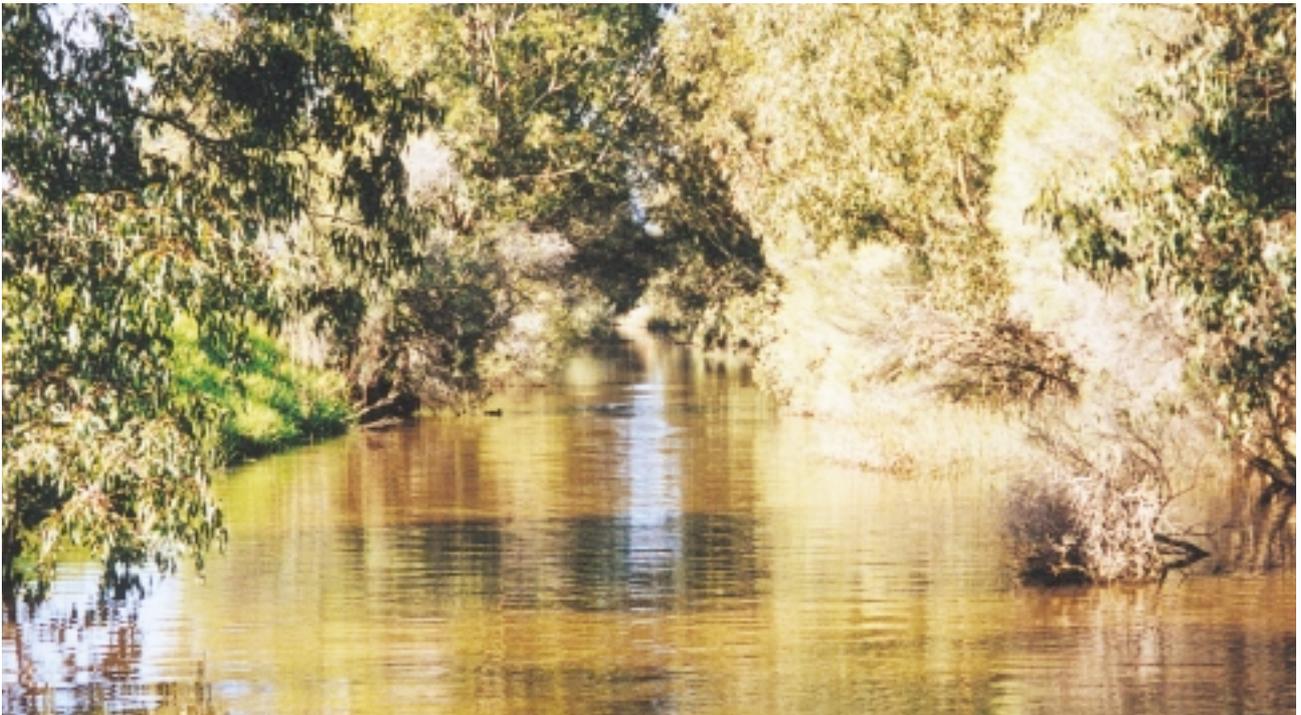




FORESHORE ASSESSMENT IN THE BLACKADDER - WOODBRIDGE CREEKS CATCHMENT



WATER RESOURCE MANAGEMENT SERIES

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2001



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Cover Photograph: Blackadder Creek to Swan River confluence at First Avenue, Guildford - Brad Jakowyna



Foreshore assessment in the Blackadder/Woodbridge Creeks Catchment

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Foreword

Landcare groups in Western Australia have been concerned with the protection and rehabilitation of river systems for some time. However, with such large areas to cover, and many streams being in private ownership, there is a lack of information available to many groups to assist them in making management decisions.

In 1995 Pen and Scott developed a technique for '*Stream Foreshore Assessment in Farming Areas*'.

This provided a standardised assessment technique that can be performed by groups and individual landholders themselves. It has been widely accepted and used to successfully assess many streams throughout south-west WA. As use of the technique has expanded from farm to catchment scale surveys, some users began to express a need for a modification of the methodology that would enable them to assess streams in urban and semi-rural environments, where there are a different suite of issues to be considered. In 1997 the Water and Rivers Commission obtained Natural Heritage Trust funding to assist in the development of a foreshore condition assessment methodology suitable for use in urban areas and to undertake surveys on several major tributaries of the Swan-Canning Catchment.

Nicole Siemon and Kelly Shepherd of Ecosystem Management Services (EMS), in consultation with the Water and Rivers Commission, have developed a technique for '*Foreshore Condition Assessment in Urban and Semi-rural Areas*'. The assessment technique is comprehensive, yet like that of Pen and Scott, does not require specialised knowledge or expensive technical assistance and hence assessment can be performed by groups and individuals themselves.

The methodology considers overall stream condition to be comprised of four major parameters that are independently assessed and the results are then combined to determine the overall stream condition.

Bank stability includes assessment of bank slope, erosion, slumping, sedimentation and stabilising structures.

Foreshore vegetation structure and composition, includes the use of tables with native and weed species commonly found in the region. This allows for

straightforward yet comprehensive vegetation surveys looking at abundance, health and regeneration of individual species.

Stream cover recognises the importance of overhanging native vegetation and in-stream cover, and notes the abundance of native and exotic vegetation and the presence of deciduous trees.

Habitat diversity includes stream form, water quality and identifies habitat requirements for a variety of terrestrial and aquatic fauna.

Along with recording information on stream condition at the time of the survey the methodology also ensures that information is collected that will aid groups in making management decisions. This information includes disturbance factors, surrounding land use, evidence of existing management and special cultural or spiritual significance.

The condition assessment technique that has been developed has several features that are particularly important in helping groups to make their own river management decisions. The techniques:

- do not require specialised knowledge or expensive technical assistance and surveys can therefore be undertaken by individual landholders or by community groups;
- immediately provide managers with data to aid them in their decision making, especially in prioritisation of works;
- provide standardised data suitable for compilation and comparative assessment, even when using data collected by a variety of groups and individuals; and
- provide standardised data suitable for ongoing monitoring and evaluation.

The methodology has been tested on several tributaries in the Swan-Canning catchment. These tributaries have active catchment groups working on, or planning, rehabilitation works. Reaches surveyed were those identified by the catchment groups as priority areas in which they plan to be undertaking works. It is hoped that this report will assist in the long-term management of these tributaries.



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1. Introduction

The riparian zone adjacent to natural watercourses acts as a buffer to the surrounds. Healthy foreshore vegetation stabilises the foreshore banks, and slows and filters water thus reducing erosion of the banks and sedimentation of major channels. Foreshore vegetation also provides stream cover and suitable habitats for aquatic and terrestrial animals. Often these areas are a haven for native fauna, particularly during the dry summer months.

Riparian areas have always been a focus for development and as a consequence are often highly degraded. The major threats to foreshore health are the loss of native vegetation or a decline in health due to weed invasion. The loss of deep-rooted native plants often causes the destabilisation of foreshore banks, leaving these areas prone to erosion particularly during peak flow events.

Gaining an understanding of the health of river foreshores is the first step towards developing appropriate management strategies to protect and enhance these areas.

1.1 Need for this study

Community groups are becoming increasingly interested in foreshore management and are taking an active role in this process. This interest in foreshores provides opportunities to collect substantial data about waterways.

The need for a standard methodology to assess foreshore condition in both rural and urban environments was recognised to ensure consistency of information gathering. This led to the development of the Foreshore

Assessment Proforma (Shepherd and Siemon 1999; WRC Report RR2) during Stage 1 of the foreshore assessment surveys undertaken by Ecosystem Management Services (EMS) on behalf of the Water and Rivers Commission (WRC) and the Natural Heritage Trust (NHT) (WRC Report No. WRM 13, 1999). The Stage 1 surveys were conducted along the waterways of the Bennett Brook, Canning and Ellen Brook catchments.

This report comprises work undertaken by EMS for the Foreshore Assessment Stage 2 Project. Stage 2 involved testing the suitability of the proforma within a broader range of environments, including the Perth Hills and eastern side of the Swan Coastal Plain.

1.2 Community involvement process

The intended audience for the Foreshore Assessment Stage 2 is State and local government officers and the community. Site selection was dependent on advice from local residents, local government and catchment groups with an interest in the health of their waterways.

Discussions were held with community groups to determine specific areas of interest for each catchment group. Each group identified priority foreshore areas to undergo assessment during Stage 2 (Table 1). The locations selected included areas that were already a focus or are potential sites for future rehabilitation works.

The sites surveyed, as nominated by the Blackadder - Woodbridge Catchment Group for this second stage of surveys, were as follows:



Table 1: Community nominated sites

Site No	Location	Situated
1	Blackadder Creek	Elvire Street near Charles Street
2	Blackadder Creek	Elvire Street to Fredrick Street
3	Blackadder-Woodbridge Creek	Lloyd Street
4	Stratton Reserve	Farrell Road
5	Talbot Road Reserve	Myles Road
6	Woodbridge Creek	Swan Road
7	Woodbridge Creek	Ward Avenue
<i>Not applicable</i>	<i>Farrall Road wetland</i>	<i>Not surveyed</i>

As a result of time constraints and access difficulties not all of the foreshore areas that were nominated by the community group were surveyed.

1.3 This report

This report summarises the results of the Stage 2 Foreshore Assessment Surveys for Blackadder-Woodbridge Creek using the foreshore condition assessment proforma (Shepherd and Siemon 1999; WRC Report RR2). It provides a description of the current status of the foreshore environment, and identifies major threats to the health of the area.

Recommended strategies for appropriate management of future works on the focus foreshore areas are also detailed in the document. Information is provided on weed control techniques, recommended native species for foreshore rehabilitation and how to undertake soft engineering works.



2. Methodology

2.1 Site selection within tributaries

Following the community involvement process the nominated sections of the selected waterways were assessed to determine the most appropriate areas for the foreshore survey. This was based on the need to assess a complete range of foreshore health in a variety of areas, to ensure that the proforma continued to be sufficiently balanced to cover all situations ranging from rural to urban.

2.2 Implementing the survey

The foreshore assessment survey proforma has been developed to enable community groups to assess the condition of foreshores in urban and semi-rural areas. For detailed information on the methodology used to assess foreshore condition refer to Shepherd and Siemon 1999; WRC Report RR2.

As outlined above, this process ensures consistency of information gathering over time, allowing the information collected from multiple surveys by various people to be collated. The accumulated information can then be used to prepare management plans and identify priority areas for rehabilitation. The results can also be used to monitor changes over time and to compare different foreshore areas; and be shared amongst State and local government authorities and the community.

2.2.1 Undertaking foreshore surveys

Each of the foreshore areas selected was traversed before survey. The foreshore was then divided into relatively homogeneous sections of similar vegetation structure and land use. A survey was conducted for each of these sections, and the condition of the foreshore parameters was calculated and the overall Stream Condition Index determined.

In areas where foreshore vegetation was very dense on both banks, both sides were surveyed separately and a form was completed for each side. On highly degraded

ivers where the foreshore along both banks was easily observed from one side, and the vegetation and disturbance factors were similar, a single survey form was completed for both sides.

Scaled baseline maps were prepared by the Water and Rivers Commission showing cadastral boundaries and the waterway. The cadastral information assists in identifying location out in the field. As each homogeneous section was identified, information was sketched onto baseline maps. Other information such as the composition and location of native vegetation along the foreshore, the location and extent of predominant weeds and the presence of disturbance factors such as discharge pipes and other infrastructure was detailed on each map. Fences and remedial works were also noted.

Note that the left and right sides of the main channel are defined with respect to the view upstream.

2.2.2 Environmental parameters of foreshore condition

Principal environmental parameters are used as indicators of foreshore condition and are assessed during the foreshore survey to determine the overall Stream Condition Index.

These parameters are:

- bank stability
- foreshore vegetation
- stream cover
- habitat diversity

A colour-coded system has been developed to summarise the condition of each of the above environmental parameters. This system allows the information to be provided in an immediately recognisable form. The status of each of the parameters is assessed and graded from Blue (Excellent) to Black (Very Poor) (Table 2) using the criteria outlined in Table 3. For example, the bank stability of an area is



determined by assessing the level of erosion, slumping and sedimentation along the foreshore. In a pristine area where there is no discernible decline in condition and no obvious erosion, the bank stability may be graded as Blue. In a highly modified system where the foreshore

is highly degraded and subject to severe erosion and bank collapse, bank stability may be graded as Red or Black. A scoring system is linked to this process to provide a quantitative method of calculating stream health.

Table 2: Colour codes and points value for ranking stream conditions

Condition	Excellent	Good	Moderate	Poor	Very Poor
Colour rating	Blue	Green	Yellow	Red	Black
Score	8	6	4	2	0

From: Shepherd and Siemon 1999; WRC Report RR2.



Table 3: The determination of foreshore health

	Blue - Excellent 8 points	Green - Good 6 points	Yellow - Moderate 4 points	Red - Poor 2 points	Black - Very poor 0 points
Bank Stability	No erosion, slumping or sediment deposits; dense native vegetation cover on banks and verge; no evidence of disturbance or areas of exposed soil.	No significant erosion, slumping or sediment deposits in floodway or on lower banks; good native vegetation cover; only isolated areas of exposed soil or thinning vegetation.	Some localised erosion, slumping and sediment deposits; native vegetation cover on verges may be patchy and interspersed with patches of exposed soil.	Extensive active erosion slumping and sediment desposition particularly during peak flows; bare banks and verges common.	Almost continuous erosion; over 50% of banks slumping; sediment heaps line or fill much of the floodway; little or no vegetation cover.
Foreshore vegetation	Healthy, undisturbed native vegetation with structure intact and verges more than 20 m wide; no weed or signs of disturbance evident.	Vegetation structure dominated by native plants that comprise 80 - 100% of the total number of species; only scattered weeds or rarely evident in small clusters; nil or minor signs of disturbance (i.e: tracks, rubbish dumping).	Some changes in vegetation structure, native plants comprising of 50 - 80% of the total species composition; little regeneration of trees and shrubs; weeds occurring occasionally; moderate levels of disturbance.	Modified vegetation structure with native plants comprising only 20 - 50% of the total species composition. Trees remain with only scattered shrubs and an understorey dominated by weeds; high prevalence of disturbance.	Insufficient vegetation to control erosion; natural vegetation structure absent with occasional native trees and shrubs comprising less than 20% of the total species composition; weeds abundant; very high prevalence of disturbance and extensive areas of exposed soil.

	Blue - Excellent 8 points	Green - Good 6 points	Yellow - Moderate 4 points	Red - Poor 2 points	Black - Very poor 0 points
Stream Cover	Abundant stream cover from dense overhanging vegetation providing almost continuous shade; frequent instream cover from aquatic vegetation and/or leaf litter, rocks or logs.	Abundant shade from overhanging vegetation; occasional instream cover from patches of aquatic vegetation and isolated heaps of leaf litter or rocks and logs.	Scattered fringing vegetation with occasional patches of shade; infrequent instream cover with little aquatic vegetation, very infrequent rocks and logs.	Stream channel mainly clear; fringing vegetation almost absent providing very little permanent shade; instream cover almost absent with generally no instream vegetation and very infrequent rocks and logs.	Zero or minimal stream cover with no permanently shaded areas and no instream cover.
Habitat Diversity	Excellent water quality with permanent water (i.e: pools and creeks); three or more aquatic and terrestrial habitats including diverse vegetation types, edge waters, instream cascades, riffles, pools and woody debris.	Good water quality and some permanent water; at least three aquatic habitat types; at least one habitat type for terrestrial invertebrates; at least one habitat type for each terrestrial vertebrate category (frogs, reptiles and birds).	No apparent problems with water quality (i.e: muddy or cloudy in winter); at least two aquatic habitat types; at least one habitat type for terrestrial invertebrates; at least one habitat type for any two of the terrestrial vertebrate categories.	Possible seasonal problems with water quality and no permanent water; at least one aquatic habitat type; at least one habitat type for terrestrial invertebrates; at least one habitat type for one of the terrestrial vertebrates.	Poor water quality; almost no healthy habitats available for aquatic and terrestrial organisms.



The Stream Condition Index is a summary of the foreshore environmental parameters (Table 4) and is an indication of the overall stream condition.

Table 4: Stream Condition Index

Colour Code	Parameter Rating	Description
Blue (32 points)	Excellent	All parameters blue.
Green (22-30 points)	Good	Three to four parameters rated green or better with only one parameter rated yellow; no red or black ratings.
Yellow (14-20 points)	Moderate	Three parameters rated yellow or better with no more than one red; no black
Red (6-12 points)	Poor	Two or three parameters rated red with no more than one black.
Black (0-4 points)	Very Poor	Two or more parameters rated black.

2.2.3 Collating the results

The results compiled from the foreshore surveys of the selected sites were collated and a series of maps produced. These maps were digitised to enable presentation of the foreshore information in a visual format with corresponding text. The summary codes of the condition of the four environmental parameters

assessed at each site and the overall Stream Condition Index are included on each summary map.

