively, focussed on dense tussock grass-herbaceous understorey with low shrubs;
- Report on project results at regular milestones and complete a project evaluation at the end of six years.

Duration: up to five years if an intensive program of revegetation is carried out

Cost: Moderate; $10K-50K depending on final planting densities

Priority: High; this project is not overly complex but requires some community engagement to give it the best chance of success, particularly if dog off-lead areas are affected.

Monitoring: aerial photography assessment; photopoints; population assessment of Austral Crane's-bill and Silky Daisy-bush; quadrat floristic data (higher quality areas of Valley Grassy Forest); regular site inspections during any contractor works and ongoing assessments of weed cover.

Table 8. Work plan for Bowen Street Vegetation Enhancement

Works period	Task	Target	Cost range
Year 1	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	Target weeds <5% cover	$3-10K
	Source propagation material for revegetation across 1 ha: ▪ A minimum of 10,000 plants that includes: ▪ At least 5000 grasses (or direct seed equivalent or greater amount) ▪ At least 3000 small shrubs and other herbaceous understorey species ▪ Aquatic or riparian-specialist species on the drainageline ▪ Scattered medium shrubs to fill any major gaps Note that any observed natural regeneration can be substituted for revegetation and removed from the 1 ha planting area	Commission plant production or seed purchase for planting in the next appropriate period for revegetation Plant in spring through early autumn planting for warm season grasses (e.g. *Themeda triandra* and *Hemarthria uncinata)*.	$8K-15K
	Monitoring	Recapture photopoints to document change in site condition	<$1K
Year 2	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	Target weeds <5% cover	$3-10K
	Revegetate over winter-spring. Guard plants on a case-by-case basis if heavy rabbit or macropod activity is likely in the planting areas - Include community volunteers wherever possible	Target weds <5% cover Plant survivorship >75% Install sufficient supplementary (in-fill) plants	$4K-8K
	Monitoring	As per year 1	<$1K
Year 2	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	Target weeds <1% cover	$2-6K
	Revegetation maintenance – weed control, watering, maintain guards and install replacement plants as required - Complete maintenance treatments at least four times annually	As per year 2	$4K-8K
	Monitoring	As per year 1	<$1K
Year 3	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	As per year 3	$2-6K
	Revegetation maintenance – weed control, watering, maintain guards and install replacement plants as required - Complete maintenance treatments at least four times annually	As per year 2	$4K-8K
	Monitoring	As per year 1	<$1K
Year 4	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	As per year 3	$2-6K
	Revegetation maintenance – weed control, watering, maintain guards and install replacement plants as required - Complete maintenance treatments at least four times annually	As per year 2	$4K-8K
	Monitoring	As per year 1	<$1K

Works period	Task	Target	Cost range
Year 5	All treatment areas shown in Figures 4: control all priority weeds, perennial grasses and herbs	As per year 3	$2-6K
	Detailed monitoring	Document plant survivorship and weed cover	$1-2K
	Project evaluation and reporting – compile all previous project monitoring data and reports and prepare an overview of the project outcomes, lessons learned and improvements for the future	Project evaluation report completed	$2-5K

5.5. Creekline Maintenance and Understorey Enhancement

Location and area: all sections of the study site that are close to the watercourse that includes assessment zones 5, 9, 12, 16, 20 and 22 (potentially 12 ha of land but more likely in practice to cover a much smaller area) (these are not depicted on detailed maps but can be seen on the overview provided on figure 2).

Key objectives: Maintain Swampy Riparian Woodland and lower slopes areas of Valley Grassy Forest and enhance their understorey conditions; prevent high threat weed establishment and spread. Note this restoration project provides a framework for ongoing maintenance of the major creekline sections that have been revegetated historically – these zones support a combination of remnant and revegetated native vegetation values and were the result of significant voluntary community labour.

Major benefits: Increase the quality of EVCs along the creekline and adjacent terraces, banks and low slopes; improve water quality inflows to Five Mile Creek (e.g. by replacing weeds with functionally diverse, perennial understorey vegetation and through low herbicide use as weed populations are maintained at low levels); enhanced protection for Austral Crane's-bill; increase recruitment opportunities for Black Gum; regular community engagement opportunities.

Significant risks: community dissatisfaction due to site management changes (exotic tree removal); high weed cost due to long-term pressure of weeds from the surrounding environment and upstream sources; limited effectiveness due to irregular or inconsistent approach to site maintenance; a constrained restoration outcome due to the need to retain oak or pine trees.

Priority works: stakeholder engagement if any significant exotic trees are proposed for removal; site preparation for understorey plantings (extensive understorey weed control); planting (potential community participation); ongoing site maintenance (inspections and control of priority weeds).

Goals: Treat priority weeds and revegetate on low slopes, floodplain terraces and the riparian corridor to the general guide of EVC 83 and 47. This requires treatment of each section of creekline at intervals over a ten year period to attain target weed cover <5%.

Duration: a cyclic approach to creekline maintenance could be carried out over a ten-year timeframe, providing each section of the creek treatment over one or two seasons across that period.

Cost: Variable; $2K-20K for maintenance of each zone, depending on the desired targets for each treatment and whether revegetation will be completed; >$20K-$50K for major tree removal through some sections of the creek.

Priority: Moderate; this project should be integrated into standard, ongoing site maintenance to keep weeds at manageable levels. The project may not be essential in the short-term but if maintenance is not carried out then future maintenance costs will increase substantially.

Monitoring: aerial photography assessment for large tree removal; photopoints at key creek sections (not completed in this assessment); population assessment of Austral Crane's-bill; quadrat floristic data; regular site inspections during any contractor works and ongoing assessments of weed cover.

Table 9. Work plan for Creekline Maintenance and Understorey Enhancement

Works period	Task	Target	Cost range
Year 1			
1.1	Zone 20 & 22 Treat high priority weeds including early planting preparation. For planting preparation focus on areas of perennial pasture grasses or otherwise disturbed areas under existing vegetated areas, either under existing canopy cover or in canopy gaps	<5% cover of high priority weeds within treated areas <1% cover of exotic vegetation within target planting areas	$3K-6K
1.2	Zone 20 & 22 Source propagation material for revegetation across 0.5 ha: ▪ A minimum of 10,000 plants that includes: ▪ At least 50% grasses (or direct seed an equivalent or greater amount) ▪ At least 30% small shrubs and herbaceous understorey species ▪ Aquatic or riparian-specialist species for seasonally inundated or boggy sites ▪ Avoid planting trees and larger shrubs	Commission plant production or seed purchase for planting in the next appropriate period for revegetation	$8K-15K
1.3	Monitoring	Set up photopoints at new planting sites and document baseline site condition	<$1K
Year 2			
2.1	Zone 20 & 22: Treat high priority weeds focussing on species difficult to control in year 1 (e.g. plants unable to be treated due to access constraints or outside the year 1 budget)	<5% cover of high priority weeds within treated areas	$2K-5K
2.2	Zone 20 & 22: Revegetate (minimum 0.5 ha) over winter-spring. Guard plants on a case-by-case basis if heavy rabbit or macropod activity is likely in the planting areas Include community volunteers wherever possible	Install 10,000 plants in suitable conditions Plant in spring through early autumn planting for any warm season grasses (e.g. *Themeda triandra* and *Hemarthria uncinata)*.	$3K-6K
2.3	Monitoring	Revisit photopoints at planting sites and document baseline site condition	<$1K
Year 3			
3.1	Zone 14 & 16 Apply the same weed control treatment as item 1.1	As per item 1.2	$5K-10K
3.2	Zone 14 & 16 Apply the same plant procurement as item 1.2	As per item 1.2	$8K-15K
3.3	Zone 20 & 22: Planting maintenance across all revegetation areas Ensure each area receives maintenance at least twice annually	Maintain target weed species cover at <5% Ensure >75% planting survivorship or provide appropriate in-fill planting	$2K-4K
3.4	Monitoring	Set up photopoints at new planting sites and document baseline site condition Revisit existing photopoints and recapture site condition	<$2K

Works period	Task	Target	Cost range
Year 4			
4.1	Zone 14 & 16 Apply the same weed control treatment as item 2.1	As per item 2.1	$5K-10K
4.2	Zone 14 & 16 Apply the same plant revegetation as item 2.2	As per item 2.2	$8K-15K
4.3	Zone 20 & 22: Planting maintenance across all revegetation areas Ensure each area receives maintenance at least once – this is the final plant maintenance unless monitoring shows that more investment is required	As per item 3.3	$1K-2K
4.4	Monitoring	Revisit existing photopoints and recapture site condition	<$2K
Year 5			
5.1	Zone 12 & 13 Apply the same weed control treatment as item 1.1	As per item 1.1	$5K-10K
5.2	Zone 12 & 13 Apply the same plant procurement as item 1.2	As per item 1.2	$8K-15K
5.3	Zone 14 & 16: Apply the same planting maintenance treatment as item 3.3	As per item 3.3	$2K-4K
5.4	Monitoring	As per item 3.4	<$2K
Year 6			
6.1	Zone 12 & 13 Apply the same weed control treatment as item 2.1	As per item 2.1	$5K-10K
6.2	Zone 12 & 13 Apply the same plant revegetation as item 2.2	As per item 2.2	$8K-15K
6.3	Zone 14 & 16: Apply the same planting maintenance treatment as item 4.3	As per item 3.3	$1K-2K
6.4	Monitoring	As per item 3.4	<$2K
Year 7			
7.1	Zone 5 & 9 Apply the same weed control treatment as item 1.1	As per item 1.1	$5K-10K
7.2	Zone 5 & 9 Apply the same plant procurement as item 1.2	As per item 1.2	$8K-15K
7.3	Zone 14 & 16: Apply the same planting maintenance treatment as item 4.3	As per item 3.3	$2K-4K
7.4	Monitoring	As per item 3.4	<$2K

Works period	Task	Target	Cost range
Year 8			
8.1	Zone 5 & 9 Apply the same weed control treatment as item 2.1	As per item 2.1	$5K-10K
8.2	Zone 5 & 9 Apply the same plant revegetation as item 2.2	As per item 2.2	$8K-15K
8.3	Zone 14 & 16: Apply the same planting maintenance treatment as item 4.3	As per item 3.3	$1K-2K
8.4	Monitoring	As per item 3.4	$2K-5K
Year 9			
9.1	Zone 5 & 9 Apply the same planting maintenance treatment as item 3.3	As per item 3.3	$5K-10K
9.2	Monitoring	As per item 3.4	<$2K
Year 10			
10.1	Zone 5 & 9 Apply the same planting maintenance treatment as item 4.3	As per item 4.3	$5K-10K
10.2	Monitoring	As per item 3.4	$2K-5K
	Detailed monitoring Across all areas reassess current plant survivorship and weed cover	Document plant survivorship and current weed cover	$2-3K
	Project evaluation and reporting – compile all previous project monitoring data and reports and prepare an overview of the project outcomes, lessons learned and improvements for the future	Project evaluation report completed	$3-6K

5.6. Black Gum Floodplain Restoration

Location and area: western areas of the study site across assessment zone 4, up to 3.1 ha (see figure 6).

Key objectives: Restore Swampy Riparian Woodland; greatly increase habitat for Black Gum; increase Black Gum population size.

Major benefits: Major increase to native vegetation extent and habitat for flora and fauna; major community engagement opportunities; water quality improvement to the Campaspe River catchment.

Significant risks: high project cost without volunteer planting labour; modified soil conditions may limit the quality of restored understorey vegetation; long-term weed persistence is expected.

Priority works: viability analysis, site preparation (ecological burn, land profile analysis, weed control), revegetation and site maintenance.

Goals: Within ten years replace herbaceous weeds with desirable indigenous species suitable for Swampy Riparian Woodland across no less than 1.5 ha. Achieve 80% revegetation survivorship over a five-year period within each restoration area and attain at least 50% woody lifeform cover within 10 years of revegetation and at least 30% ground cover of herbaceous species including but not limited to robust tussock grasses, sedges and broadleaf herbs suited to the local microhabitats. Prioritise the use of locally sourced Black Gum seed to re-establish a eucalypt canopy at the site.

Key tasks:

- Complete a detailed project plan to accompany large-scale site restoration; ensure the plan addresses site preparation requirements to maximise the survivorship and success of revegetation works and is considerate of any future trail network development proposed in the area.
- Complete large-scale site preparation, using planned burns, herbicide use or other methods based on the detailed project plan.
- Supply seed and other propagation materials for revegetation.
- Monitor and manage woody and herbaceous weeds following large woody weed removal.
- Prepare revegetation sites using herbicide, fire or other method as appropriate and set out in the project plan.
- Complete revegetation and maintain for ten years from planting/seeding, ensure weeds and herbivores do not threaten new plants.
- Undertake periodic monitoring to ensure project meets the set goals; follow-up with post-project evaluation to assess the project outcomes.

Duration: up to ten years.

Cost: High; $20K-50K.

Priority: Medium; this project could commence immediately but requires minor additional analysis to determine if sufficient funding is available for the necessary site preparation and plant procurement and to identify whether it has the support of the local community, ideally to contribute volunteer planting labour.

Monitoring: aerial photography assessment; photopoints; quadrat floristic data; regular site inspections during contractor works and ongoing assessments of weed cover.

Ten year work plan: This works proposed in this project are not included in the ten year work plan due to the large size, complexity and high cost of the project. Further planning is required to ensure the project can be delivered successfully to a high standard.

5.7. Floodplain Woodland Reclamation

Location and area: western areas of the study site across assessment zone 2, up to 5.3 ha (see figure 6).

Key objectives: Restore Swampy Riparian Woodland; increase habitat quality for riparian and floodplain flora and fauna

Major benefits: Significant increase to native vegetation extent and habitat for flora and fauna; major ongoing community engagement opportunities; water quality improvement to the Campaspe River catchment; major improvement to stream condition and habitat quality for aquatic and terrestrial flora and fauna.

Significant risks: high project cost; major stream channel modification may arise from woody weed removal (temporary but possibly significant site changes could arise); modified soil conditions may limit the quality of restored understorey vegetation; long-term weed persistence is expected.

Priority works: viability analysis, geomorphological risk analysis, site preparation (large-scale woody weed control), large scale revegetation, extended site maintenance.

Goals: Within thirty years replace woody weeds with desirable indigenous species suitable for Swampy Riparian Woodland across no less than 3 hectares that includes at least 1.3 ha of Willows along Five Mile Creek, 0.5 ha of Hawthorn thicket and 1.3 ha of Poplar infestation. Achieve 80% revegetation survivorship over a ten-year period within each restoration area and attain at least 30% woody lifeform cover within 10 years of revegetation and at least 50% ground cover of herbaceous species including but not limited to robust tussock grasses, sedges and broadleaf herbs suited to the local microhabitats.

Key tasks:

- Complete a detailed project plan to accompany large-scale site restoration; ensure the plan addresses possible downstream hydrology changes that may result from floodplain restoration actions and is considerate of any future trail network development proposed in the area.
- Complete large scale woody weed control and retain any cut woody material as coarse woody debris and for other uses (e.g. public interpretation features).
- Supply seed and other propagation materials for revegetation.
- Monitor and manage woody and herbaceous weeds following large woody weed removal.
- Prepare revegetation sites using herbicide, fire or other method as appropriate and set out in the project plan.
- Complete revegetation and maintain for ten years from planting/seeding, ensure weeds and herbivores do not threaten new plants.
- Undertake periodic monitoring to ensure project meets the set goals; follow-up with post-project evaluation to assess the project outcomes.