This report also contains a detailed description of each site surveyed outlining the key findings of the four environmental parameters assessed and recommended strategies for appropriate remedial works.

3. Key findings for the Blackadder - Woodbridge Creeks Catchment

The predominant landuse surrounding the surveyed areas of the Blackadder/Woodbridge catchment are developed residential sites, although there is one rural zone at Site 1. A wetland characterises this surveyed site and currently cattle are present within the area. There are, however, proposals for residential development at this location.

Many of the river sections adjoin private residential properties, although some of the surveyed areas are within reserves that are surrounded by residential developments. The proximity of residential developments to waterways increases the level of disturbance to the riparian zone. People from nearby residential developments use the waterway for recreational pursuits. Nearby gardens allows for exotic plant species to become introduced within the foreshore sites and runoff and grey water inputs from the stormwater system add to the disturbance of the foreshore.

3.1 Bank stability

Bank stability is determined by the extent of erosion and slumping occurring along foreshore banks and the level of sedimentation within stream channels. Erosion is evident at almost all sites within the Blackadder Creek catchment to varying degrees.

Of the foreshore surveyed, those most prone to severe erosion, generally lacked healthy foreshore vegetation. The banks of the creek at Stratton Reserve (Site 4, Sections A and C) exhibit severe erosion and as a consequence bank stability were rated as Poor (Red), due to a lack of fringing vegetation. Erosion is exacerbated at these sites by the presence of numerous bicycle tracks that indiscriminately cross the waterway, causing bank destabilisation and further vegetation loss. The nature of the soil of the riverbank also contributes to poor bank stability. The duplex soils within this site at the Stratton Reserve are characterised by grey sands overlying orange clay, which is easily destabilised following vegetation loss, or disturbance through trampling and/or traversing of vehicles.

Localised disturbance frequently occurs along steep banks near the entry points of drainage channels or near outflow points of discharge pipes. Erosion also increases where infrastructure works have been undertaken, for example near crossovers and bridges, such as at the start of Lloyd Street (Site 3).

The impact of the loss of dense emergent species along most of the foreshores surveyed is evident, particularly near the base of trees that grow immediately along the banks. As the soil is scoured away, roots are exposed and trees are less supported. Consequently, there is an increased likelihood of trees collapsing which further exacerbates the erosion problem.

The erosion and collapse of banks increases the sediment load within a waterway. The Stratton Reserve (Site 4) and Lloyd Street (Site 3) sites exhibit significant levels of sedimentation within the stream channel. Some of the sediment plumes within the Lloyd Street site have stabilised and been colonised by vegetation, such as the *Melaleuca raphiophylla* (Swamp Paperbark). This instream feature is now contributing to further bank destabilisation as the diverted waters widen the main channel by scouring the banks either side of the colonised sediment plume.

3.2 Vegetation

The foreshore vegetation along the majority of the surveyed tributaries in the Blackadder Creek catchment is in Poor (Red) to Moderate (Yellow) condition. This reflects the degree of disturbance to the remnant vegetation in the area. Disturbance factors, which are most prevalent within the catchment, include the invasion of weeds, physical disturbance through trampling and the clearing of vegetation for residential developments and grazing of stock.

3.2.1 Native species

The benefit of maintaining healthy native vegetation along foreshore zones has been well documented (Pen and Majer 1993; Riding and Carter 1992). Native vegetation provides local fauna with a range of suitable



habitats, is often deep rooted and is therefore better at supporting the banks of the waterway and preventing the onset of bank destabilisation. Native plant communities are also less likely to choke waterways (Pen 1999).

Corymbia calophylla (Marri), *Melaleuca raphiophylla* (Swamp Paperbark) and *Eucalyptus rudis* (Flooded Gum) are the dominant overstorey species within the surveyed areas, although their distribution is generally patchy or sparse. The more frequently occurring native middlestorey species include *Xanthorrhoea preissii* (Grass Tree), *Acacia pulchella* (Prickly Moses), *Hakea undulata* (Wavy Leaved Hakea), *H. trifurcata* (Two-Leaf Hakea) and *Calothamnus quadrifidus* (One Sided Bottlebrush).

The dominant native understorey species include *Dryandra nivea* (Couch Honey-pot), *Borya* sp., *Hibbertia* sp. (Yellow Buttercups), *Hypolaena exsulca*, *Kennedia prostrata* (Running Postman) and *Drosera microphylla*. The diversity of some patches of riparian vegetation is often surprising given the degradation that generally characterises the sections surveyed. Species identified during the survey are listed in Appendix 1. Often occurring within and adjacent to the stream channels are native rushes and sedges including *Lepidosperma angustatum*, *Juncus pallidus* (Pale Rush) and *Lepidosperma effusum* (Spreading Sword Sedge). *Juncus kraussii* (Shore Rush) dominate the tidal areas near the confluence of the creek with the Swan River.

There is evidence of stress and disease amongst the *Eucalyptus rudis* (Flooded Gum) populations. The level of insect attack appears to be more severe than in previous years, probably as a result of stress from either increased waterlogging or conversely a reduction in the water levels, making them more vulnerable to insect attack. Waterlogging has become widespread following the construction of crossovers and other infrastructure, which do not maintain the natural hydrological balance. Many of these features are acting as mini-interceptor banks, holding water in wetland areas for longer than occurred in the past.

3.2.2 Weeds

Exotic deciduous trees, such as Fig (*Ficus carica*) are common along degraded foreshores in urbanised areas, and have further spread into the neighbouring rural areas. These trees were originally planted as ornamentals or have escaped from nearby gardens.

Deciduous trees threaten foreshore health as sudden leaf fall during winter decreases available stream cover and often introduces large amounts of vegetative material into the water column. The breakdown of large amounts of soft leaves may cause a sudden decline in the amount of available oxygen in the water column, affecting instream organisms.

Weeds in the middlestorey often form dense, clumped stands or occur in narrow strips along the edge of the watercourse. The most widespread weed species that form dense stands include the Giant Reed (*Arundo donax*) and the introduced Bulrush (*Typha orientalis*). Arum Lily (*Zantedeschia aethiopica*) is frequently present in high numbers along foreshore areas and in low lying winter wet depressions in the floodplain. Other species that are present at a number of the survey sites but often in low numbers include Castor Oil (*Ricinus communis*), and the declared Cotton Bush (*Gomphocarpus fruticosus*) (Appendix 1B).

One of the greatest threats to native foreshore vegetation health, and regeneration, is the presence of dominant understorey weeds including Watsonia (*Watsonia bulbifera*) and grasses such as Kikuyu (*Pennisetum clandestinum*), Guildford Grass (*Romulea rosea*), African Fountain Grass (*Pennisetum setaceum*) and African Lovegrass (*Eragrostis curvula*). Other frequently occurring weeds include Soursob (*Oxalis pes-caprae*), Deadly Nightshade (*Solanum nigrum*) and Fleabane (*Conyza* spp.). Creepers such as Bridal Creeper (*Asparagus asparagoides*) and less frequently Morning Glory (*Ipomoea* sp.) are present in a number of weed dominated foreshore areas. The introduced rush, *Juncus microcephalus*, exists within some stream channels.

3.3 Stream cover

The level of overhanging vegetation and the abundance of native and non-deciduous exotic species along the foreshore determines the level of cover and permanent shade along a waterway. Instream emergent and submerged vegetation, rocks and logs also provide cover for aquatic organisms.

Within the Blackadder Creek catchment the level of stream cover maintained by the fringing vegetation and instream features ranges from Black (Very Poor) to Yellow (Moderate). Areas of moderate stream cover (Site 5, Talbot Road Reserve) contain patchy



occurrences of fringing native vegetation. The instream cover is provided at this site by weeds such as Kikuyu (*Pennisetum clandestinum*), and some instream branches and/or rocks. Site 4, Section C – Stratton Reserve – exhibits a stream cover index of Black (Very Poor) due to the lack of fringing native vegetation or instream features, with exotic annual grass species offering the only cover.

3.4 Habitat diversity

Instream habitat diversity is affected by the quality and permanency of water and by the presence of instream rocks, submerged and emergent vegetation and logs. These features provide substrates for attachment for aquatic invertebrates, cover for fish and potential basking sites for turtles. Healthy, diverse streamside vegetation provides suitable habitats for terrestrial organisms and overstorey trees provide roosting and nesting sites for birds.

The habitat diversity offered by the sites surveyed within the Blackadder catchment ranged from Poor (Red) to Moderate (Yellow). One of the sites exhibiting Poor

habitat diversity is Railway Reserve (Site 6). The Poor (Red) rating has been applied to this site due to the lack of vegetation diversity, non-permanence of water, scarcity of instream habitat features and the extent of weed invasion. Talbot Road Reserve (Site 5) is an example of a site with a habitat rated as Moderate (Yellow). This site is of higher habitat value due to the increased vegetative diversity, wide fringing vegetative buffers and instream features such as logs, branches and rocks, which offer habitat to a wide range of organisms existing within the area.

The presence or absence of permanent water is a defining feature of an Excellent (Blue) habitat rating. However, this may be misleading for the sites surveyed in the Scarp region. Many of the upper reaches of the waterway are expected to be seasonal, with permanent water only occurring where there are permanent seeps. As a consequence this often results in the downgrading of many sites where the permanence of water is uncharacteristic. Therefore, in some circumstances, it maybe useful to reduce the weighting of this character when the headwaters of a catchment are surveyed.



3.5 Overall summary conditions for all surveyed sites

The overall condition of the foreshore sections surveyed for each of the sites is summarised below.

3.5.1 Summary results for Blackadder Creek

Summary of river health: Site 1 - Elvire Street near Charles Street

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Green	Yellow	Yellow	Yellow
Good	Moderate	Moderate	Moderate
6	4	4	4

Stream Condition
Yellow
Moderate
18

Summary of river health: Site 2 - Elvire Street to Fredrick Street

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Yellow	Yellow
Poor	Poor	Moderate	Moderate
2	2	4	4

Stream Condition
Red
Poor
12

3.5.2 Summary results for Blackadder/Woodbridge Creek

Summary of river health: Site 3 - Lloyd Street, TAFE grounds

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Red	Red
Poor	Poor	Poor	Poor
2	2	2	2

Stream Condition
Red
Poor
8

3.5.3 Summary results for Stratton Reserve

Summary of river health: Site 4, Section A - Farrell Road

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Red	Red
Poor	Poor	Poor	Poor
2	2	2	2

Stream Condition
Red
Poor
8



Summary of river health: Site 4, Section B – Farrell Road or Likely Place

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Yellow	Yellow
Poor	Moderate	Moderate	Moderate
2	4	4	4

Stream Condition
Yellow
Moderate
14

Summary of river health: Site 4, Section C – Farrell Road and Myles Road

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Black	Red
Poor	Poor	Very Poor	Poor
2	2	0	2

Stream Condition
Red
Poor
6

3.5.4 Summary results for Talbot Road Reserve**Summary of river health: Site 5 - Myles Road**

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Yellow	Yellow
Poor	Moderate	Moderate	Moderate
2	4	4	4

Stream Condition
Yellow
Moderate
14

3.5.5 Summary results for Woodbridge Creek.**Summary of river health: Site 6 – Swan Road**

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Yellow	Red	Red	Red
Moderate	Poor	Poor	Poor
4	2	2	2

Stream Condition
Red
Poor
10

Summary of river health: Site 7 – Ward Avenue

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Red	Yellow	Red
Poor	Poor	Moderate	Poor
2	2	4	2

Stream Condition
Red
Poor
10



4. Specific site reports

4.1 Blackadder Creek

Elvire Street near Charles Street

Results

Foreshore Condition Survey

A Study undertaken on behalf of

Water and Rivers Commission and the Natural Heritage Trust



Blackadder - Site 1: Map 1-2 Blackadder Creek

Length of section (m): 720 m
Recorder's name: B Waining and N Siemon
Date surveyed: 13/6/99
Nearest road access: Elvire Street near Charles Street
Lot number(s): 3

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Green	Yellow	Yellow	Yellow	Yellow
Good	Moderate	Moderate	Moderate	Moderate
6	4	4	4	18

Description

Bank stability: This section of the Blackadder Creek (Elvire Street Wetland; Site 1) is characterised by a broad seasonal wetland with braided channels. During winter a large (up to 100 m wide and 200 m long) open body of water dominates the area. During summer, water levels are reduced and some areas dry out to form clay pans and salt flats. The pasture species that dominate the area extend their distribution into the flood zone interspersed with patches of relic native saltmarsh species. High tides inundate the area periodically.

The foreshore banks slope down on a shallow gradient from the surrounding land, apart from the southern boundary of the wetland where considerable fill has been dumped. No signs of erosion, sedimentation or slumping were apparent within the area. There is some disruption to sediment cohesion where stock cross. The floodplain has been collecting sediment over time to create the present landform, however there was limited evidence of recent sediment movement. The flow of the creek is constricted near a stockyard, which causes pooling and stagnation upstream. Stock has open access to the water body, which impacts on nutrient levels, bank destabilisation and sedimentation of the stream.

Recommended Strategies

- Ensure that the sediment levels within the seasonal wetland do not restrict tidal exchange and water movement into, and out of, the braided channel.
- Liaise with the landholder to realign paddock boundary fences to excise the seasonal wetland and riparian zone to enable a different management strategy of the waterlogged zones and retain winter access between paddocks.
- Stabilise the stock crossing in a manner that does not impact on stream flow or other hydrological features. One possible option, although costly, may be to use continuous box culverts to the width of winter water levels.
- Revegetate the fringes of the seasonal wetland with suitable locally derived overstorey and middlestorey plant species (Appendix 3).
- Revegetate the salt pans with suitable halophytic or salt tolerant species listed in Table 5 (Section 6.8).



Vegetation: There is evidence of significant levels of long term disturbance to the vegetation structure of this area. The structure is highly modified as a result of continued land use optimised for grazing and agricultural ventures. Isolated patches of trees and occasional individual mature trees characterise the overstorey component of this site. Scattered *Eucalyptus rudis* (Flooded Gum) and patches of *Melaleuca raphiophylla* (Swamp Paperbark) occur on the upland region of the floodplain. The *Eucalyptus rudis* (Flooded Gum) growing upstream of the stock crossing are stressed. It is likely that increased periods of waterlogging may be weakening the trees, increasing their vulnerability to insect attack. There are no middlestorey species present. The understorey is continuous, with native *Juncus kraussii* (Shore Rush) occurring frequently. For the most part, however, pasture grasses including annual grasses and Kikuyu (*Pennisetum clandestinum*) and Medics dominate the area. There is no evidence of natural regeneration of the native tree species, most likely due to grazing pressure from the cows that are present within the area. Other occasional weed species along the foreshore include Dock (*Rumex* spp.), Arum Lily (*Zantedeschia aethiopica*) and Fleabane (*Conyza* spp.).

Stream Cover: The isolated patches of canopy provide some occasional areas of stream cover. The weed species present rarely provide stream cover. Leaf litter/detritus, herbaceous plants and submerged logs and branches provide some limited instream cover.

Habitat diversity: There is no permanent water within this survey section. During the time of the survey the depth of water varied from very shallow to 1 m. There is a significant quantity of suspended solids and tannin in the water, resulting in a milky brown colour. Erosion further upstream in the catchment results in high levels of sediment entering the waterway. Stock movement across the wetland also destabilises banks. The limited vegetation types along the foreshore provide a few suitable habitats for invertebrates. The existence of soft substrates and emergent vegetation creates good habitat for frogs. There are trees and rushes suitable for nesting and

- Focus control of weeds on species such as Arum Lily, Fleabane and Dock (Appendix 2), which can be effectively controlled with sustained effort.
- Liaise with the landholder to realign paddock boundary fences to excise the seasonal wetland and riparian zone to enable a different management strategy of the waterlogged zones and retain winter access between paddocks.
- Revegetate the fenced areas that are not dominated by Kikuyu using direct seeding methods with supporting tubestock planting to establish the understorey, particularly in waterlogged areas as the water recedes in November / December.
- Initiate a short term crash grazing in summer of the areas retaining Kikuyu to enable management of the perennial grass.
- Monitor the levels of natural regeneration in fenced and non-grazed areas and determine the feasibility of implementing supported regeneration of native vegetation in the future.

- Retain fallen branches and logs to provide instream cover where these features do not exacerbate erosion.
- Revegetate portions of the wetland zone with suitable rushes and sedges listed in Appendix 3 to provide additional areas of instream protection.

- Revegetate the modified foreshore areas to ensure a diversity of vegetation types, which provide a variety of habitats for terrestrial and aquatic organisms.
- Ensure old trees and stags are retained, as they provide valuable habitats for reptiles, birds and invertebrates.
- Control random stock movement through the wetland during winter by restricting them to formal, designated stock crossing zones to reduce the level of suspended solids in the waterway.