Duration: up to thirty years due to the large area involved; this can be staged or broken into smaller areas completed as separate sub-projects.

Cost: Very high; $260K-300K

Priority: Low; while this project offers very significant ecological benefits it requires further analysis to determine its viability – whether it can be adequately funded and if it has the support of the local community with a commitment from Council to manage and deliver the works.

Monitoring: aerial photography assessment; photopoints; quadrat floristic data; index of stream condition; geomorphological assessment; regular site inspections during any contractor works and ongoing assessments of weed cover.

Table 10. Work plan for Floodplain Woodland Reclamation

Works period	Task	Target	Cost range
Year 1			
1.1	Obtain Works on Waterways permit to undertake works from North Central CMA (if CMA is not undertaking works)	Permit compliance	N/A
1.2	Engage contractor to complete stem injection of willows and poplars	Standing dead willows and poplars to reduce stump and twig regrowth after removal	$14K-18K
1.3	Monitoring	Capture pre-works photopoints to document change in site condition	<$1K
Year 2			
2.1	Zone 2 Source propagation material for revegetation across 5.3 ha. A minimum of 20,000 tubestock or hiko cells that includes* approximately: ▪ 1200 canopy trees ▪ 650 understorey trees ▪ 1300 medium shrubs ▪ 660 small shrubs ▪ 6600 large tufted graminoids ▪ 1000 robust aquatic or riparian-specialist species for seasonally inundated or boggy areas. ▪ 5000 medium tufted graminoids and medium to tiny non-tufted graminoids, prioritising warm-season grasses such as *Themeda triandra* and *Hemarthria uncinata* ▪ 5000 small to large herbs prioritising species capable of vegetatively spreading such as *Asperula conferta, Haloragis heterophylla* and *Veronica gracilis* (these are desirable to grow in six-inch pots to improve establishment success). * Tubestock/hiko plantings are based on the guidelines from section 5.2 and overplanting rate (125%) to account for attrition.	Commission plant production or seed purchase for planting in spring Years 4, 6, 8 and 10	$15K-25K
2.2	Engage contractor to undertake mechanical removal and grinding of 1.3 ha of willows along Five Mile Creek, 0.5 ha of hawthorn thicket and 1.3 ha of poplar infestation. Retain some cut woody material as coarse woody debris and for other uses (e.g. public interpretation features). Timed in drier summer months to minimize damage to soil profile.	Removal of weed biomass. Chips could be used on site to suppress weed growth. Burning of dead, cut material not an option so close to urban area for air pollution concerns.	$60K-80K
2.3	Monitoring	Capture post-works photopoints to document change in site condition	<$1K
Year 3			
3.1	Targeted herbicide control of woody and herbaceous weeds twice yearly	Maintenance of weed free area in preparation for revegetation	$3K-7K
3.2	Monitoring	As per year 2	<$2K

Works period	Task	Target	Cost range
Year 4			
4.1	Engage contractor to undertake spring revegetation using tubestock selected (c. 12,000 plants minimum). Guard against all herbivores using a range of guards, e.g. 1m plastic mesh, large and small cardboard guards, reusable corflute guards (noting costs will vary widely depending on the materials used). Consider any future trail network development proposed in the area when planning areas for revegetation.	Achieve 80% revegetation survivorship over a ten-year period within each restoration area and attain at least 30% woody lifeform cover within 10 years of revegetation and at least 50% ground cover of herbaceous species. Plant in spring through early autumn planting for warm season grasses (e.g. *Themeda triandra* and *Hemarthria uncinata*).	$25K-40K
4.2	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-5K
4.3	Monitoring	As per year 2	<$2K
Year 5			
5.1	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-5K
5.2	Monitoring	As per year 2	<$1K
Year 6			
6.1	Supplementary (20%, c. 4000 plants) revegetation based on monitoring results. Use guards that successfully protected plants and withstood overbank flows.	Achieve 80% revegetation survivorship over a ten-year period within each restoration area and attain at least 30% woody lifeform cover within 10 years of revegetation and at least 50% ground cover of herbaceous species	$8-15K
6.2	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-$5K
6.3	Monitoring	As per year 2	<$1K
Year 7			
7.1	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-5K
7.2	Monitoring	As per year 2	<$1K
Year 8			
8.1	Supplementary (20%) revegetation based on monitoring results. Use guards that successfully protected plants and withstood overbank flows.	Achieve 80% revegetation survivorship over a ten-year period within each restoration area and attain at least 30% woody lifeform cover within 10 years of revegetation and at least 50% ground cover of herbaceous species	$8-15K
8.2	Monitoring	As per year 2	<$1K
Year 9			
9.1	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-5K
9.2	Monitoring	As per year 2	<$1K
Year 10			
10.1	Supplementary (20%) revegetation based on monitoring results. Use guards that successfully protected plants and withstood overbank flows.	Achieve 80% revegetation survivorship over a ten-year period within each restoration area and attain at least 30% woody lifeform cover within 10 years of revegetation and at least 50% ground cover of herbaceous species	$8-15K
10.2	Targeted herbicide control of woody and herbaceous weeds annually	Maintenance of weed free area	$3K-5K

Works period	Task	Target	Cost range
	Detailed monitoring Across all areas reassess current plant survivorship and weed cover	Document plant survivorship and current weed cover	$2-3K
	Project evaluation and reporting – compile all previous project monitoring data and reports and prepare an overview of the project outcomes, lessons learned and improvements for the future. Evaluate the restoration site's long-term management requirements (a provisional management regime is outlined for years 11-30 below).	Project evaluation report completed	$3-6K
Years 11-30			
	Targeted herbicide control of woody and herbaceous weeds every 2 years	Maintenance of weed free area. Native revegetation to progressively shade out weed regrowth and naturally regenerate.	$3K-5K (each)
	Monitoring every 3 years	As per year 2	<$1K (each)

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Appendix 1. Flora species recorded from the Five Mile Creek study area, Woodend.

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
#	*Acacia baileyana*	Cootamundra Wattle	500014
#	*Acacia brachybotrya* s.l.	Grey Mulga	500017
#	*Acacia cognata*	Narrow-leaf Bower-wattle	500021
#	*Acacia cyclops*	Western Coastal Wattle	505135
	Acacia dealbata subsp. *dealbata*	Silver Wattle	505875
#	*Acacia elata*	Cedar Wattle	500031
#	*Acacia floribunda*	White Sallow-wattle	500036
#	*Acacia howittii*	Sticky Wattle	500044
	Acacia implexa	Lightwood	500045
#	*Acacia longifolia* subsp. *longifolia*	Sallow Wattle	500053
	Acacia mearnsii	Black Wattle	500056
	Acacia melanoxylon	Blackwood	500057
#	*Acacia pravissima*	Ovens Wattle	500077
	Acacia provincialis	Wirilda	504209
#	*Acacia saliciformis*	Willow Wattle	N/A
#	*Acacia spp.*	Wattle	508003
	Acacia verticillata subsp. *verticillata*	Prickly Moses	504213
	Acaena agnipila	Hairy Sheep's Burr	500104
	Acaena novae-zelandiae	Bidgee-widgee	500105
*	*Acanthus mollis*	Bear's Breach	505372
*	*Acer pseudoplatanus*	Sycamore Maple	500108
*	*Acer* spp.	Maple	N/A
*	*Acetosella vulgaris*	Sheep Sorrel	502966
*	*Achillea millefolium*	Milfoil	500109
	Acrotriche serrulata	Honey-pots	500123
*	*Agapanthus praecox* subsp. *orientalis*	Agapanthus	503638
*	*Agrostis capillaris* var. *capillaris*	Brown-top Bent	504225
*	*Aira elegantissima*	Delicate Hair-grass	500166
*	*Aira spp.*	Hair Grass	508024
*	*Ajuga reptans*	Common Bugle	505815
	Alisma plantago-aquatica	Water Plantain	500174
*	*Allium triquetrum*	Angled Onion	500179
	Allocasuarina littoralis	Black Sheoak	500677
#	*Allocasuarina spp.*	Sheoak	508033
	Allocasuarina verticillata	Drooping Sheoak	500685
*	*Alopecurus pratensis*	Meadow Fox-tail	500183
	Amphibromus spp.	Swamp Wallaby-grass	508046
	Anthosachne scabra s.s.	Common Wheat-grass	528409
*	*Anthoxanthum odoratum*	Sweet Vernal-grass	500236
*	*Aphanes arvensis*	Parsley Piert	500239
*	*Aptenia cordifolia*	Heart-leaf Ice-plant	500249
*	*Arbutus unedo*	Irish Strawberry Tree	500253
*	*Arctotheca calendula*	Cape weed	500255
	Arthropodium strictum s.s.	Chocolate Lily	505126
*	*Arum italicum* subsp. *italicum*	Italian Cuckoo-pint	503644
	Austrostipa rudis subsp. *rudis*	Veined Spear-grass	504942
*	*Avena ludoviciana*	Sterile Oat	504226
	Banksia marginata	Silver Banksia	500363
*	*Barbarea verna*	Early Wintercress	500369
*	*Bellis perennis*	English Daisy	500384

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
*	*Betula pendula*	Silver Birch	514703
	Bossiaea prostrata	Creeping Bossiaea	500440
*	*Brassica fruticulosa*	Twiggy Turnip	500488
*	*Briza maxima*	Large Quaking-grass	500495
*	*Briza minor*	Lesser Quaking-grass	500496
*	*Bromus catharticus* var. *catharticus*	Prairie Grass	505582
*	*Bromus diandrus*	Great Brome	500500
*	*Buddleja davidii*	Butterfly Bush	503653
	Bulbine bulbosa	Bulbine Lily	500510
	Burchardia umbellata	Milkmaids	500512
	Bursaria spinosa subsp. *spinosa*	Sweet Bursaria	500515
*	*Calendula officinalis*	Garden Marigold	500560
	Callistemon sieberi	River Bottlebrush	500565
#	*Callistemon* spp.	Bottlebrush	508176
*	*Callitriche stagnalis*	Common Water-starwort	500574
	Calystegia sepium subsp. *roseata*	Large Bindweed	500604
*	*Cardamine hirsuta s.s.*	Common Bitter-cress	505022
*	*Carduus pycnocephalus*	Slender Thistle	500620
	Carex appressa	Tall Sedge	500623
	Carex breviculmis	Common Grass-sedge	500627
*	*Carex divisa*	Divided Sedge	500635
	Carex gaudichaudiana	Fen Sedge	500639
	Carex inversa	Knob Sedge	500642
	Carex iynx	Tussock Sedge	500643
	Carex polyantha	River Sedge	500647
*	*Carex riparia*	Great Pond Sedge	N/A
	Cassinia aculeata subsp. *aculeata*	Common Cassinia	500666
⌀	*Cassinia sifton*	Drooping Cassinia	500667
	Centipeda spp.	Sneezeweed	508210
*	*Centranthus ruber* subsp. *ruber*	Red Valerian	500710
*	*Chamaemelum nobile*	Common Chamomile	500725
*	*Chenopodium album*	Fat Hen	500736
	Chiloglottis valida	Common Bird-orchid	504888
*	*Cichorium intybus*	Chicory	500778
*	*Cirsium vulgare*	Spear Thistle	500782
*	*Claytonia perfoliata* subsp. *perfoliata*	Miner's Lettuce	500787
*	*Clematis vitalba* var. *vitalba*	Traveller's Joy	504310
*	*Conium maculatum*	Hemlock	500803
*	*Cordyline australis*	New Zealand Cabbage-tree	504393
#	*Correa alba* var. *alba*	White Correa	504363
*	*Cotoneaster glaucophyllus*	Large-leaf Cotoneaster	500843
*	*Cotoneaster symondsii*	Himalayan Cotoneaster	503690
*	*Crassula alata* var. *alata*	Three-part Crassula	500858
	Crassula decumbens var. *decumbens*	Spreading Crassula	500860
	Crassula helmsii	Swamp Crassula	500862
*	*Crataegus monogyna* subsp. *monogyna*	Hawthorn	505458
*	*Crepis capillaris*	Smooth Hawksbeard	500869
*	*Crocosmia* X *crocosmiiflora*	Montbretia	500875
	Cycnogeton procerum (broad erect leaf variant)	Common Water-ribbons	505507
	Cycnogeton procerum (narrow floating leaf variant)	Common Water-ribbons	505506
*	*Cyperus eragrostis*	Drain Flat-sedge	500918
	Cyperus gunnii subsp. *gunnii*	Flecked Flat-sedge	500922
*	*Cytisus scoparius*	English Broom	500947
*	*Dactylis glomerata*	Cocksfoot	500948

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
	Dianella revoluta var. revoluta s.l.	Black-anther Flax-lily	504413
	Dianella tasmanica	Tasman Flax-lily	501030
	Dichondra repens	Kidney-weed	501036
	Dillwynia cinerascens s.s.	Grey Parrot-pea	505931
	Drosera hookeri	Branched Sundew	528663
*	*Echinochloa crus-galli*	Barnyard Grass	501118
	Eleocharis acuta	Common Spike-sedge	501139
	Eleocharis sphacelata	Tall Spike-sedge	501146
*	*Elytrigia repens*	English Couch	500145
	Epilobium billardiereanum subsp. *billardiereanum*	Smooth Willow-herb	504444
	Epilobium billardiereanum subsp. *cinereum*	Grey Willow-herb	504445
*	*Epilobium ciliatum*	Glandular Willow-herb	501176
*	*Epilobium hirsutum*	Great Willow-herb	504798
	Epilobium hirtigerum	Hairy Willow-herb	501179
	Eragrostis brownii	Common Love-grass	501185
*	*Erica lusitanica*	Spanish Heath	501210
*	*Erigeron karvinskianus*	Seaside Daisy	501212
*	*Erigeron* spp.	Fleabane	508253
	Eucalyptus aggregata	Black Gum	501244
#	*Eucalyptus camaldulensis* var. *camaldulensis*	River Red-gum	505313
#	*Eucalyptus cinerea* subsp. *victoriensis*	Beechworth Silver Stringybark	503824
#	*Eucalyptus crenulata*	Buxton Gum	501265
#	*Eucalyptus globulus* subsp. *globulus*	Southern Blue-gum	504491
#	*Eucalyptus kitsoniana*	Bog Gum	501290
	Eucalyptus melliodora	Yellow Box	501297
	Eucalyptus ovata subsp. *ovata*	Swamp Gum	505179
#	*Eucalyptus polyanthemos* subsp. *vestita*	Red Box	504335
	Eucalyptus radiata subsp. *radiata*	Narrow-leaf Peppermint	503828
	Eucalyptus rubida subsp. *rubida*	Candlebark	504496
#	*Eucalyptus* spp.	Eucalypt	508415
	Eucalyptus viminalis subsp. *viminalis*	Manna Gum	504463
	Euchiton japonicus s.s.	Creeping Cudweed	501466
*	*Festuca arundinacea*	Tall Fescue	501356
	Festuca asperula	Graceful Fescue	501357
*	*Fraxinus angustifolia* subsp. *angustifolia*	Desert Ash	504306
*	*Fumaria bastardii*	Bastard's Fumitory	501379
*	*Galium aparine*	Cleavers	501402
*	*Genista monspessulana*	Montpellier Broom	501422
*	*Geranium dissectum*	Cut-leaf Crane's-bill	501426
	Geranium potentilloides	Soft Crane's-bill	501431
	Geranium solanderi var. *solanderi* s.s.	Austral Crane's-bill	505337
	Geranium sp. 5	Naked Crane's-bill	505346
*	*Geranium yeoi*	Greater Herb-Robert	503751
	Glyceria australis	Australian Sweet-grass	501451
*	*Glyceria declinata*	Manna Grass	501452
	Gonocarpus tetragynus	Common Raspwort	501489
	Goodenia ovata	Hop Goodenia	501507
	Gratiola peruviana	Austral Brooklime	501524
#	*Hakea salicifolia* subsp. *salicifolia*	Willow-leaf Hakea	505748
	Haloragis heterophylla	Varied Raspwort	501584
*	*Hedera helix*	English Ivy	501599
*	*Helminthotheca echioides*	Ox-tongue	502511
	Hemarthria uncinata var. *uncinata*	Mat Grass	501654
*	*Hesperocyparis* spp.	Cypress	903581
*	*Holcus lanatus*	Yorkshire Fog	501692