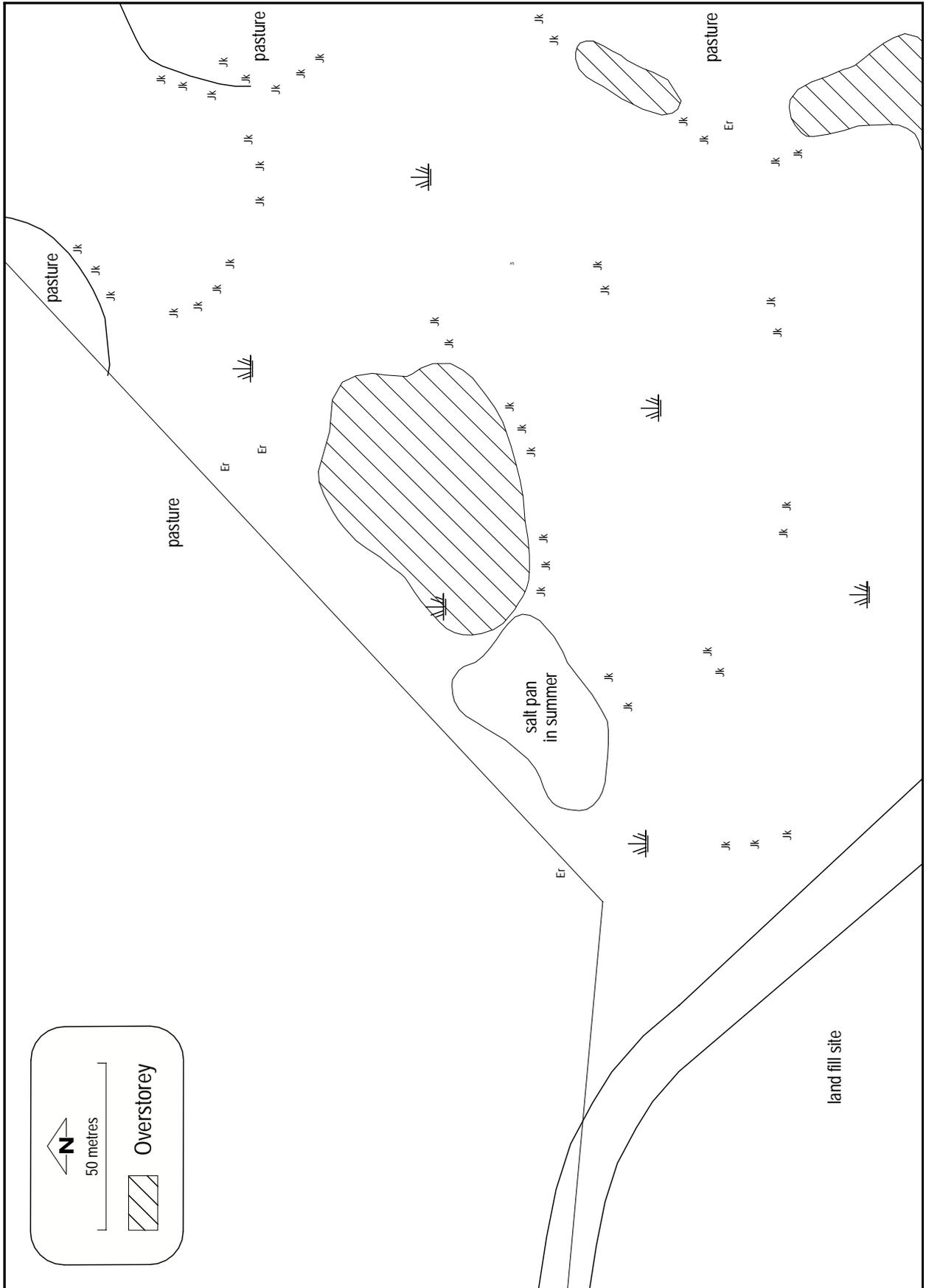
roosting sites for birds. Several bird species were observed during the survey including owls, black swans, ducks and cockatoos. It is likely that the area is favoured by wading birds during spring and summer, as the water levels recede. There are also populations of native bees within the hollows of some of the older trees.

Other issues: This site is wholly contained within a cattle paddock. The current fencing arrangement does not protect the wetland and stream zone from random stock movement. The cattle indiscriminately wade across the wetland, trampling and grazing, preventing the natural regeneration of the overstorey species and potentially excluding the re-establishment of the native shrub species. Increasing pressures may be placed upon this area, with proposals for further residential developments. There is also the risk of polluted leachates entering the waterway from the adjoining landfill site.

- Exclude stock from wetland during frog and bird breeding season (August to January), and utilise this paddock only for short term crash grazing during late summer.

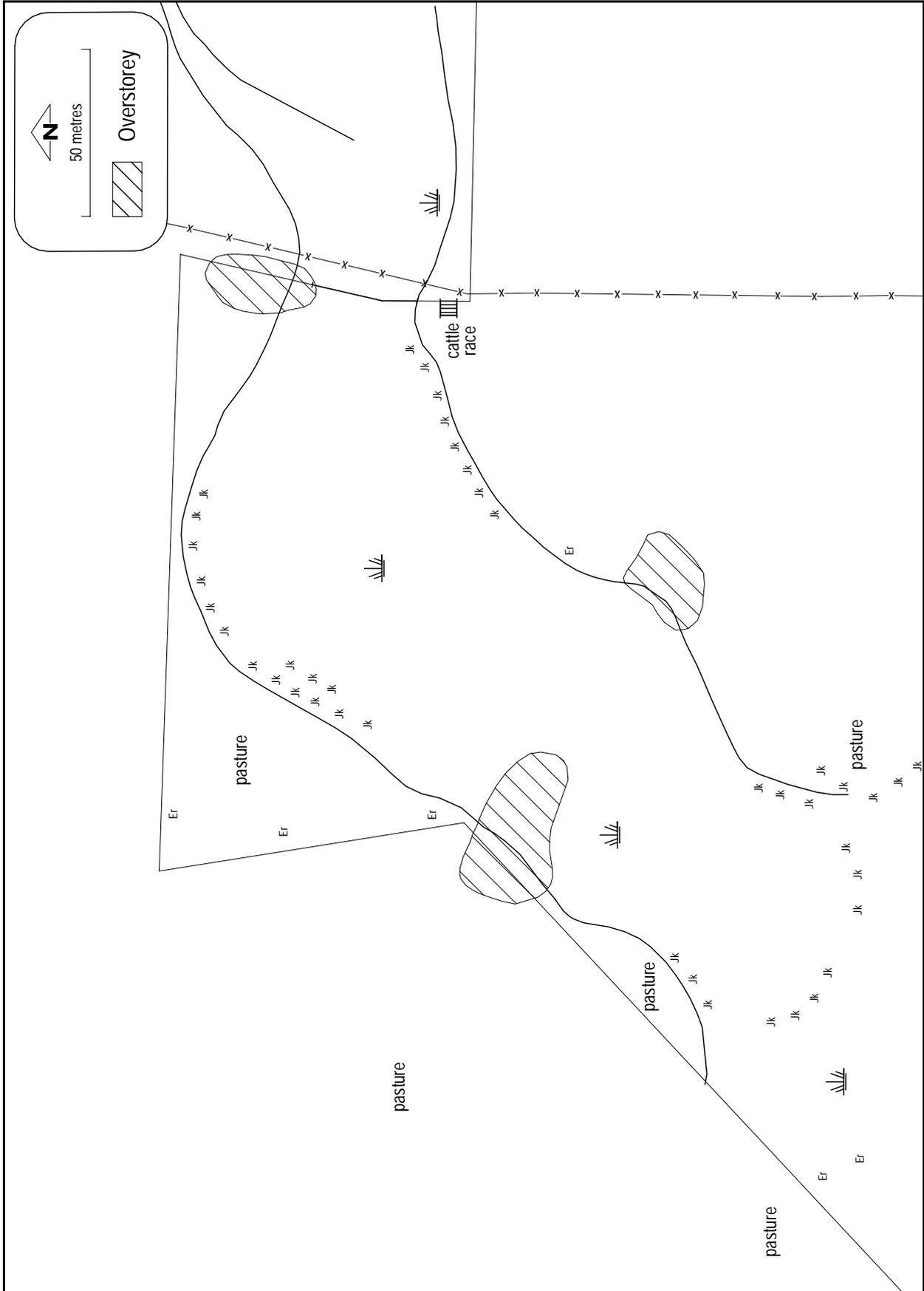
- Negotiate with the landowner to implement recommendations listed above relating to re-alignment of fencing and creating formal stock crossing points.
- Encourage the Department of Environmental Protection and the Water and Rivers Commission to monitor pollutant levels within the water body, to ensure no seepage from the landfill site is occurring.
- Liaise with the Department of Environmental Protection, Ministry for Planning and the local government authority to undertake a comprehensive environmental assessment to assess potential impacts on the existing waterway prior to any new residential developments in the area.





Blackadder Creek Site 1 - Map 1





Blackadder Creek Site 1 - Map 2



4.2 Blackadder Creek

Elvire Street to Fredrick Street

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder – Site 2: Map 1 Blackadder Creek

Length of section (m): 1100 m

Recorder's name: B Waining and N Siemon

Date surveyed: 23/6/99

Nearest road access: Elvire Street to Frederic Street

Lot number(s): 800, 163, 162, 161, 90, 1, 141, 142, 80, 79, 77, 72, 7, 12345 and 79

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Yellow	Yellow	Red
Poor	Poor	Moderate	Moderate	Poor
2	2	4	4	12

Description

Bank stability: The upper reaches of this section of Blackadder Creek (Site 2) are characterised by a clearly defined channel, up to 8 m wide, with steep banks rising at a slope up to 80° and 6 m in height. In contrast, the downstream section grades into a low lying floodplain that lacks a clearly defined main channel. There is a significant amount of erosion evident, along at least 20 – 50% of the section surveyed. Erosion is most evident on the outside of the stream bends (power bends), and at the outfall of culverts and stormwater drains. The floodplain and stream banks have been significantly modified through dumping of landfill. The unconsolidated and mixed nature of the materials used for these works could contribute to future bank destabilisation. There is localised slumping and sedimentation evident along 5 – 20% of the section. The floodplain to the west of the surveyed area is a zone of sedimentation, due to the wider channel with subsequent decreased water energy.

Vegetation: The vegetation composition within this section characterises many urban waterways in suburbs that have been developed for a long time. The overstorey is patchy providing 20-80% cover along the stream foreshore. The composition of the overstorey is predominantly native (75%) with

Recommended strategies

- Liaise with adjacent landowners to encourage them to manage the foreshores with a focus on restoration and revegetation to minimise further foreshore destabilisation.
- Stabilise areas of landfill, to prevent erosion by reducing the bank gradient where possible.
- Liaise with Main Roads WA and local government authorities to implement soft engineering works to stabilise areas of the banks which are currently under erosion pressures, such as inflow points of the stormwater system. For example, opening up the stormwater system and running the water through an open rocky spillway may benefit the waterway (see Appendix 4).
- Prioritise the removal of invasive weed species such as Cottonbush and Watsonia, ensuring that weed control works will not exacerbate bank destabilisation.
- Focus weed control activities on large tree species such as Japanese Pepper and Edible Fig if resources are available, using techniques outlined in Appendix 2.



frequent occurrences of *Eucalyptus rudis* (Flooded Gum) and *Melaleuca raphiophylla* (Swamp Paperbark) and occasional *E. wandoo* (Wandoo). The overstorey throughout this section exists either as a narrow fringing band, a dense closed stand or as individual trees scattered along the foreshore. Occasionally interspersed throughout the overstorey are weed species such as Japanese Pepper (*Schinus terebinthifolia*) and Edible Fig tree (*Ficus carica*). The middlestorey cover is also patchy along the stream foreshore and the proportion of native species present is only 5%, represented by the occasional occurrence of *Acacia saligna* (Coojong) and infrequent *Typha domingensis* (the native Bulrush). The majority of the middlestorey is dominated by weed species including frequent occurrences of Canna Lily (*Canna* sp.), Castor Oil (*Ricinus communis*) and the Giant Reed (*Arundo donax*). There are also occasional occurrences of the introduced Bulrush (*Typha orientalis*) and Cotton Bush (*Gomphocarpus fruticosus*). The understorey is continuous throughout, however it consists exclusively of weed species. There are abundant perennial grasses including Kikuyu (*Pennisetum clandestinum*), and frequent occurrences of Couch Grass (*Cynodon dactylon*), *Paspalum* sp., Buffalo Grass (*Stenotaphrum secundatum*). Soursob (*Oxalis pes-caprae*), Arum Lily (*Zantedeschia aethiopica*) are also frequent, while there are occasional patches of Watsonia (*Watsonia bulbifera*), Fleabane (*Conyza* spp.), Morning Glory (*Ipomoea* sp.) and Elephant Ears (*Alocasia brisbanensis*).

Stream cover: There are frequent areas of native vegetation and weed species which offer permanent stream cover along the foreshore. There are occurrences of deciduous trees, i.e. Edible Fig, which contribute only summer cover to the stream. Within the stream, cover is provided in the form of leaf litter and detritus, branches and vegetation. The majority of the green matter present within the stream comprises weed grasses and rushes, with an infrequent occurrence of the native rush *Juncus pallidus* (Pale Rush).

- Investigate availability of Greencorp or equivalent working groups to implement preliminary weed control works, and utilise them if there is sufficient commitment to manage weeds and implement revegetation works.
- Undertake broadscale weed control in 20 m wide bands and replace with 10 m wide strips of native vegetation (using species recommended in Appendix 3) – leaving a 5 m buffer on each side of the planting to enable weed control access.
- Brush cut perennial grasses to reduce the fire hazard and remove flower heads of broad leaf species prior to seed set to minimise further spread.
- Reinforce native vegetation (using species suggested in Appendix 3) in zones where effective weed control has occurred, leaving a weed management buffer around plantings. This should only occur where a maintenance program with sufficient prescribed resources has been established.
- Work to re-establish native vegetation in areas where there is available substrate on sections of steep banks.
- Establish clearly defined access routes to allow for fire suppression, weed control and revegetation monitoring.
- Continue a long term program for weed control and removal activities, in accordance with the methodologies suggested in Appendix 2.

- Remove instream weed species in working in nodes as outlined above and replace with native vegetation to establish suitable stream cover.
- Retain rocks, branches and other instream features, where they do not disrupt stream flow and create erosion points.

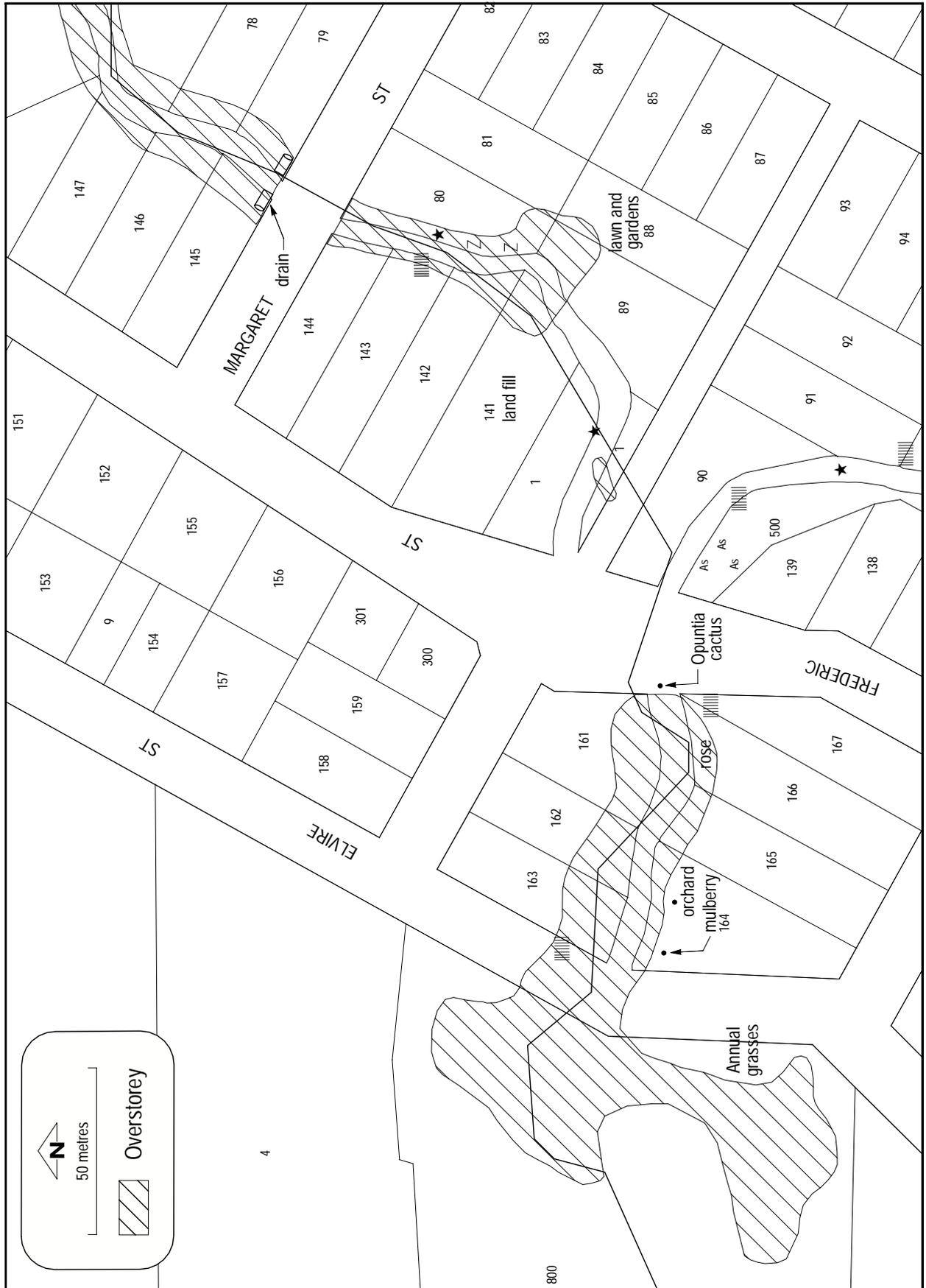
Habitat diversity: During the time of survey the instream water was brown in colour, due to high turbidity and possible tannin levels. It is unlikely that there is permanent water. The depth of the stream varies depending on the width of the channel, and the amount of instream vegetation. Depths observed varied between 0.15 m and 0.6 m. A variety of vegetation types present in the riparian zone provide protected basking sites for terrestrial invertebrates and reptiles. The existence of instream vegetation and logs provides suitable habitats for frogs and basking turtles. The overstorey and patches of dense closed middlestorey provide roosting and nesting sites for birds.