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
*	*Hyacinthoides* spp.	Wood Hyacinth	508567
	Hydrocotyle sibthorpioides	Shining Pennywort	501728
*	*Hypericum calycinum*	Aaron's Beard	501740
*	*Hypochaeris radicata*	Flatweed	501748
*	*Ilex aquifolium*	English Holly	501759
	Indigofera australis subsp. *australis*	Austral Indigo	501761
*	*Iris foetidissima*	Stinking Iris	505849
*	*Iris germanica*	German Iris	501763
*	*Iris* spp.	Iris	508577
	Isolepis cernua	Nodding Club-sedge	505944
*	*Isolepis hystrix*	Awned Club-sedge	501778
	Isolepis inundata	Swamp Club-sedge	501779
⌀	*Isolepis marginata*	Little Club-sedge	501780
	Juncus amabilis	Hollow Rush	501803
*	*Juncus articulatus* subsp. *articulatus*	Jointed Rush	501806
	Juncus australis	Austral Rush	501808
*	*Juncus bufonius*	Toad Rush	501810
*	*Juncus capitatus*	Capitate Rush	501813
	Juncus gregiflorus	Green Rush	501820
	Juncus holoschoenus	Joint-leaf Rush	501821
	Juncus pallidus	Pale Rush	501830
*	*Juniperus spp.*	Juniper	508602
#	*Kunzea* spp.	Kunzea	508620
	Lachnagrostis filiformis s.s.	Common Blown-grass	504219
*	*Lactuca serriola*	Prickly Lettuce	501860
*	*Lathyrus latifolius*	Everlasting Pea	501881
	Lemna disperma	Common Duckweed	501893
*	*Leontodon saxatilis* subsp. *saxatilis*	Hairy Hawkbit	501895
	Leptospermum continentale	Prickly Tea-tree	501956
	Leptospermum lanigerum	Woolly Tea-tree	501958
#	*Leptospermum turbinatum*	Shiny Tea-tree	501963
*	*Leucanthemum* X *superbum*	Shasta Daisy	504604
*	*Leycesteria formosa*	Himalayan Honeysuckle	501999
*	*Ligustrum vulgare*	European Privet	504689
*	*Lolium perenne* var. *perenne*	Perennial Rye-grass	504586
*	*Lolium rigidum*	Wimmera Rye-grass	502037
	Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush	504709
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush	504710
	Lomandra longifolia subsp. *longifolia*	Spiny-headed Mat-rush	504714
*	*Lotus uliginosus*	Greater Bird's-foot Trefoil	502061
	Luzula meridionalis	Common Woodrush	503841
*	*Lysimachia arvensis* (Red-flowered variant)	Scarlet Pimpernel	505170
	Lythrum hyssopifolia	Small Loosestrife	502092
*	*Malus pumila*	Apple	502118
#	*Melaleuca ericifolia*	Swamp Paperbark	502147
#	*Melaleuca linariifolia*	Flax-leaf Paperbark	507526
	Melicytus dentatus s.s.	Tree Violet	504933
*	*Melissa officinalis*	Lemon Balm	502163
*	*Mentha* X *piperita* var. *piperita*	Peppermint	505197
	Microlaena stipoides var. *stipoides*	Weeping Grass	502179
*	*Moenchia erecta*	Erect Chickweed	502214
	Montia australasica	White Purslane	502221
	Montia fontana subsp. *chondrosperma*	Water Blinks	504309
*	*Myosotis discolor*	Yellow-and-blue Forget-me-not	502245
*	*Myosotis sylvatica*	Wood Forget-me-not	502247

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
	Myriophyllum crispatum	Upright Water-milfoil	503867
	Myriophyllum variifolium	Varied Water-milfoil	503872
*	*Narcissus tazetta*	Tazetta	504330
*	*Nymphaea alba*	White Waterlily	504895
	Olearia lirata	Snowy Daisy-bush	502312
	Olearia myrsinoides	Silky Daisy-bush	502316
	Oreomyrrhis eriopoda	Australian Caraway	502361
*	*Oxalis articulata*	Sourgrass	502376
	Oxalis exilis	Shade Wood-sorrel	502381
	Oxalis perennans	Grassland Wood-sorrel	502386
	Ozothamnus obcordatus	Grey Everlasting	501620
*	*Panicum capillare*	Common Millet	502401
*	*Paspalum dilatatum*	Paspalum	502430
	Persicaria decipiens	Slender Knotweed	503919
	Persicaria prostrata	Creeping Knotweed	502635
*	*Phalaris aquatica*	Toowoomba Canary-grass	502476
	Pimelea humilis	Common Rice-flower	502523
*	*Pinus radiata*	Radiata Pine	502539
*	*Pittosporum tenuifolium*	Kohuhu	505796
#	*Pittosporum undulatum*	Sweet Pittosporum	502543
*	*Plantago coronopus* subsp. *coronopus*	Buck's-horn Plantain	504821
*	*Plantago lanceolata*	Ribwort	502561
	Plantago varia	Variable Plantain	502566
*	*Platycladus orientalis*	Brookleaf Cypress	N/A
*	*Poa bulbosa* var. *bulbosa*	Bulbous Meadow-grass	504518
	Poa ensiformis	Sword Tussock-grass	502590
*	*Poa infirma*	Early Meadow-grass	502599
	Poa labillardierei var. *labillardierei*	Common Tussock-grass	504694
*	*Poa pratensis*	Kentucky Blue-grass	502606
	Poa sieberiana var. *sieberiana*	Grey Tussock-grass	504835
	Poa tenera	Slender Tussock-grass	502610
*	*Polygonum arenastrum*	Wireweed	503954
*	*Populus alba*	White Poplar	502679
*	*Populus nigra* 'Italica'	Lombardy Poplar	502681
	Poranthera microphylla s.s.	Small Poranthera	507704
	Potamogeton cheesemanii	Red Pondweed	505274
	Potamogeton ochreatus	Blunt Pondweed	502690
	Potamogeton sulcatus	Furrowed Pondweed	505272
#	*Prostanthera melissifolia*	Balm Mint-bush	502744
*	*Prunella vulgaris*	Self-heal	502757
*	*Prunus cerasifera*	Cherry Plum	502758
*	*Prunus cerasifera* 'Nigra'	Purple-leaf Cherry-plum	505232
*	*Prunus laurocerasus*	Cherry Laurel	502759
*	*Prunus lusitanica*	Portugal Laurel	505235
	Pteridium esculentum subsp. *esculentum*	Austral Bracken	502777
*	*Quercus palustris*	Pin Oak	507728
*	*Quercus robur*	English Oak	502884
	Ranunculus lappaceus	Australian Buttercup	502894
*	*Ranunculus muricatus*	Sharp Buttercup	502897
*	*Ranunculus repens*	Creeping Buttercup	502906
*	*Raphanus raphanistrum*	Wild Radish	502917
*	*Romulea rosea* var. *australis* s.s.	Common Onion-grass	504113
*	*Romulea rosea* var. *reflexa*	Large-flower Onion-grass	505300
*	*Rosa canina*	Dog Rose	503970
*	*Rubus anglocandicans*	Common Blackberry	502959

Origin	Taxon Name	Taxon Common Name	VBA Taxon Code
*	*Rumex crispus*	Curled Dock	502970
*	*Rumex obtusifolius* subsp. *obtusifolius*	Broad-leaf Dock	502973
	Rytidosperma duttonianum	Brown-back Wallaby-grass	500963
	Rytidosperma pallidum	Silvertop Wallaby-grass	500973
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass	500977
*	*Sagina procumbens*	Spreading Pearlwort	502987
*	*Salix fragilis*	Crack Willow	502991
*	*Salix* X *reichardtii*	Pussy Willow	505119
*	*Sambucus nigra*	Common Elder	503000
	Schoenus apogon	Common Bog-sedge	503039
*	*Sedum rupestre*	Stonecrop	505832
	Senecio campylocarpus	Floodplain Fireweed	507136
	Senecio glomeratus subsp. *glomeratus*	Annual Fireweed	507141
	Senecio hispidulus s.s.	Rough Fireweed	504959
	Senecio minimus	Shrubby Fireweed	503119
	Senecio quadridentatus	Cotton Fireweed	503124
*	*Solanum americanum*	Glossy Nightshade	503168
	Solanum laciniatum	Large Kangaroo Apple	503179
	Solenogyne gunnii	Hairy Solenogyne	503196
*	*Soliva sessilis*	Jo Jo	503199
*	*Sonchus asper* subsp. *asper*	Rough Sow-thistle	504923
*	*Sonchus oleraceus*	Common Sow-thistle	503204
*	*Stachys arvensis*	Stagger Weed	503240
*	*Stellaria media*	Chickweed	503251
	Stellaria pungens	Prickly Starwort	503255
	Stuckenia pectinata	Fennel Pondweed	502691
*	*Symphoricarpos orbiculatus*	Coral Berry	505653
*	*Symphyotrichum subulatum*	Aster-weed	500297
#	*Syzygium* spp.	Satinash	508009
*	*Tamarix* spp.	Tamarisk	509119
*	*Taraxacum officinale* spp. agg.	Garden Dandelion	503336
	Themeda triandra	Kangaroo Grass	503387
*	*Tragopogon porrifolius* subsp. *porrifolius*	Salsify	503417
*	*Trifolium dubium*	Suckling Clover	503427
*	*Trifolium repens* var. *repens*	White Clover	503435
*	*Trifolium* spp.	Clover	509161
*	*Trifolium subterraneum*	Subterranean Clover	503440
	Typha domingensis	Narrow-leaf Cumbungi	503468
*	*Typha latifolia*	Lesser Reed-mace	503469
*	*Ulex europaeus*	Gorse	503471
*	*Ulmus* spp.	Elm	509197
*	*Verbascum virgatum*	Twiggy Mullein	503495
	Veronica gracilis	Slender Speedwell	503506
*	*Veronica hederifolia*	Ivy-leaf Speedwell	503507
*	*Veronica persica*	Persian Speedwell	503511
*	*Viburnum tinus*	Laurestinus	504042
*	*Vicia hirsuta*	Tiny Vetch	503516
*	*Vicia sativa*	Common Vetch	503518
*	*Vicia* spp.	Vetch	509217
*	*Vinca minor*	Lesser Periwinkle	505837
	Viola hederacea sensu Thiele & Prober	Ivy-leaf Violet	505794
*	*Viola odorata*	Common Violet	503531
*	*Vulpia bromoides*	Squirrel-tail Fescue	503544
#	*Westringia fruticosa*	Coast Rosemary	505762
*	*Zantedeschia aethiopica*	White Arum-lily	503599

Appendix 2. High priority weeds at Five Mile Creek

The list below categorises weeds by their lifeform and/or habitat and an assessment of their distribution and abundance at the study site. Predominantly aquatic weeds are indicated with [AQ] next to the taxon name.

Weed type	Taxon Name	Taxon Common Name
Woody weed	*Acer pseudoplatanus*	Sycamore Maple
	Arbutus unedo	Irish Strawberry Tree
	Buddleja davidii	Butterfly Bush
	Cordyline australis	New Zealand Cabbage-tree
	Cotoneaster glaucophyllus	Large-leaf Cotoneaster
	Cotoneaster symondsii	Himalayan Cotoneaster
	Crataegus monogyna subsp. monogyna	Hawthorn
	Cytisus scoparius	English Broom
	Erica lusitanica	Spanish Heath
	Fraxinus angustifolia subsp. angustifolia	Desert Ash
	Genista monspessulana	Montpellier Broom
	Hesperocyparis spp.	Cypress
	Ilex aquifolium	English Holly
	Leycesteria formosa	Himalayan Honeysuckle
	Ligustrum vulgare	European Privet
	Pinus radiata	Radiata Pine
	Pittosporum tenuifolium	Kohuhu
	Populus alba	White Poplar
	Populus nigra 'Italica'	Lombardy Poplar
	Prunus cerasifera	Cherry Plum
	Prunus cerasifera 'Nigra'	Purple-leaf Cherry-plum
	Prunus laurocerasus	Cherry Laurel
	Prunus lusitanica	Portugal Laurel
	Quercus palustris	Pin Oak
	Quercus robur	English Oak
	Rosa canina	Dog Rose
	Rubus anglocandicans	Common Blackberry
	Salix fragilis	Crack Willow
	Salix X reichardtii	Pussy Willow
	Sambucus nigra	Common Elder
	Ulex europaeus	Gorse
	Ulmus spp.	Elm
	Viburnum tinus	Laurestinus

Weed type	Taxon Name	Taxon Common Name
Vine	*Clematis vitalba var. vitalba*	Traveller's Joy
	Hedera helix	English Ivy
Sedge	*Carex divisa*	Divided Sedge
	Carex riparia AQ	Great Pond Sedge
Perennial herb	*Acanthus mollis*	Bear's Breach
	Achillea millefolium	Milfoil
	Agapanthus praecox subsp. orientalis	Agapanthus
	Ajuga reptans	Common Bugle
	Arum italicum subsp. italicum	Italian Cuckoo-pint
	Centranthus ruber subsp. ruber	Red Valerian
	Conium maculatum	Hemlock
	Crocosmia X crocosmiiflora	Montbretia
	Geranium yeoi	Greater Herb-Robert
	Hyacinthoides spp.	Wood Hyacinth
	Hypericum calycinum	Aaron's Beard
	Iris foetidissima	Stinking Iris
	Iris germanica	German Iris
	Iris spp. AQ	Iris
	Lathyrus latifolius	Everlasting Pea
	Melissa officinalis	Lemon Balm
	Mentha X piperita var. piperita AQ	Peppermint
	Myosotis sylvatica	Wood Forget-me-not
	Narcissus tazetta	Tazetta
	Nymphaea alba AQ	White Waterlily
	Oxalis articulata	Sourgrass
	Ranunculus repens	Creeping Buttercup
	Sedum rupestre	Stonecrop
	Typha latifolia	Lesser Reed-mace
	Vinca minor	Lesser Periwinkle
	Viola odorata	Common Violet
	Zantedeschia aethiopica	White Arum-lily

Appendix 3. Plant list for Valley Grassy Forest

Species prefixed by + are highly recommended.