Other issues: This highly disturbed site has been used for dumping of general rubbish and garden refuse. There are also crossing points and point source discharges. The stream flows through a residential zone and is crossed by five roads. This proximity to a number of residential properties and roads creates large amounts of potential inflow to the stream from stormwater and garden runoff, which are known sources of nutrients and chemical residues. The extent of landfill along the banks of the stream has changed the overall stream hydrology, by preventing natural overflow onto areas that were once floodplains. This may increase the chance of severe erosion events during peak flow times.

- Request the Water and Rivers Commission to investigate the major source of suspended sediment entering the waterway and address possible remedial activities to reduce the sediment load within the stream.
- Ensure weed control activities are implemented across the entire section, but retain areas for fauna refuge until weed control and revegetation is completed successfully in nodes.
- Encourage neighbouring residents with dogs and/or cats to manage their pets and prevent them from accessing the riparian zone.

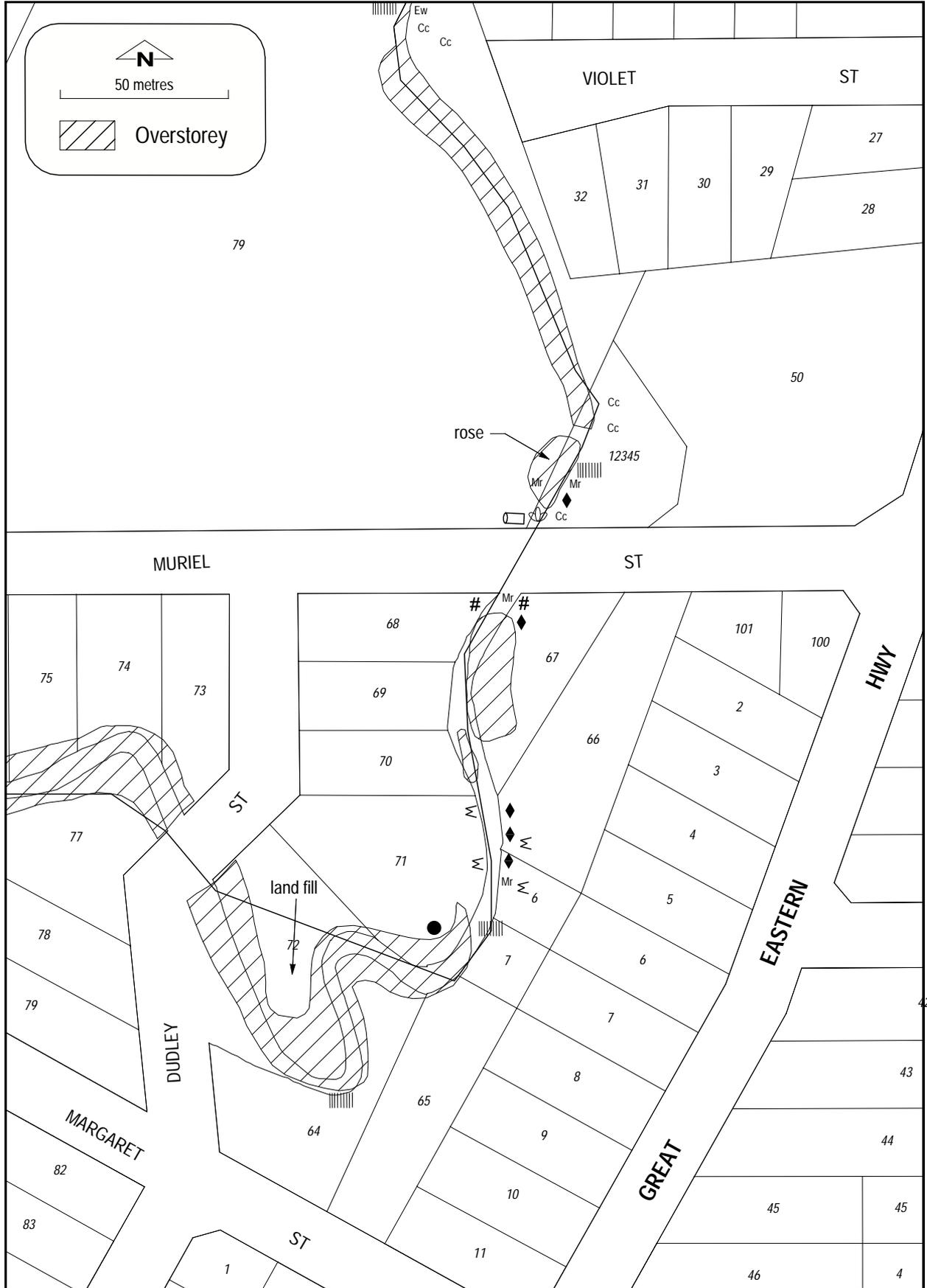
- Provide the nearby residents with information on the impact of exotic garden plants, which can escape and become established within the stream system.
- Liaise with the Department of Environmental Protection and the Water and Rivers Commission to investigate the levels of nutrient and/or chemical residue within the stream, which may be sourced from the numerous gardens and private orchards surrounding the stream, or from toxic residues remaining within the landfill material.
- Encourage local residents to take an active interest in management of the waterway and the serious weed infestation present.





Blackadder Creek Site 2 - Map 1





Blackadder Creek Site 2 - Map 2



4.3 Blackadder/Woodbridge Creeks

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder - Site 3: Map 1-2 Blackadder/Woodbridge Creek

Length of section (m): 816 m
Recorder's name: B Waining and N Siemon
Date surveyed: 23/6/99
Nearest road access: Lloyd Street
Lot number(s): Midland TAFE College grounds

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Red	Red	Red
Poor	Poor	Poor	Moderate	Poor
2	2	2	2	8

Description

Bank stability: The main channel of Blackadder Creek along this section (Site 3) is well defined, up to 1.5 m deep and 2 m wide. There is a significant amount (20-50%) of erosion evident. Bedrock is exposed in several locations, which may indicate that the suspended solid load is significant as erosion is severe in some sections. Slumping and sedimentation is localised, with 5 – 20% of the section being affected. A large box culvert is present at the western end of the section, allowing water to flow under Lloyd Street. There is a significant plume of coarse sediments immediately upstream. There is evidence that the channel has been previously dredged at this location as significant piles of spoil have been piled up adjacent to the creek. This has reduced surface runoff in some locations, with pooling occurring. The channel banks generally have a steep (>60°) gradient and open onto broad, flat floodplains on either side of the stream channel. There is evidence of a recent flood event, with fringing vegetation flattened and debris suspended in the riparian vegetation.

Vegetation: The vegetation of the section is characterised by a sparse (less than 20%) overstorey and middlestorey. Native species comprise the overstorey, while only 10% of the middlestorey are native. The species dominating the overstorey are

Recommended Strategies

- Ensure weed control activities do not impact on bank stability.
- Control indiscriminate trampling and crossing of the stream by establishing a designated crossing point and investigate the possibility of creating an appropriate size box culvert.
- Approach the Water and Rivers Commission to determine the feasibility of undertaking a catchment wide survey to determine hydrological conditions and peak water flows, particularly as it relates to Roe Highway and runoff from the Speed Dome carparks.
- Investigate the opportunity to construct instream riffles to slow water flows prior to power bends, and direct the main flow into the centre of the stream.
- Remove the coarse sediment plume from upstream of the Lloyd Street culvert to prevent this sediment from further degrading the waterway downstream.
- Ensure removal of any dredged sediment from the site or spread the soil on the floodplain at least 50 m from the main channel.
- Implement control of the highly invasive Paterson's Curse to prevent it from becoming widespread (Appendix 2).



occasional *Melaleuca raphiophylla* (Swamp Paperbark), *Eucalyptus rudis* (Flooded Gum) with *Corymbia calophylla* (Marri) occurring infrequently. The only example of native middlestorey vegetation is a single occurrence of *Acacia saligna* (Coojong). Weed species include Castor Oil (*Ricinus communis*) and the introduced Bulrush (*Typha orientalis*). The understorey cover is >80%, however there are no native species present. The weed species dominating the area are the highly invasive Watsonia (*Watsonia bulbifera*), Dock (*Rumex* spp.), Soursob (*Oxalis pes-caprae*), Guildford Grass (*Romulea rosea*), Kikuyu (*Pennisetum clandestinum*) and African Lovegrass (*Eragrostis curvula*). Paterson's Curse (*Echium plantagineum*) is also present.

Stream Cover: The sparse and patchy nature of the native vegetation and limited extent of exotic vegetation on the stream banks create only occasional areas of stream cover. This cover is restricted to areas dominated by the introduced Bulrush and Kikuyu growing within the stream channel. There is also some instream cover provided by leaf litter and detritus.

Habitat diversity: Due to the sparsity of the native overstorey and middlestorey vegetation there is little habitat value for basking terrestrial animals and reptiles along this section. There is no permanent water within the stream and only minor variations in water depth, depending on the amount of scouring of the unconsolidated stream bed materials. These areas provide some habitat values for aquatic organisms for short periods of time. Watsonia (*Watsonia bulbifera*) provides some dense streamside protective habitat for frogs. The presence of an extensive stand of the introduced Bulrush (*Typha orientalis*) may enable birds to nest in the area.

- Brushcut/mow Watsonia, Guildford Grass and African Lovegrass on the floodplain while flowering every year prior to seed set, to minimise the spread of these weeds.
- Encourage the neighbouring TAFE group to become involved in weed control and revegetating the area with appropriate riparian vegetation (Appendix 3).
- Determine appropriate access routes to the area by establishing fences to prevent trampling of native vegetation and spreading of weeds. Ensure that these access routes can be utilised by fire services.
- Investigate the possibility of the TAFE students installing the fences so they gain understanding of its purpose.
- Focus annual weed control efforts on localised nodes so that control is achievable.
- Re-establish riparian vegetation in areas where successful localised weed control has occurred using suitable species outlined in Appendix 3.

- Brushcut the introduced Bulrush in May and remove the resulting leaf material to manage the extent of this plant, while preventing erosion.
- Retain any instream cover in the way of branches, rocks and native vegetation where they do not disrupt stream flow and exacerbate erosion.
- Liaise with the local government authority and the Water and Rivers Commission to investigate the potential to construct riffles to manage stream flow, and enable vegetation to re-establish alongside the main channel for increased cover.

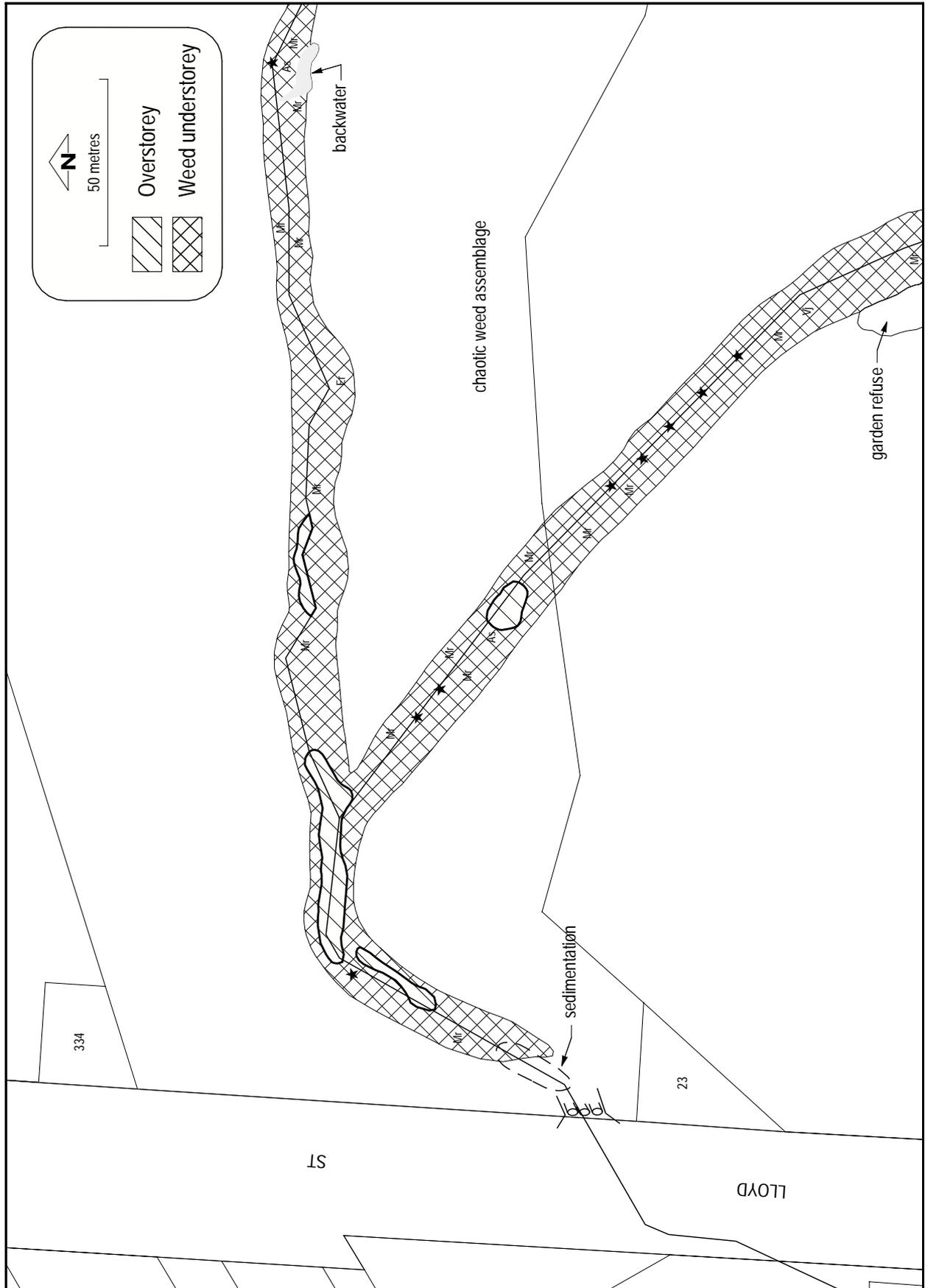
- Retain existing branches and logs within the riparian zone and within the stream channel where these features do not interrupt stream flow or cause foreshore erosion.
- Prepare a revegetation plan which relates to the natural hydrology of the area, ensuring it includes a variety of plant forms and species (Appendix 3).
- Investigate restoration of the semi-permanent wetland currently dominated by the introduced Bulrush, to assist in managing water quantity and quality.



Other issues: Within this stream section there is scattered rubbish, some garden refuse and evidence of disease within a stand of *Melaleuca raphiophylla* (Swamp Paperbark). There is a TAFE fencing practice area adjacent to the stream. There is one main crossing point within the stream section, which is contributing to erosion of the channels and is a source of sediment within the stream. At the western end of the section there is evidence of some dredging activity of the main channel.