Lifeform	Species name	Common name
Canopy tree	*Eucalyptus radiata subsp. radiata*	Narrow-leaf Peppermint
	Eucalyptus rubida subsp. rubida	Candlebark
	Eucalyptus viminalis subsp. viminalis	Manna Gum
Understorey tree or large shrub	*Acacia dealbata subsp. dealbata*	Silver Wattle
	+*Acacia implexa*	Lightwood
	Acacia mearnsii	Black Wattle
	Acacia melanoxylon	Blackwood
	+*Allocasuarina littoralis*	Black Sheoak
	+*Allocasuarina verticillata*	Drooping Sheoak
	+*Banksia marginata*	Silver Banksia
	+*Exocarpos cupressiformis*	Cherry Ballart
Medium shrub	*Acacia paradoxa*	Hedge Wattle
	+*Bursaria spinosa subsp. spinosa*	Sweet Bursaria
	Cassinia longifolia	Shiny Cassinia
	Coprosma quadrifida	Prickly Currant-bush
	+*Daviesia leptophylla*	Narrow-leaf Bitter-pea
	Goodenia ovata	Hop Goodenia
	Indigofera australis subsp. australis	Austral Indigo
	Leptospermum continentale	Prickly Tea-tree
	Melicytus dentatus	Tree Violet
	Olearia lirata	Snowy Daisy-bush
	+*Olearia myrsinoides*	Silky Daisy-bush
	+*Ozothamnus obcordatus*	Grey Everlasting
	Pultenaea daphnoides	Large-leaf Bush-pea
Small shrub	*Acacia aculeatissima*	Thin-leaf Wattle
	+*Dillwynia cinerascens*	Grey Parrot-pea
	Hovea heterophylla	Common Hovea
	Pimelea humilis	Common Rice-flower
Prostrate shrub	*Acrotriche serrulata*	Honey-pots
	Bossiaea prostrata	Creeping Bossiaea
	Kennedia prostrata	Running Postman
	+*Platylobium montanum subsp. prostratum*	Mountain Flat-pea
	+*Pultenaea pedunculata*	Matted Bush-pea
	+*Styphelia humifusa*	Cranberry Heath

Lifeform	Species name	Common name
Large non-tufted graminoid	*Austrostipa mollis*	Supple Spear-grass
	Austrostipa pubinodis	Tall Spear-grass
	+*Austrostipa rudis subsp. rudis*	Veined Spear-grass
	Deyeuxia quadriseta	Reed Bent-grass
	Festuca asperula	Graceful Fescue
	Juncus pallidus	Pale Rush
	Lomandra longifolia subsp. longifolia	Spiny-headed Mat-rush
	Rytidosperma pallidum	Silvertop Wallaby-grass
Medium to small tufted graminoid	*Anthosachne scabra*	Common Wheat-grass
	Austrostipa densiflora	Dense Spear-grass
	Austrostipa semibarbata	Fibrous Spear-grass
	Carex breviculmis	Common Grass-sedge
	Carex inversa	Knob Sedge
	Dianella amoena	Matted Flax-lily
	+*Dianella revoluta var. revoluta*	Black-anther Flax-lily
	Dichelachne crinita	Long-hair Plume-grass
	Dichelachne rara	Common Plume-grass
	+*Lepidosperma laterale*	Variable Sword-sedge
	+*Lomandra filiformis*	Wattle Mat-rush
	Lomandra nana	Dwarf Mat-rush
	Luzula meridionalis	Common Woodrush
	+*Poa morrisii*	Soft Tussock-grass
	+*Poa sieberiana var. sieberiana*	Grey Tussock-grass
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma geniculatum	Kneed Wallaby-grass
	Rytidosperma racemosum var. racemosum	Slender Wallaby-grass
	Rytidosperma setaceum var. setaceum	Bristly Wallaby-grass
	+*Themeda triandra*	Kangaroo Grass
Medium to tiny non-tufted graminoid	*Hemarthria uncinata var. uncinata*	Mat Grass
	Microlaena stipoides var. stipoides	Weeping Grass
	Poa tenera	Slender Tussock-grass
Large herb	*Arthropodium milleflorum s.s.*	Pale Vanilla-lily
	Arthropodium strictum s.s.	Chocolate Lily
	Chrysocephalum semipapposum subsp. semipapposum	Clustered Everlasting
	Linum marginale	Native Flax
	Senecio minimus	Shrubby Fireweed
	Senecio phelleus	Stony Fireweed
	Xerochrysum viscosum	Shiny Everlasting

Lifeform	Species name	Common name
Medium herb	*Acaena agnipila*	Hairy Sheep's Burr
	Acaena echinata	Sheep's Burr
	Asperula conferta	Common Woodruff
	Asperula scoparia subsp. scoparia	Prickly Woodruff
	Brachyscome diversifolia	Tall Daisy
	Brunonia australis	Blue Pincushion
	Bulbine bulbosa	Bulbine Lily
	Burchardia umbellata	Milkmaids
	Caesia calliantha	Blue Grass-lily
	Chrysocephalum apiculatum subsp. apiculatum	Common Everlasting
	Coronidium scorpioides s.s.	Button Everlasting
	Craspedia variabilis	Variable Billy-buttons
	Daucus glochidiatus	Australian Carrot
	Geranium potentilloides	Soft Crane's-bill
	Geranium solanderi var. solanderi	Austral Crane's-bill
	Gonocarpus tetragynus	Common Raspwort
	Hackelia suaveolens	Sweet Hound's-tongue
	Haloragis heterophylla	Varied Raspwort
	Hydrocotyle laxiflora	Stinking Pennywort
	Lagenophora stipitata	Common Bottle-daisy
	Leptorhynchos squamatus subsp. squamatus	Scaly Buttons
	Leptorhynchos tenuifolius	Wiry Buttons
	Microseris walteri	Yam Daisy
	Oreomyrrhis eriopoda	Australian Caraway
	Pelargonium rodneyanum	Magenta Stork's-bill
	Plantago varia	Variable Plantain
	Pterostylis nutans	Nodding Greenhood
	Ranunculus lappaceus	Australian Buttercup
	Stackhousia monogyna	Creamy Candles
	Stellaria pungens	Prickly Starwort
	Tricoryne elatior	Yellow Rush-lily
	Veronica calycina	Hairy Speedwell
	Veronica gracilis	Slender Speedwell
	Veronica plebeia	Trailing Speedwell
	Viola hederacea	Ivy-leaf Violet
	Wahlenbergia stricta subsp. stricta	Tall Bluebell

Lifeform	Species name	Common name
Small herb	*Cymbonotus preissianus*	Austral Bear's-ear
	Opercularia ovata	Broad-leaf Stinkweed
	Opercularia varia	Variable Stinkweed
	Solenogyne dominii	Smooth Solenogyne
	Solenogyne gunnii	Hairy Solenogyne
	Dichondra repens	Kidney-weed
Scrambler or climber	*Billardiera mutabilis*	Common Apple-berry
	Glycine clandestina	Twining Glycine
	Hardenbergia violacea	Purple Coral-pea
Fern	*Pteridium esculentum subsp. esculentum*	Austral Bracken

Appendix 4. Plant list for Swampy Riparian Woodland (EVC 83)

Species prefixed by + are highly recommended. Species names affixed with [AQ] indicate aquatic taxa.