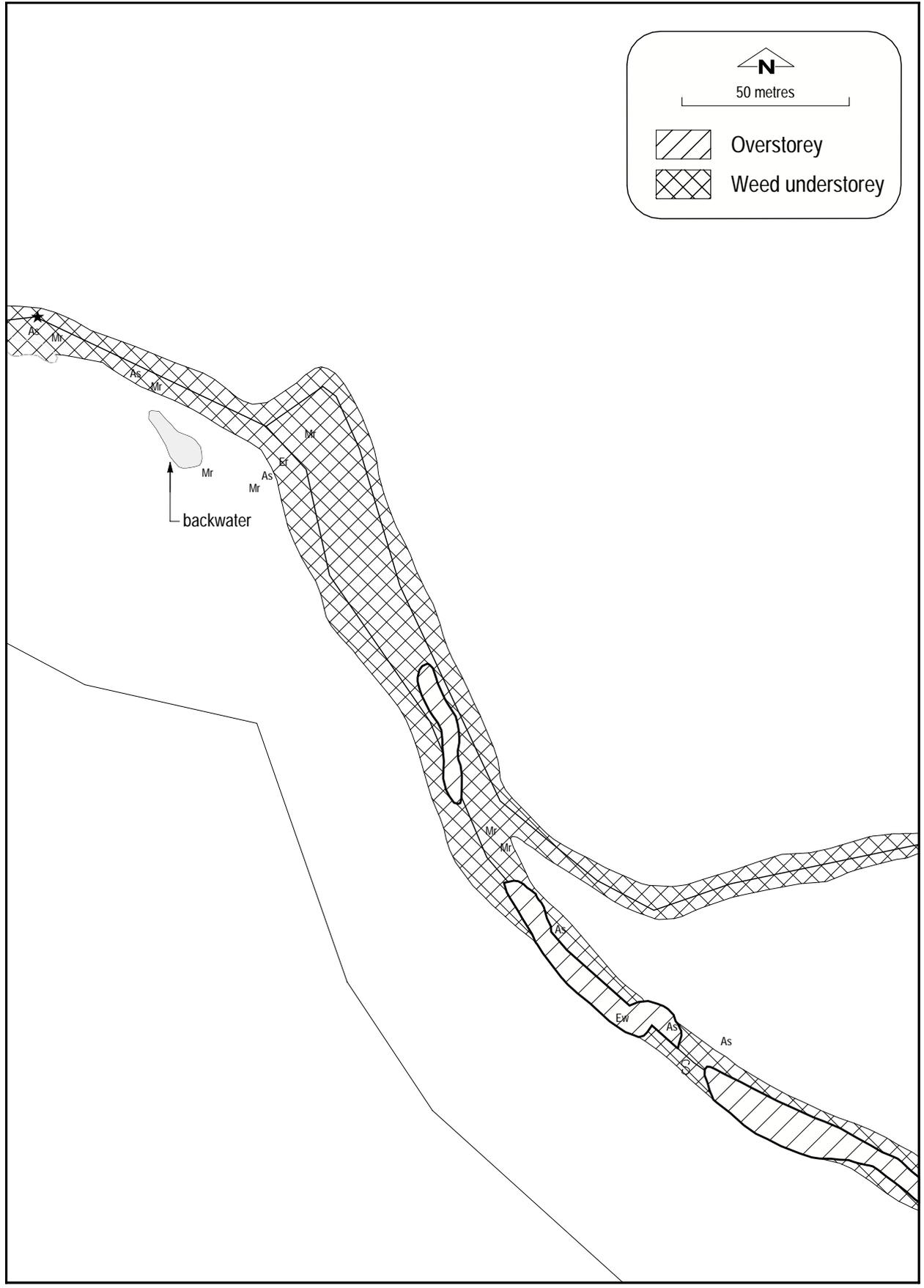
- Ensure weed control occurs in nodes with plantings of native rushes and sedges close to the Bulrush to ensure adequate habitats are maintained for aquatic organisms.
- Liaise with the Water and Rivers Commission and the local government authority to investigate the possibility of installing a designated crossing point using a box culvert.
- Remove garden refuse pile from the site.
- Trace the sources of garden refuse and rubbish through liaising with the local government authority and Main Roads WA, and design a means by which to limit the accumulation of rubbish in the future (possibly a gross pollutant trap).
- Assess the health of the *Melaleuca* stands, contact AGWEST for expert advice and take appropriate action to remedy their decline in health.





Blackadder/Woodbridge Creeks Site 3 - Map 1





Blackadder/Woodbridge Creeks Site 3 - Map 2



4.4 Stratton Reserve

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder – Site 4: Map 1 (Section A) Stratton Reserve

Length of section (m): 80 m
Recorder's name: B Waining and N Siemon
Date surveyed: 10/6/99
Nearest road access: Farrall Road
Lot number(s): 14, 12356

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Red	Red	Red
Poor	Poor	Poor	Poor	Poor
2	2	2	2	8

Description

Bank stability: The channel along this section of Blackadder Creek (Site 4, Section A) is severely eroded with over >50% of the section length affected. The channel is up to 1 m in depth and 1.2 m in width. The banks are very steep (>60°) with evidence of slumping in localised areas. There is a significant level of sedimentation, with 20-50% of the length of the channel affected. The presence of a duplex soil profile, grey sands overlying variable clays, has contributed to the destabilisation of the bank. Scouring of the banks, and the high level of sediment within the stream channel illustrate this. The degradation of the banks is also exacerbated by the presence of numerous crossing points, bare ground and BMX tracks through the area. There is a gas/water pipeline crossing the stream, beneath which there is a severe erosion zone. Debris trapped upstream of this is exacerbating the problem.

Recommended Strategies

- Develop a management strategy and undertake soft engineering works (Appendix 4) to achieve erosion control at the outfall passing beneath Farrall Road at the western end of the section.
- Encourage the local government authority to install designated crossing points using raised open boardwalk-type structures, which connect with the existing path network.
- Construct temporary fencing using bollards and establish woodchip pathways to protect remnant vegetation and new planting works, and to direct access to the designated crossing points along the stream length.
- Implement revegetation of the stream banks and bare ground areas using native species suggested in Appendix 3.
- Encourage the local government authority to provide facilities for BMX users in an area beyond the floodway to discourage indiscriminate use of the reserve for this purpose.
- Liaise with Main Roads WA and the local government authority to investigate erosion occurring around the pipeline, and develop and implement remedial strategies.



Vegetation: The vegetation in this area is highly disturbed. There is a patchy distribution of overstorey remaining, consisting exclusively of *Corymbia calophylla* (Marri). This overstorey occurs in only two isolated patches, surrounded by bare ground and/or a chaotic weed assemblage consisting mainly of annual grasses (mowed). The middlestorey is sparse and covers less than 20% of the area. Species that are present include *Xanthorrhoea preissii* (Grass Tree), with infrequent occurrences of *Acacia saligna* (Coojong), *Allocasuarina humilis* (Dwarf Sheoak) and *Viminaria juncea* (Swishbush). The understorey of the area is patchy, covering between 20 and 80% of the section. Approximately 30% of the understorey species are weed species and include Soursob (*Oxalis pes-caprae*), Guildford Grass (*Romulea rosea*) and African Lovegrass (*Eragrostis curvula*). Native species include frequent *Dryandra nivea* (Couch Honey-pot), with occasional occurrences of *Kennedia coccinea* (Coral Pea) and *Lepidosperma angustatum*.

Stream cover: The patchy overstorey provides some permanent instream shading. There is also occasional instream cover provided by branches and leaf litter. A large proportion of this section, however, comprises bare ground or has minimal vegetation cover which results in poor, if any, habitat value.

Habitat diversity: The water levels in the stream are variable and include constricted deeper channels, pools and wider areas of shallow floodplain. There is no permanent water in the stream. Discolouration of the water is evident, due to the presence of suspended white clays, which gives the water a milky appearance. Habitat values are decreased through the lack of vegetation diversity, instream vegetation cover and instream rocks, logs and cobbles. Some habitat exists for basking reptiles and invertebrates, including trees, which may also provide habitat opportunities for birds to nest and roost.

- Focus weed control activities on the annual grasses that increase the fire risk in the area, in accordance with the suggestions in Appendix 2.
- Ensure that bank stability is not threatened by weed control activities.
- Investigate the possibility of the local government authority defining two designated access points and installing crossovers, which connect with the existing network.
- Undertake revegetation of the denuded areas, using locally derived native plant species (Appendix 3).
- Encourage the local government authority to install temporary fencing using bollards and three strands of wire to protect remnant vegetation from trampling and over-zealous mowing.

- Restore the fringing vegetation along the stream bank using native species recommended in Appendix 3.
- Retain any fallen branches within the riparian zone for the provision of extra habitat and instream cover where these features do not interrupt stream flow or exacerbate erosion.

- Protect remnant vegetation and instream features, so as to maintain existing habitats through fencing of the foreshore.
- Enhance the existing habitat values through reinforcement planting of native vegetation, and implementation of weed control using the techniques suggested in Appendix 2.
- Establish instream vegetation such as native rushes and sedges to act as water filters and to provide instream habitats.



Other issues: This section of Blackadder Creek traverses a reserve within a residential area, which is used as parkland for recreational purposes. As a result, the health of this site reflects the impact of numerous disturbance factors such as the creation of bicycle tracks and jumps, crossing points, rubbish, evidence of fire events and a possibility of the spread of *Phytophthora* (dieback). The area is regularly mowed, which is helping in the suppression of *Watsonia* (*Watsonia bulbifera*), but is also contributing to the lack of natural regeneration of the native vegetation species beyond the areas of overstorey cover.

There are also significant amounts of litter and rubbish generally throughout the area.

- Encourage the local government authority to provide recreational facilities, such as picnic tables and rubbish bins, to enhance the recreational and aesthetic values of the area.
- Develop a foreshore management plan to manage access, and determine locations for facilities and specific areas for revegetation and weed control.
- Construct designated cross-country bicycle track(s), and preclude the use of the existing, or the development of new and unauthorised, BMX tracks.
- Fill any holes with the spoil used to create jumps by BMX users quickly to discourage this behaviour.
- Work to involve the community in the development of the facilities, and the revegetation of the area through the formation of a waterway protection group.
- Establish the cause of death of many trees in the area and, if found to be *Phytophthora*, ensure revegetation activities utilise species resistant to the fungal disease. Contact AGWEST and the Department of Conservation and Land Management for advice.
- Liaise with the Fire & Emergency Services Authority of WA and local government authority to establish fire control procedures, ensuring that access for firefighting is maintained.

Blackadder – Site 4: Map 1-2 (Section B) Stratton Reserve

Length of section (m): 50 m
Recorder's name: B Waining and N Siemon
Date surveyed: 10/6/99
Nearest road access: Farrall Road or Likely Place
Lot number(s): 14, 12356

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity
Red	Yellow	Yellow	Yellow
Poor	Moderate	Moderate	Moderate
2	4	4	4

Stream Condition
Yellow
Moderate
14



Description

Bank stability: The depth of this section of Blackadder Creek (Site 4, Section B) channel varies from 0.15 m up to 1 m due to erosion and scouring. The main channel width ranges from 0.75 m to 1.5 m and bank slopes grade from 20° to greater than 60°. There are significant levels of erosion and sedimentation, with 20-50% of the section affected. There are isolated areas of slumping, especially associated with undercutting of the bank on stream bends. There are points of deep scour and associated collapse of the substrate.

Vegetation: This area retains moderately healthy remnant vegetation, which is indicative of the plant community that dominated this area prior to development. The overstorey is relatively sparse, covering less than 20% of the section. There are two overstorey species present, with the dominant species being *Corymbia calophylla* (Marri) and infrequent occurrences of *Nuytsia floribunda* (Christmas Tree). There is a patchy distribution of the middlestorey species (20 – 80%). This community comprises predominantly *Xanthorrhoea preissii* (Grass Tree), with some occurrences of *Macrozamia reidleyi* (Zamia) and *Allocasuarina humilis* (Dwarf Sheoak). The understorey covers between 20-80% of the section, and is moderately diverse. Characteristic species include *Dryandra nivea* (Couch Honeypot), *Drosera* sp. (Sundews) and diverse sedges including *Restio* sp., *Lepidosperma angustatum* and *Mesomelaena* spp. There is an occasional occurrence of annual grasses and weeds within this section, comprising approximately 10% of the total understorey species.

Stream cover: There is occasional stream cover provided by fringing native vegetation, and also by the exotic species growing on the banks of the stream channel. Within the stream there are occasional areas of leaf litter and detritus, and a few occurrences of vegetation providing cover. There are no rocks or branches in this section of the stream.

Recommended Strategies

- Liaise with Main Roads WA, the local government authority and the Water and Rivers Commission to investigate loading of stormwater from adjacent subdivisions and determine whether it is possible to install riffles and instream structures to encourage sedimentation and restoration of the channel.
- Install fencing to prevent access to remnant vegetation areas and rehabilitation sites.
- Investigate opportunities for use of soft bank stabilisation works, such as hemp matting and other soft engineering procedures immediately upstream of power bends (Appendix 4).

- Focus weed control on hand weeding annual grasses and any isolated broadleaf weeds prior to flowering to reduce their spread.
- Designate weed control access routes through the remnant vegetation to minimise unnecessary damage to the native vegetation.
- Undertake appropriate weed control measures, with consideration of the impact on bank stability (Appendix 2).
- Encourage the local government authority to provide fencing to prevent random access to the site and subsequent trampling of vegetation, and to exclude mowers.
- Use the fence as the spray line for grass selective herbicides to ensure a buffer is created.
- Rehabilitate the area using species identified in Appendix 3.
- Liaise with the Fire & Emergency Services Authority of WA and the local government authority to prepare a fire management plan for the entire reserve.

- Retain instream cover components such as rocks and branches, ensuring these features do not interrupt water flow or cause further erosion of the main channel.
- Remove weed species which are fringing the stream, and replace with appropriate native species of rushes, sedges and shrubs (Appendix 3).
- Install rocky riffle structures to slow water flow and enable the incised channel sections to rebuild. These structures will provide some instream cover.



Habitat diversity: There is no permanent water in this waterway. Depths vary from <0.1 cm to >1 m in areas of localised erosion and scouring. The water is slightly discoloured with a milky appearance, probably the result of the presence of suspended clays. There are a variety of vegetation types providing some habitat diversity and protected basking sites for reptiles and invertebrates. The variation in depth of the stream, with the associated creation of meanders, pools and cascades, provides a greater diversity of habitat for the aquatic organisms.

Other issues. The residential nature of the surrounding land use contributes greatly to the disturbance of this area. Multiple crossing points and the loss of native fringing vegetation have created avenues for weed invasion of the site. The presence of fire damage to the remaining vegetation is indicative of another disturbance pressure on the remnant plant community. The nature of the use of the area means that there is a good chance of further damage through indiscriminate access and trampling of the regenerating understorey, middle- and overstorey species.

- Stabilise the banks and channel of the creek with soft engineering works (Appendix 4) to retain the present levels of habitat diversity, and augment to allow the establishment of native fringing vegetation.
- Assist the natural regeneration process by installing middlestorey and overstorey species to provide a wider habitat range, and to protect the vegetation from trampling.
- Retain current instream habitat occurrences of rocks, branches and leaf litter.

- Develop a management plan which includes provision for designated crossing points and a network of pathways around remnant vegetation.
- Establish a fire management plan in consultation with the Fire & Emergency Services Authority of WA .
- Encourage the local government authority to provide rubbish bins and picnic tables to enhance the recreational value of this area.
- Protect areas of native vegetation regeneration through improved mowing procedures, and encourage the local government authority to establish fencing to define the lawn area separate to the foreshore.
- Provide Water and Rivers Commission "Caring for Waterways" pamphlets to local residents to increase awareness about protecting the riparian area.



Blackadder – Site 4: Maps 1-3 (Section C) Stratton Reserve

Length of section (m): 940 m
Recorder's name: B Waining and N Siemon
Date surveyed: 10/6/99
Nearest road access: Farrall Road and Myles Road
Lot number(s): 14, 12356

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Black	Red	Red
Poor	Moderate	Very Poor	Poor	Poor
2	2	0	2	6

Description

Bank stability: This section of the Blackadder Creek (Site 4, Section C) channel is highly variable in width and depth. The channel varies between widely separated braided channels and a narrow incised single channel. Depths range from 0.05 m to 0.50 m, and the bank slope ranges from 50 to >60°. Erosion along the section is significant, with up to 50% of the length exhibiting erosion and slumping features. Sedimentation is localised within 5-20% of the section.

There are areas of localised collapse of the sediment, which has resulted in the creation of vertical tunnels up to 1.5 m deep.

Vegetation: The vegetation of this section of the stream is highly disturbed. There is a sparse representation of native overstorey and middlestorey species, however these are set back from the main channel. There occasional overstorey is dominated by *Corymbia calophylla* (Marri) with a few

Recommended Strategies

- Liaise with the Water and Rivers Commission to investigate the hydrology of the catchment to determine water control options to enable the bed to cope with greater water volumes passing through these channels.
- Work with the local government authority to construct riffles within incising channels to control erosion.
- Address problems of bank instability associated with the duplex soils, with the aid of soft engineering solutions (Appendix 4).
- Remove weed species from floodplain and braided channels and replace with appropriate native rushes and sedges recommended in Appendix 3.
- Liaise with the Water and Rivers Commission to investigate strategies to deal with the formation of vertical erosion tunnels to minimise the risk to recreational users.
- Brushcut/mow weed species. Peg any remnant native plants to ensure there is no unintentional loss of native vegetation.
- Ensure that weed control activities do not result in loss of root material so as not to further destabilise the stream banks.



occurrences of *Eucalyptus marginata* (Jarrah) and *Melaleuca raphiophylla* (Swamp Paperbark). *Xanthorrhoea preissii* (Grass Tree), *Acacia pulchella* (Prickly Moses) and some *Hypocalymma angustifolium* (White Myrtle) comprise the middlestorey. There is a near continuous understorey cover, 95% of which is made up of weed species such as African Lovegrass (*Eragrostis curvula*), *Paspalum* sp., *Watsonia* (*Watsonia bulbifera*) and Wild Radish (*Raphanus raphanistrum*). Four species of *Mesomelaena* were the most common native understorey species present.

Stream Cover: There is an absence of stream cover offered by the native vegetation of the section, however exotic grasses create abundant stream cover. This vegetation is also the only instream cover offered within the section.

Habitat diversity: The dominance of exotic grasses within the riparian zone decreases the habitat value of the area, due to the lack of variety of vegetation types and the absence of protected basking sites. The grasses do, however, provide habitat for frogs. The existence of some meanders and pools provides some habitat for aquatic organisms.

- Focus weed control on the annual grass, African Lovegrass, and *Watsonia* to reduce the fire hazard using techniques outlined in Appendix 2.
- Focus revegetation works on re-establishing overstorey in dense localised nodes using species suggested in Appendix 3.
- Construct fencing and guided woodchip walkways to protect revegetated areas from trampling and mower access.
- Encourage local community involvement in weed control in the area, encouraging them to focus on hand weeding broadleaf weeds such as wild radish.

- Revegetate the area to provide permanent areas of instream shading.
- Retain instream features, such as rocks and branches.
- Replace weed species with appropriate native wetland species within the braided channel and seasonally wet zones.

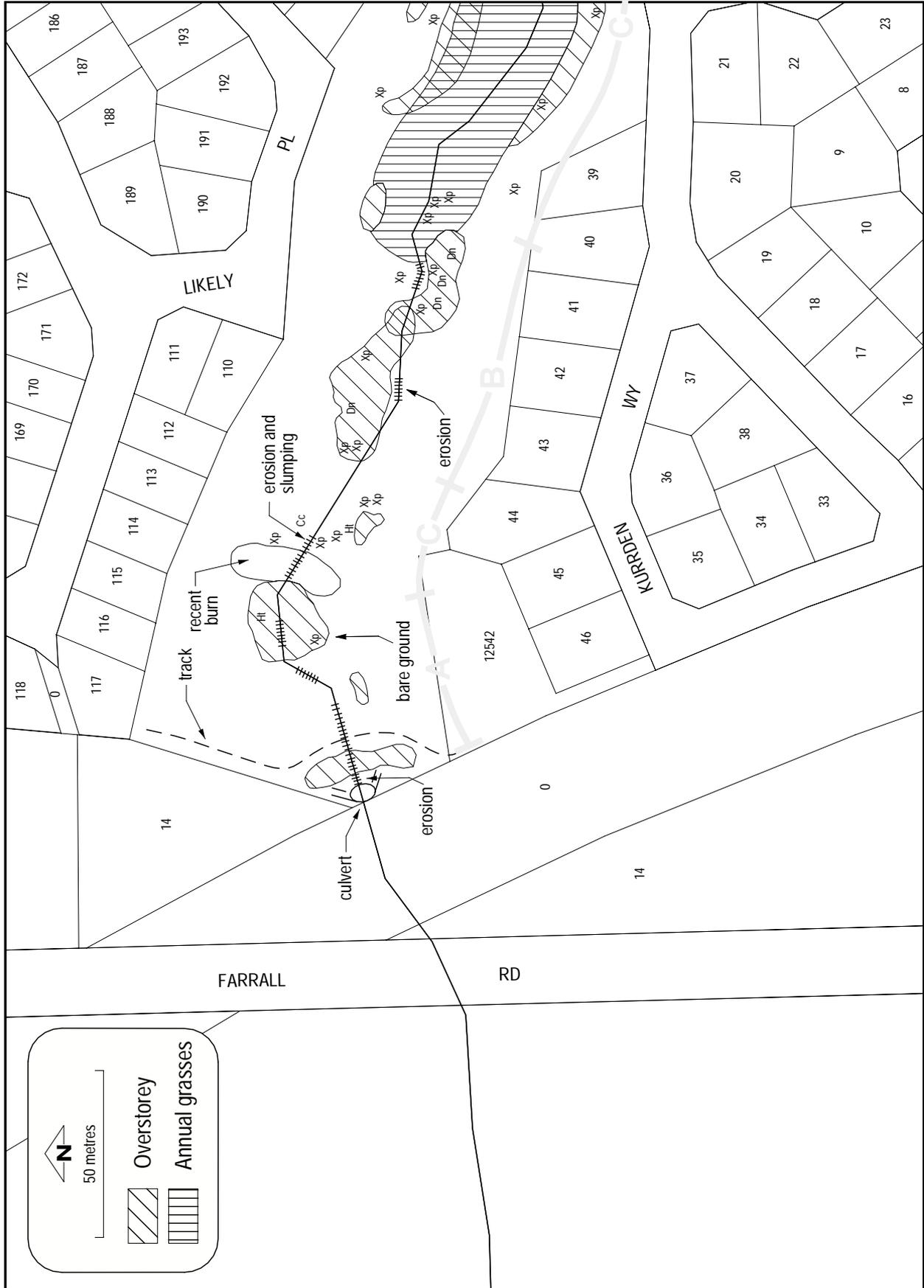
- Ensure that vegetation debris is retained onsite and placed close to the waterway. This will not create difficulties for the mowing team, but will provide a boundary to keep mechanical mowers away from any remnant vegetation.



Other issues. The presence of a myriad of BMX tracks and stream crossings within this area creates conditions which are likely to further exacerbate stream degradation. There is also an appreciable amount of rubbish within the stream, which may be sourced from stormwater inflow or from direct rubbish disposal by the users of the parkland. There are also signs of disease within the population of *Eucalyptus marginata* (Jarrah).

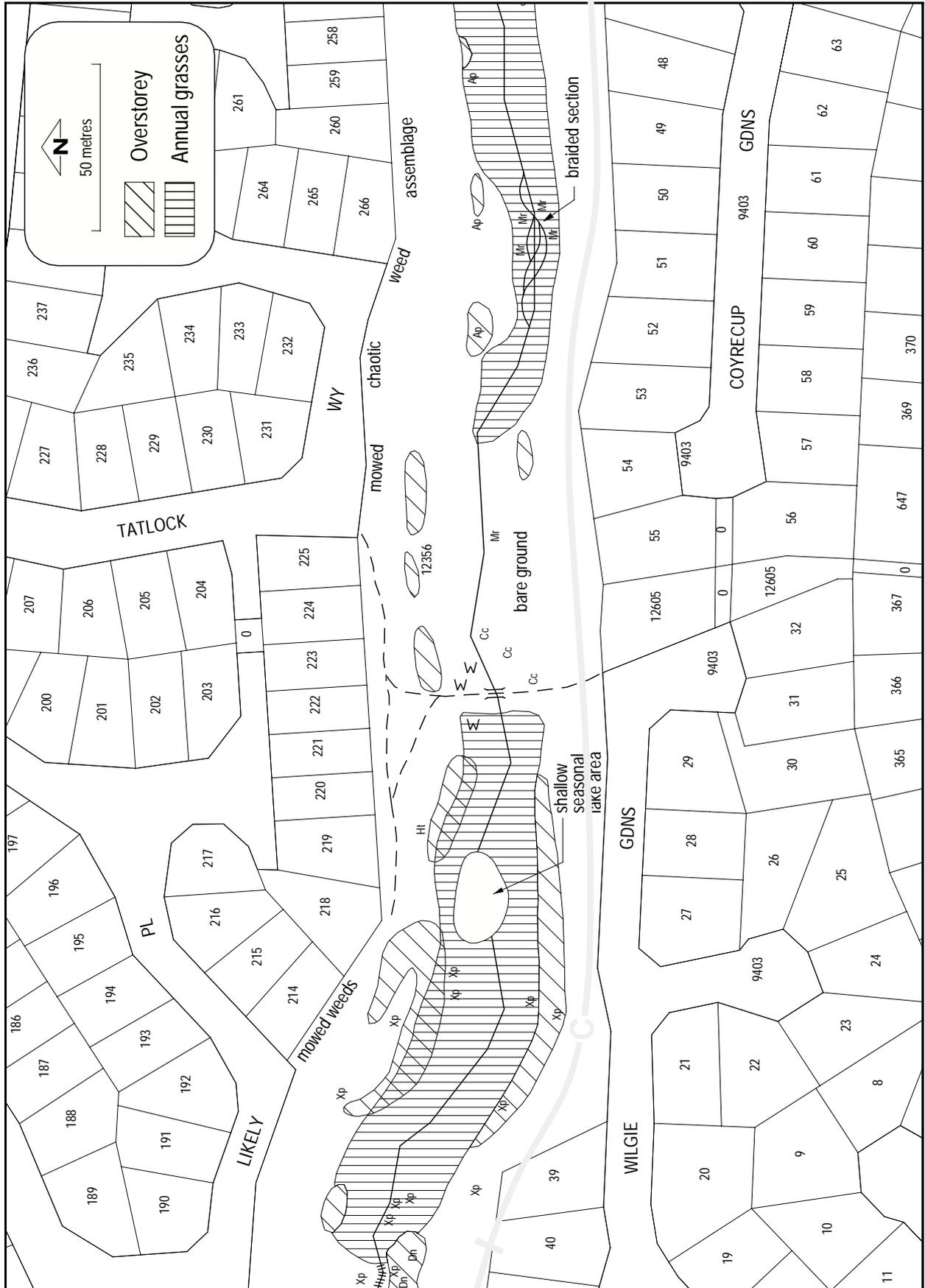
- Fence off or block areas of BMX track construction/use, especially those areas close to the stream banks.
- Encourage the local government authority to construct an appropriate style of track for use by the BMX riders that is directed away from the creek foreshore.
- Ask the local government authority to provide rubbish bins in strategic places around the reserve.
- Liaise with Main Roads WA and the local government authority to address the influx of rubbish and road runoff pollution from the stormwater system, with the use of solutions such as gross pollutant traps and off-line filters.
- Investigate the cause of disease within the Jarrah population, and address with appropriate methods of control. Contact AGWEST or the Department of Conservation and Land Management for advice.
- Encourage the local government authority to create designated crossing points using raised open boardwalks, ensuring minimal disruption to peak flows and install guide ways and signs to direct people along pathways.





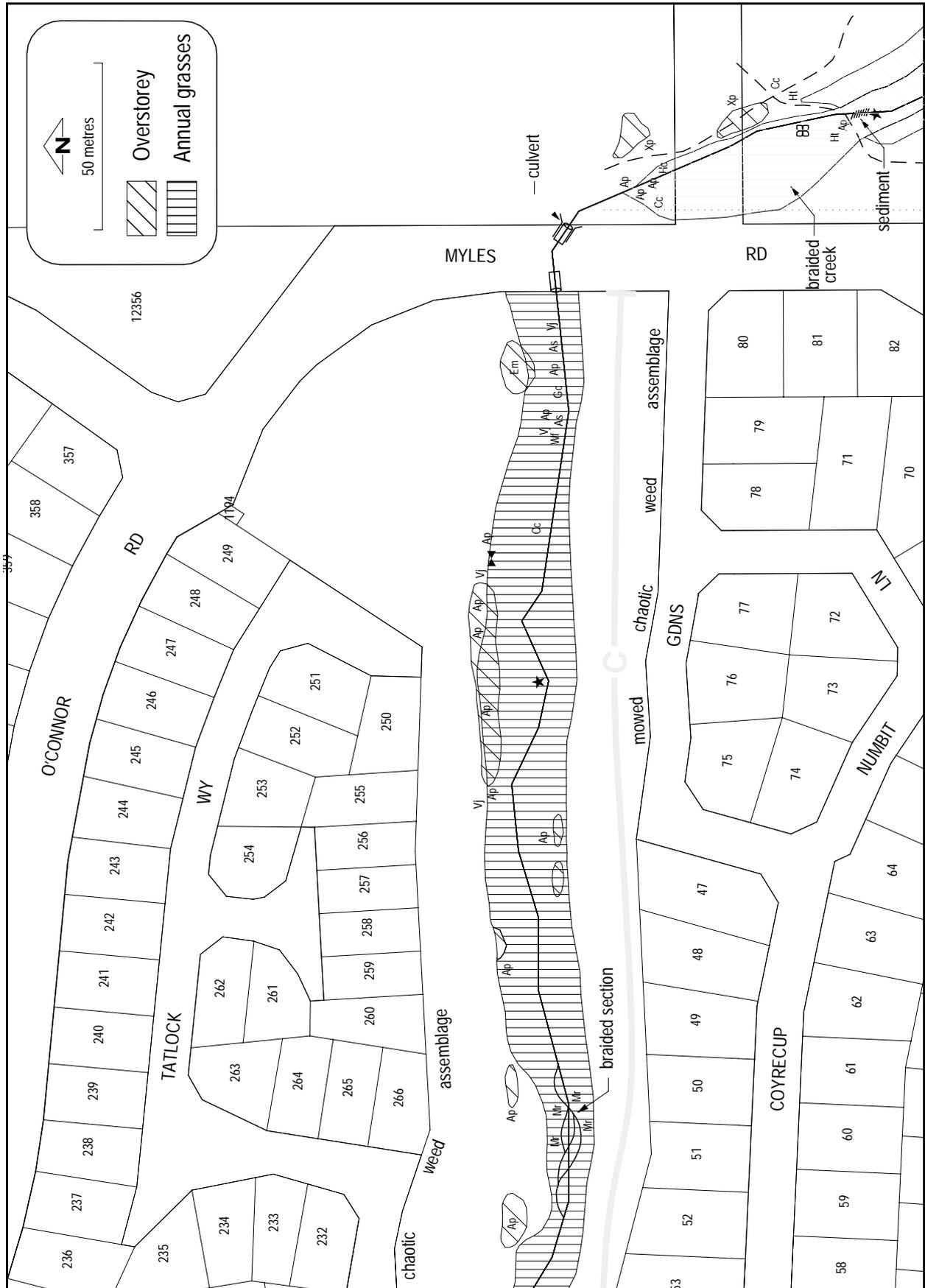
Stratton Reserve Site 4 - Map 1





Stratton Reserve Site 4 - Map 2





Stratton Reserve Site 4 - Map 3



4.5 Talbot Road Reserve

Results Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder – Site 5: Map 1 Talbot Road Reserve

Length of section (m): 430 m
Recorder's name: B Waining and N Siemon
Date surveyed: 1/6/99
Nearest road access: Myles Road
Lot number(s): 11314

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Yellow	Yellow	Yellow	Yellow
Poor	Moderate	Moderate	Moderate	Moderate
2	4	4	4	14

Description

Bank stability: The main channel of this stream section along Talbot Road Reserve (Site 5) varies in width from 1 m up to 5 m across the braided sections. The depth is also variable ranging from 0.2 m to 0.6 m along its length. The braided section has a number of slow flowing, shallow subsidiary channels. This section of Blackadder Creek is significantly eroded, for up to 50% of the section. Where the stream flows along a single, well-defined channel, the banks are steep, (greater than 45°), and exhibit areas of erosion and slumping. The erosion is exacerbated in the areas of stream crossings and in areas of recent fires. There are some localised occurrences of slumping along the section, mostly confined to stream bends. Sedimentation is also occurring in localised zones (5-20%), creating the braided areas of the stream. Sediment has been deposited in the entrance to culverts, where the rate of stream flow decreases.