Lifeform	Species name	Common name
Canopy tree	+*Eucalyptus aggregata*	Black Gum
	Eucalyptus ovata subsp. ovata	Swamp Gum
	Eucalyptus viminalis subsp. viminalis	Manna Gum
Understorey tree or large shrub	+*Acacia dealbata subsp. dealbata*	Silver Wattle
	Acacia mearnsii	Black Wattle
	+*Acacia melanoxylon*	Blackwood
	Allocasuarina littoralis	Black Sheoak
	Allocasuarina verticillata	Drooping Sheoak
	Banksia marginata	Silver Banksia
	Exocarpos cupressiformis	Cherry Ballart
Medium shrub	+*Acacia verticillata subsp. verticillata*	Prickly Moses
	+*Bursaria spinosa subsp. spinosa*	Sweet Bursaria
	Callistemon sieberi	River Bottlebrush
	Cassinia aculeata subsp. aculeata	Common Cassinia
	Coprosma quadrifida	Prickly Currant-bush
	Goodenia ovata	Hop Goodenia
	Leptospermum continentale	Prickly Tea-tree
	Leptospermum lanigerum	Woolly Tea-tree
	Melicytus dentatus	Tree Violet
	Olearia lirata Snowy	Daisy-bush
	Ozothamnus ferrugineus	Tree Everlasting
	Pomaderris aspera	Hazel Pomaderris
	Prostanthera lasianthos	Victorian Christmas-bush
Small shrub	*Sambucus gaudichaudiana*	White Elderberry
Large non-tufted graminoid	*Eleocharis sphacelata* [AQ]	Tall Spike-sedge
	Phragmites australis [AQ]	Common Reed

Lifeform	Species name	Common name
Large-tufted graminoid	*Amphibromus nervosus*	Common Swamp Wallaby-grass
	Austrostipa rudis subsp. rudis	Veined Spear-grass
	+*Carex appressa*	Tall Sedge
	Carex polyantha AQ	River Sedge
	Cycnogeton procerum AQ	Common Water-ribbons
	Cyperus lucidus	Leafy Flat-sedge
	Deyeuxia quadriseta	Reed Bent-grass
	Juncus australis	Austral Rush
	Juncus gregiflorus	Green Rush
	Juncus pallidus	Pale Rush
	+*Lepidosperma elatius*	Tall Sword-sedge
	Lomandra longifolia subsp. longifolia	Spiny-headed Mat-rush
	+*Poa ensiformis*	Sword Tussock-grass
	+*Poa labillardierei var. labillardierei*	Common Tussock-grass
Medium to small tufted graminoid	*Anthosachne scabra*	Common Wheat-grass
	Carex breviculmis	Common Grass-sedge
	+*Carex gaudichaudiana*	Fen Sedge
	Carex inversa	Knob Sedge
	+*Carex iynx*	Tussock Sedge
	Dianella amoena	Matted Flax-lily
	Dianella revoluta var. revoluta	Black-anther Flax-lily
	+*Dianella tasmanica*	Tasman Flax-lily
	Glyceria australis	Australian Sweet-grass
	Isolepis inundata	Swamp Club-sedge
	Luzula meridionalis	Common Woodrush
	Poa morrisii	Soft Tussock-grass
	Poa sieberiana var. sieberiana	Grey Tussock-grass
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma fulvum	Copper-awned Wallaby-grass
	Rytidosperma indutum	Shiny Wallaby-grass
	Rytidosperma laeve	Smooth Wallaby-grass
	Rytidosperma racemosum var. racemosum	Slender Wallaby-grass
Medium to tiny non-tufted graminoid	*Eleocharis acuta*	Common Spike-sedge
	Eleocharis pusilla	Small Spike-sedge
	+*Hemarthria uncinata var. uncinata*	Mat Grass
	+*Microlaena stipoides var. stipoides*	Weeping Grass

Lifeform	Species name	Common name
Large herb	*Allittia cardiocarpa*	Swamp Daisy
	Arthropodium milleflorum s.s.	Pale Vanilla-lily
	Chrysocephalum semipapposum subsp. semipapposum	Clustered Everlasting
	Craspedia paludicola	Swamp Billy-buttons
	Epilobium pallidiflorum AQ	Showy Willow-herb
	Linum marginale	Native Flax
	Persicaria decipiens AQ	Slender Knotweed
	Senecio campylocarpus	Floodplain Fireweed
	Senecio minimus	Shrubby Fireweed
	Urtica incisa	Scrub Nettle
	Xerochrysum palustre	Swamp Everlasting
Medium herb	*Acaena agnipila*	Hairy Sheep's Burr
	+*Acaena novae-zelandiae*	Bidgee-widgee
	Alisma plantago-aquatica AQ	Water Plantain
	Asperula conferta	Common Woodruff
	Asperula scoparia subsp. scoparia	Prickly Woodruff
	Chrysocephalum apiculatum subsp. apiculatum	Common Everlasting
	+*Coronidium gunnianum*	Pale Swamp Everlasting
	Crassula helmsii AQ	Swamp Crassula
	+*Eryngium vesiculosum*	Prickfoot
	Geranium gardneri	Rough Crane's-bill
	Geranium potentilloides	Soft Crane's-bill
	Geranium solanderi var. solanderi	Austral Crane's-bill
	Gonocarpus humilis	Shade Raspwort
	Gratiola peruviana AQ	Austral Brooklime
	+*Haloragis heterophylla*	Varied Raspwort
	Montia australasica	White Purslane
	Plantago debilis	Shade Plantain
	Ranunculus lappaceus	Australian Buttercup
	Rumex bidens	Mud Dock
	Rumex brownii	Slender Dock
	+*Veronica gracilis*	Slender Speedwell
Small herb	*Centella cordifolia*	Centella
	Hydrocotyle hirta	Hairy Pennywort
	Hydrocotyle sibthorpioides	Shining Pennywort
	Lobelia pratioides	Poison Lobelia
	Ranunculus inundatus AQ	River Buttercup
	Dichondra repens	Kidney-weed
Scrambler or climber	*Rubus parvifolius*	Small-leaf Bramble
Fern	*Blechnum minus*	Soft Water-fern

Lifeform	Species name	Common name
	+*Blechnum nudum*	Fishbone Water-fern
	Blechnum wattsii	Hard Water-fern
	+*Polystichum proliferum*	Mother Shield-fern
	+*Pteridium esculentum subsp. esculentum*	Austral Bracken

Appendix 5. Site condition assessment results

Zone	Vegetation quality score		Sub-total	Standardiser	Total
	Riparian	Non-riparian			
1	0	0.75	0.75	2	1.5
2	0.25	0	0.25	1	0.25
3	0	0.25	0.25	2	0.5
4	0	0.25	0.25	2	0.5
5	0.75	0.75	1.5	1	1.5
6	0	0.75	0.75	2	1.5
7	0.5	0	0.5	1	0.5
8	0	0.25	0.25	2	0.5
9	0.75	0.75	1.5	1	1.5
10	0.5	0	0.5	1	0.5
11	0	0.5	0.5	2	1
12	1	0.75	1.75	1	1.75
13	0	0.25	0.25	2	0.5
14	0	0.25	0.25	2	0.5
15	0	0.25	0.25	2	0.5
16	1	0.75	1.75	1	1.75
17	0	0.75	0.75	2	1.5
18	1	0	1	1	1
19	0	0.25	0.25	2	0.5
20	1	0.75	1.75	1	1.75
21	0	0	0	2	0
22	1	0.75	1.75	1	1.75