Vegetation: The vegetation in this section is reasonably healthy, but contains areas of moderate disturbance. The structure of the vegetation community is consistent with dry open woodlands of the ridge hill shelf complex. The overstorey is represented in a patchy distribution, with approximately 30% of the section containing

Recommended Strategies

- Encourage the local government authority to stabilise designated crossing points using box culverts or a riffle crossing, where defined tracks are required for access, with design parameters which allow the maintenance of stream function.
- Establish native vegetation including rushes and sedges along the banks of the stream to reduce the continuing erosion of the banks.
- Establish instream vegetation in the southeastern end of the stream, to assist in reducing erosion through slowing the rate of water flow.
- Liaise with the Water and Rivers Commission and the local government authority to identify upstream sources of sediment which results in coarse sediments being moved through the channel. Develop strategies to trap the sediment further upstream.
- Work to protect the riparian zone from fire to reduce surface runoff and sediment load.
- Create a native and weed species field herbarium, to ensure correct identification during weed removal works.
- Hand weed and bag Fleabane prior to the end of flowering to reduce their spread.



overstorey cover. The dominant overstorey species is *Corymbia calophylla* (Marri) with an isolated occurrence of two introduced species of Eucalypts. The proportion of middlestorey cover is rated as patchy (20-80%), which is indicative of the nature of the open woodland vegetation structure combined with disruption events, such as fire and vegetation community fragmentation. The dominant middlestorey species include *Xanthorrhoea preissii* (Grasstree), *Acacia pulchella* (Prickly Moses), *Hakea undulata* (Wavy Leaved Hakea), *H. trifurcata* (Two-Leaf Hakea) and *Calothamnus quadrifidus*. Introduced species such as the introduced Bulrush (*Typha orientalis*) and the exotic rush *Juncus microcephalus* exist within the stream channel, especially within the braided stream sections. The understorey of the section is continuous, with >80% cover. The dominant native understorey species include *Dryandra nivea* (Couch Honeypot), *Borya* sp., *Hibbertia* sp. (Yellow Buttercups), *Hypolaena exsulca*, *Kennedia prostrata* (Running Postman) and *Drosera microphylla*. Adjacent to the main channel *Lepidosperma angustatum* is the dominant native sedge, with occasional *Juncus pallidus* (Pale Rush) and *Lepidosperma effusum* (Spreading Sword Sedge). The understorey has frequent stands of a number of perennial and annual weed species. These include an abundance of grasses such as *Paspalum* sp., African Lovegrass (*Eragrostis curvula*) and Kikuyu (*Pennisetum clandestinum*). Other weed species include *Watsonia* (*Watsonia bulbifera*), Dock (*Rumex* spp.) and Bushy Starwort (*Aster subulatus*).

Stream Cover: The patchy nature of the vegetation means that only occasional stream cover is provided. There is a predominance of weed species, especially annual grasses and introduced sedges, providing instream cover within the braided sections of the stream. There are some branches and leaf litter providing occasional cover within the stream.

- Implement control measures for instream weed species at the northwestern end of the section. Care should be taken to ensure no bank destabilisation occurs during any weed control activities (Appendix 2).
- Encourage the local government authority to install guide ways with bollards or woodchip pathways for pedestrian access to the reserve, to minimise the trampling of vegetation.
- Develop a management plan including the maintenance and placement of firebreaks/access tracks, overall weed control and conservation techniques to minimise the fragmentation and loss of the native vegetation and inform the local fire brigade of any changes to access.
- Further encourage, develop and maintain communication links between the local government authority, government agencies, the Catchment Group and Friends of Talbot Brook to ensure sufficient support is given to Friends of Talbot Brook in their endeavours to protect and enhance this vegetation type.
- Encourage natural regeneration as much as practicable to protect the gene pool of the vegetation within this complex.

- Undertake instream weed control measures using the suggestions in Appendix 2.
- Encourage regeneration of native fringing vegetation along the banks of the stream to increase bank stability, by implementing localised weed control.



Habitat diversity: The varieties of aquatic and terrestrial vegetation provide a range of habitats for birds, invertebrates and reptiles. There is sufficient cover and habitat variety within the stream for frogs and aquatic organisms, such as amphipods. It is unlikely that there is permanent water.

Other issues. The area contains a number of vehicle access and walking tracks, which may serve as firebreaks, but also fragment the vegetation allowing for further weed invasion and physical disturbance such as erosion. Crossing points along the stream section are obvious sites of erosion and sources of sediment. The soil/sand dump within the area may be a source of weed seeds. The disturbance associated with antisocial activities, such as dumping rubbish and the writing of graffiti, detracts from the nature of the 'bushland' setting. The source of the fire events is unknown, but may either be the result of vandalism or from prescribed burns.

- Retain instream features, such as logs, branches and rocks for the provision of aquatic habitats.

- Monitor regeneration of the native vegetation: if lacking, supplement with planting to maintain the diversity of vegetation and terrestrial habitat values.

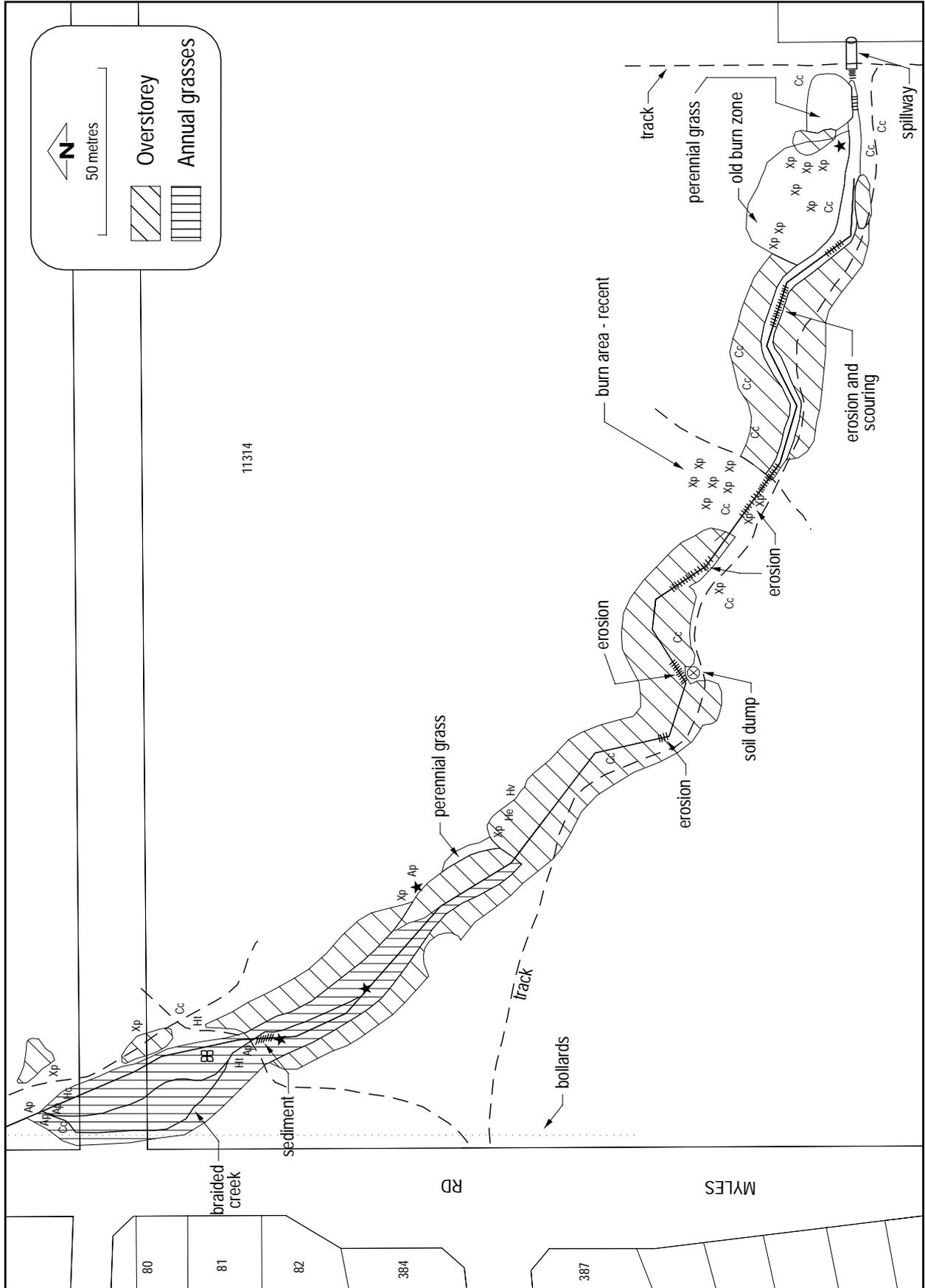
- Liaise with the local government authority, Fire & Emergency Services Authority of WA and local residents to create and implement a management plan. Considerations should include the management of fire events, firebreaks, community-access pathways, rubbish removal and weed suppression.

- Formalise and stabilise stream-crossing points.

- Liaise with the Department of Environmental Protection, the Water and Rivers Commission and the local government authority to investigate the potential impact of higher water levels, nutrient and sediment loads on the health of this area.

- Remove existing foreign soil and rubbish, and develop procedures to help prevent dumping such as increasing resident's awareness of the detrimental impacts of such acts on the riparian zone using WRC pamphlets.





Talbot Road Reserve Site 5 - Map 1





4.6 Woodbridge Creek

Swan Road

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder – Site 6: Map 1 Woodbridge Creek

Length of section (m): 410 m
Recorder's name: B Waining and N Siemon
Date surveyed: 11/6/99
Nearest road access: Swan Road
Lot number(s): 21, 8, 4, 5, and 6

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Yellow	Red	Red	Red	Red
Moderate	Poor	Poor	Poor	Poor
4	2	2	2	10

Description

Bank stability: The stream banks along this section of Woodbridge Creek (Site 6, Section A) vary from very steep sided channels, up to 1 m in width and depth, to wide braided channels up to 18 m wide and less than 0.2 m deep. There are significant levels of erosion, sedimentation and slumping affecting between 20 – 50% of the stream section. There are artificial stabilisation structures in the form of concrete aprons at the outflow of piped culverts, and some dry rock retaining walls. At least 50 m of the stream is wholly contained within a pipe, as it passes under two elevated pathways (former railway line bund). Further erosion of the riparian zone occurs towards the northwestern end of the site near Swan Road, where an open U-drain has been excavated. At the top end of the section, the stream flows down through a rocky area, where the channel is defined by pools and outcropping rocks.

Vegetation: A sparse overstorey characterises this site. The species composition of the overstorey includes occasional occurrences of *Corymbia calophylla* (Marri) and an infrequent occurrence of *Eucalyptus rudis* (Flooded Gum). This overstorey occurs as isolated stands of trees and individuals along the banks of the stream. The middlestorey is also sparse, providing <20% cover of predominantly

Recommended Strategies

- Encourage the local government authority and Main Roads WA to improve open rock spillways downstream of outflows to reduce scouring potential and slow water movement down the hillside by creating a series of riffles approximately 15 m apart to slow water movement.
- Vegetate the open U-drain at the western end of the section with native plant species (Appendix 3).

- Develop a network of tracks through the bushland to double as fire access tracks and walk trails to prevent trampling of any establishing plants.
- Undertake weed eradication and control measures in accordance with the techniques suggested in Appendix 2.



native species (80% of the total) such as *Acacia pulchella* (Prickly Moses), *Xanthorrhoea preissii* (Grass Tree), *Dryandra sessilis* (Parrot Bush), and *Calothamnus sanguineus* (Pindak). There are also occasional occurrences of *Grevillea endlicheriana*, *Ptilotus* and *Hakea trifurcata* (Two-Leaf Hakea). The understorey vegetation of this section of stream is continuous, offering >80% cover. This is made up of only 15% native species, which include frequent occurrences of *Kennedia prostrata* (Running Postman), *Mesomelaena* spp., *Lepidosperma scabrum* and *Themeda australis* (Kangaroo Grass). Dominant weed species in the middlestorey include frequent Castor Oil plants (*Ricinus communis*) and abundant Watsonia (*Watsonia bulbifera*) and Fountain Grass (*Pennisetum setaceum*). Also occurring in the understorey are frequent occurrences of Whiteflower Fumitory (*Fumaria capreolata*), Deadly Nightshade (*Solanum nigrum*) and Lupins (*Lupinus* sp.).

Stream cover: The sparse nature of the overstorey and middlestorey gives only occasional patches of stream cover. The most abundant form of stream cover is provided by the exotic weed species such as Watsonia and Fountain Grass. There is some instream cover consisting of leaf litter, rocks and branches.

Habitat diversity: It is unlikely that the stream contains permanent water. Some pooling occurs amongst the rocks at the eastern end of the section, with the remainder of the stream typified by a shallow flow beneath a Watsonia infestation. Parrots were observed in the area and another sign of wildlife was the presence of kangaroo scats. A variety of vegetation types and protected basking sites for terrestrial invertebrates and reptiles are present. Burrowing frogs are also likely to occur.

- Selectively apply herbicide in 2 m diameter circles within 15 m of the seasonal stream with a focus on re-establishing overstorey and middlestorey species to shade out the invaders.
- Extend the current distribution and diversity of upper, middle and understorey native species.
- Selectively spray Fountain Grass with Fusilade®, ensuring that the native Kangaroo Grass cannot be affected. This will reduce the fire hazard.
- Encourage local residents to become involved in the active management of this area.
- Control Castor Oil and Deadly Nightshade through manual removal and painting of any Castor Oil stumps with a systemic herbicide. Ensure this occurs prior to flowering and seed production.

- Retain instream cover features, such as rocks, branches and leaf litter.
- Replace exotic, instream vegetation with native rushes and sedges.
- Enhance existing stream cover offered by the fringing vegetation, through appropriate revegetation works (Appendix 3).

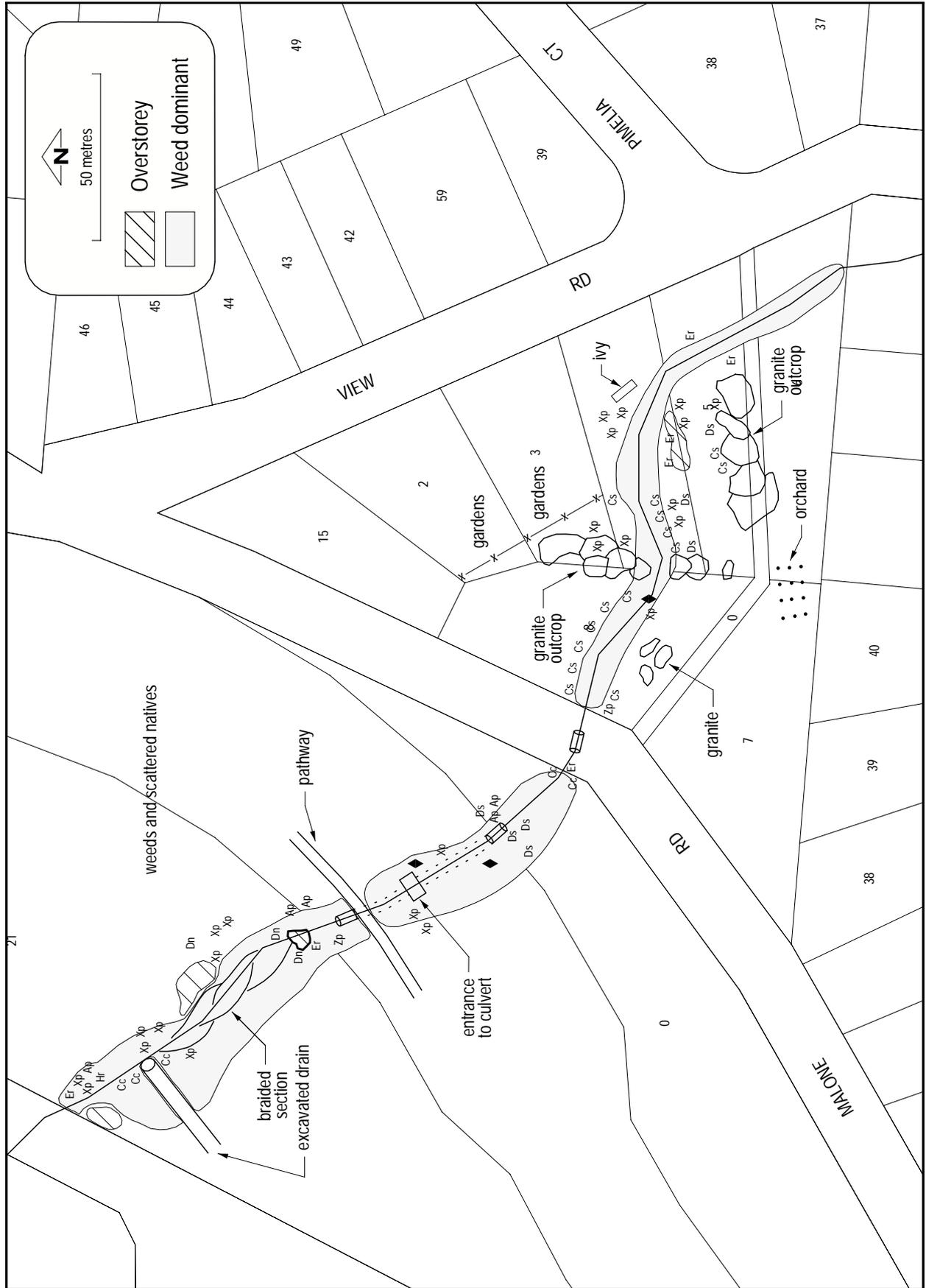
- Revegetate with appropriate native species, to enhance the habitat value of the area by establishing overstorey and middlestorey species in dense clusters.
- Retain old trees, branches and existing habitat sites.
- Replace existing exotic streamside vegetation with indigenous vegetation.



Other issues: The surrounding residential land use places extra pressures upon the stream, with the possibilities of extra nutrient loads and garden escapees adding to the degradation of the stream section. The presence of the elevated pathway to 6 m with a subterranean piped component serves to fragment the area, and further acts as a barrier to the migration of both terrestrial and aquatic organisms. The provision of this pathway does, however, increase the recreational value of the area. Unconsolidated granite rubble has been used in the bund walls, which makes traversing this section somewhat hazardous due to uncertain footing.

- Inform residents of the problems associated with garden species invading the riparian zone. Provide information such as the Water and Rivers Commission WN15 Water Note "Weeds in Waterways" pamphlet.
- Encourage the local government authority to provide rubbish bins along the pathway.
- Advise the landowner of concerns with runoff from the orchard. Work with the landowner to encourage best management practices.
- Ensure that anyone implementing weed control works is made aware of the hazardous working conditions, and that strategies to minimise the risk to workers are developed prior to commencement of works.





Woodbridge Creek - Swan Road Site 6 - Map 1





4.7 Woodbridge Creek

Ward Avenue

Results

Foreshore Condition Survey

A Study undertaken on behalf of
Water and Rivers Commission and the Natural Heritage Trust



Blackadder – Site 7: Map 1 (Section A) Woodbridge Creek

Length of section (m): 120 m
Recorder's name: N Siemon
Date surveyed: 12/6/99
Nearest road access: Ward Ave
Lot number(s): 400, 132, 126, 125, 122, 121, 107, 106, 37, 104 and 103

Summary of river health:

Bank Stability	Foreshore Vegetation	Stream Cover	Habitat Diversity	Stream Condition
Red	Red	Yellow	Red	Red
Poor	Poor	Moderate	Poor	Poor
2	2	4	2	10

Description

Bank stability: Two tributaries form part of the upper reaches of the Blackadder catchment. These collect water from the stormwater systems entering the stream zone through culverts with aprons and as surface runoff from the surrounding landform. The left tributary is quite eroded and is less than 1 m wide with very steep banks (greater than 60%). The lower reaches, however, are at a significantly lower gradient, after the stream passes a crossover point. Conversely, the right tributary has slight bank gradients with a poorly defined channel. The left tributary has severe erosion (>50%) with significant areas of slumping. There is minimal sedimentation in the left tributary. The right bank has localised areas of erosion, and minimal slumping and sedimentation.

Vegetation: The vegetation composition is considerably different along each tributary. Each is described separately below.

Left tributary: The overstorey and middlestorey are patchy while the understorey is continuous. The overstorey is dominated by *Corymbia calophylla* (Marri) with some *Nuytsia floribunda* (Christmas Tree) present. *Brachychiton* sp. (Kurrajong), a garden escapee, is present in the overstorey. The middlestorey comprises all natives, with the dominant

Recommended Strategies

- Liaise with the local government authority and Main Roads WA to investigate the possibility of installing a granite riffle structure beneath the outfall on the left tributary to slow water movement from the roads.
- Define and control access tracks using woodchip guide ways and bollards to prevent indiscriminate trampling of the waterway forming the right tributary.
- Contact the Water and Rivers Commission and liaise with the landholder upslope of the reserve to modify the management of the water to maintain environmental flows. The water is currently prevented from entering the waterway as a result of the creation of a dam.
- Liaise with neighbouring residential properties to encourage appropriate management of gardens and garden waste to prevent further weed invasion using Water and Rivers Commission and AGWEST pamphlets.
- Provide information brochures about the benefits of planting local native plants in gardens, to both reduce water use and encourage native birds and other wildlife.



species being *Acacia pulchella* (Prickly Moses), *Hakea trifurcata* (Two Leaf Hakea) and *Xanthorrhoea preissii* (Grass Tree). *Grevillea* spp., *Calothamnus sanguineus* (Pindak), *Dryandra nivea* (Couch Honeypot) and *D. sessilis* (Parrot Bush) and *Spyridium globulosum* (Basket Bush) are also present. The understorey however, is highly degraded with only 40% being native species. Understorey sedges such as *Mesomelaena* spp. and small shrubs like *Allocasuarina humilis* and the herb *Patersonia occidentalis* (Purple Flag) are present but uncommon in comparison to the annual grasses, *Paspalum* and *Watsonia bulbifera* (Watsonia). Other weed species present include Soursob (*Oxalis pes-caprae*), Whiteflower Fumitory (*Fumaria capreolata*), Bridal Creeper (*Asparagus asparagoides*) and Nasturtium (*Tropaeolum majus*). There is good litter cover.

Right tributary: The overstorey and middlestorey is sparse (<20%) while the understorey is patchy. There are occasional Eucalypts, Wattles and Hakea that have remained following a burn and the understorey retains occasional *Dryandra nivea* (Couch Honeypot) and occasional rushes and sedges.

Stream Cover: The stream cover on the left tributary is almost continuous while there is almost none in the right tributary. Granite boulders, vegetation, branches and other debris provide cover in the left tributary.

Habitat diversity: The dense understorey in the left tributary is dominated by weed species, however there are significant nectar producing plants persisting in the middlestorey. The open canopy provides for birds and other wildlife, and the exposed granite provides basking sites for reptiles. Again, the right tributary has minimal cover and limited habitat diversity as there is an almost complete lack of shelter.

- Focus control on highly invasive species such as Paspalum, Watsonia, Nasturtium and Bridal Creeper to reduce the spread of these weeds through water movement (Appendix 2).
- Discourage prescribed burning or illegal fires in the reserve by increasing surveillance of the area and encourage a neighbourhood watch system.
- Hand weed Soursob and Whiteflower Fumitory prior to flowering to reduce the level of weed infestation.
- Plant rapidly spreading understorey and middlestorey species in the right tributary to restore some vegetation cover using species recommended in Appendix 3. This will reduce weed invasion, provide cover and habitat for fauna and improve bank stability.

- Undertake weed control in localised nodes to minimise loss of stream cover and to protect the banks of the left tributary from erosion.
- Encourage regeneration and, if necessary, plant reinforcement tubestock to provide increased cover and habitat.

- Focus on weed control and assisting natural regeneration of the remnant bushland occurring in both tributaries.
- Retain vegetative debris and other sources of habitat.
- Manage fire frequency by controlling the level of flammable exotic species in the reserve.



Other issues: The boundary between the reserve and private property is currently not defined which makes it difficult to manage. Encroachment of residential gardens and disposal of garden waste are resulting in garden plants establishing along the foreshore. Further, many of the species encouraged in this area can become highly invasive weeds that are difficult to control.

There are informal tracks, which provide access in the event of fire, however these need to be rationalised more effectively to prevent indiscriminate movement of people through the area.

- Name the reserve to improve its identity and therefore encourage ownership of the area by local residents.
- Establish signage near any works to inform local residents and visitors of any rehabilitation activities.
- Formalise access using bollards and woodchip pathways to encourage people to keep to paths to encourage survival of natural regeneration.
- Survey property boundaries and clearly demarcate using pathways or bollards/fencing to prevent encroachment of domestic gardens into the reserve.





5. General recommendations

A number of general recommendations apply to all of the sites. They are listed under the core activities which will be required for groups to successfully develop and implement rehabilitation strategies.

5.1 Planning

- Determine cadastral boundaries and landowner/management to ensure that they support the foreshore assessment process, and are involved in the development and implementation of any remedial strategies.
- Collate as much existing information about the focus waterway and catchment as possible.
- Focus initial foreshore assessment survey work in areas where future rehabilitation projects may be undertaken.
- Extend future foreshore assessment work from previously surveyed areas along the foreshore, eventually mapping all sites. Future surveys may also include re-assessment of earlier surveys to assess changes to the environment.
- Create herbariums of native and weed species to assist group members and other interested parties to distinguish between native and introduced plants present in the rehabilitation zone.
- Ensure that all works are planned well in advance and that a long term strategy has been developed and is amended as new information becomes available.
- Ensure that all agencies with statutory responsibilities such as the relevant local government authority, the Water Corporation, the Water and Rivers Commission and the Swan River Trust are advised of any works within their management areas, to ensure that the works meet legislative requirements.
- Develop information brochures to increase community awareness of the importance of foreshore areas to encourage community involvement in managing their own foreshores and surrounding reserves.
- Develop an information brochure for the landholder to suggest methods of improved land management and encourage rehabilitation of the foreshore area.

- Endeavour to obtain funds from outside sources to assist both the group and any private landholders who are willing to implement rehabilitation activities.

5.2 Site preparation

5.2.1 Weed control

- Ensure weed control activities are undertaken in manageable-sized nodes, reinforcing overstorey species and restoring the middlestorey and understorey species (using species recommended in Appendix 3 of this report) once weeds have been eradicated.
- Tag any native plants present to protect them from weed control activities.
- Hand weed where possible, especially annual weeds and instream weeds.
- Use a qualified herbicide operator if chemical control is undertaken near waterways.
- Always consider the impacts that weed control will have on habitat, particularly for reptiles and small mammals such as bandicoots. Maintain vegetated corridors within which animals can move until sufficient native plants have re-established.
- Ensure that all weeds are removed from the site to limit re-infestation.
- Create buffers around existing clumps of native vegetation to encourage natural regeneration of existing plants, e.g. spray Fusilade® around native rushes to control introduced grasses and enable the clumps of rushes to spread naturally.
- Ensure the impact on bank stability is considered before weed control works are undertaken. Consider the potential for use of erosion control matting as an option for reducing weed re-emergence, supporting revegetation and improving bank stability on steeper gradient banks.



5.2.2 General site preparation

- Encourage landholders throughout the rural and semi-rural catchments to fence off waterways and tributaries and implement a broadscale revegetation program.
- Provide financial support or material assistance to landholders willing to implement rehabilitation activities.
- Define access tracks to weed management areas or where there are planting programs, to minimise disturbance and limit damage to existing vegetation and the substrate.
- Implement intensive weed control activities in manageable-sized nodes where planting will be undertaken.
- Remove flower heads prior to seeding to limit reinforcement of the weed seed bank.
- In broadscale areas proposed for future works, or in high-risk areas of dense weeds with few native plants where complete removal is inappropriate, ensure either flower removal or repeated brushcutting occurs prior to seeding.

5.3 Planting out

- Ensure planted areas within streamlines are artificially stabilised and planted in low-flow conditions to enable sufficient time for establishment, to reduce the chance of plants being washed out during peak flows.
- Plant native species only in areas where weeds have been effectively controlled and managed for a preferred minimum of two seasons.
- Encourage landholders to ensure all strata of vegetation including understorey, middlestorey and overstorey species are, over time, included in revegetation works to reinforce bank stability.
- Plant overstorey species initially in highly exposed regions lacking vegetation, to create a level of cover and protection for future plantings.
- Plant emergent and wetland plants in permanent water between September and March, securing those planted in flowing water with 600 mm steel "U" shaped pegs.

- Plant dryland plants in May to July and seasonally inundated areas in August to September.
- Plant in higher densities than ultimately required to create instant habitat and improve weed exclusion, particularly in the inner urban environments.
- Obtain professional advice about planting densities for each recommended species, to optimise chances of success and re-create a more natural ecosystem.

5.4 Maintenance

- Ensure the works program includes ongoing intensive maintenance of areas where weed control and planting works have previously been undertaken.
- Implement ongoing weed management, prior to commencing site preparation and planting works in new areas.
- Monitor for any natural regeneration on a regular basis, and undertake weed control around any emerging native plant seedlings.
- Assess the effectiveness of any river restoration works or installation of any products such as hemp matting, and modify as required.
- Determine the impact of vandalism, if any, and develop and implement strategies to manage this problem.

5.5 Monitoring

- Continue to use the proforma to assess changes and improvement to foreshore health over time.
- Assess the effectiveness and relative benefits of different management techniques utilised and update the works program accordingly.
- Document the results and learn from experience.
- Monitor the effectiveness of sustaining interest within the project at both the management and implementation level. Develop techniques to support community groups and individuals undertake this work.
- Minimise the potential for burnout by not over-extending limited resources, particularly labour.



6. Common issues

6.1 Ownership and access

It is essential that cadastral boundaries are determined at each site and that the people implementing the foreshore assessment are aware of who owns the land. Permission is required from the landowners, which may be State or local government authorities or private landholders, prior to undertaking any survey work. Gaining access to private property may prove to be difficult, while permission to enter most government managed lands is generally readily available.

Often property boundaries are fenced and landowners may be suspicious that any information collected during surveys along their foreshore will eventually be used against them. It is important that people implementing the survey are clear about the process and the reasons for the survey and approach the relevant landholders. Where landholder agreement cannot be readily obtained, it is important not to waste time and resources in excessive negotiations. Locate landholders that are interested in improving the health of their foreshore and assist them to enhance their land. Healthy foreshores can increase property values and, through discussion within communities, can ultimately result in peer pressure on others to work on protecting their waterways.

There are often conflicting perceptions about the requirements for managing riparian zones and determining what is a healthy foreshore. Many landholders consider lawn to the high water mark with occasional trees to be healthy and providing sufficient habitat value. For example, large numbers of birds, e.g. black ducks, frequently using the foreshore, may be construed as representing the existence of adequate habitat. It is very difficult to articulate foreshore management issues until a common perception of a stable, intact waterway is developed between the group doing the work and the wider community.

A further conflict can arise when landholders consider that their current foreshore management program is adequate. For example, as well maintained lawns reduce the fire hazard, limit uncontrolled weed growth and keep the stream bed free of debris, it is claimed by these private landholders to be appropriate management

technique to protect the waterway. Frequently this management regime is in contrast to management practices in neighbouring foreshore reserves that are managed by State and local government authorities. Extensive weeds, limited access and considerable fire risk are often features of these reserves. As a result it is perceived that there is little management effort. In situations where State and local government authorities are not demonstrating best management practice, it is difficult to discourage landholders from maintaining their own inappropriate management program.

Both State and local government and the wider community need to implement improved foreshore management.

6.2 Developing management and rehabilitation plans

Management plans are an important tool used to strike a balance between the multiple use demands of foreshore areas and the protection of flora, fauna and water quality. These plans should have clearly defined aims, objectives and visions as ultimately, the use of the land will determine how, where and if, rehabilitation plans should be developed and implemented.

For example, if a grassed area occurs adjacent to a waterway which is a high-use recreation zone, then extensive revegetation works are likely to impinge on the purpose of the land and therefore may be inappropriate. A compromise position may need to be negotiated such as establishing a narrow buffer zone immediately along the stream banks, with well defined access points for viewing the waterway. The buffer zone needs to have a clearly defined boundary between any lawn areas and native vegetation to avoid trampling of native seedlings.

All issues associated with development, conservation and management of the waterway and associated land need to be addressed prior to the development of any plans. Community needs and visions for particular areas need to be canvassed to ensure that the plan reflects community attitudes, which will affect whether or not plans are implemented.



Following management planning, the next stage is to develop a rehabilitation plan for the whole waterway. It is essential to extend the assessment of foreshore condition to the full length of the waterway prior to any works, to gain a complete understanding of current health. This may be limited by access issues, however the more complete the understanding of the waterway and their tributaries, the better.

An ecosystem approach to management will ensure that appropriate rehabilitation plans are developed to minimise the impact of any activities. For example, complete eradication of dense weeds along the immediate foreshore results in acute loss of habitat and may destabilise foreshore banks, increasing the danger of severe erosion and bank collapse. It is necessary to undertake weed control in small, manageable-sized nodes to ensure that eradicated weeds are immediately replaced with deep-rooted native species, to minimise the impact on bank stability and protect native fauna.

Developing detailed management and rehabilitation plans and having a clear understanding of the works required over the long term, enables the development of detailed budgets, allocation of funding or the raising of funds to ensure the completion of any project.

6.3 Long term management

The rehabilitation planning process should include a maintenance schedule for existing works as well as future projects. The importance of continued maintenance on current project sites prior to beginning any new works can not be emphasised enough. Long term ongoing management must be scheduled to ensure the success of any rehabilitation works. Weed control needs to be continued indefinitely as there will always be the threat of reinfestation.

Undertaking works on Crown land and reserves requires ongoing community commitment and assistance from State and local government agencies with firebreak maintenance and provision of qualified herbicide operators to undertake weed control.

Private landowners must be strongly committed to any project undertaken on their property to ensure ongoing maintenance. Any change in ownership may require negotiation with the new owners to determine if management will continue.

Once a rehabilitation project has commenced on a property it will require a significant amount of time to implement weed control, planting and maintenance. Setting manageable areas for work and achievable targets is the most effective way to ensure success. Over-extension of limited resources frequently causes the areas to degrade further, resulting in a situation that is worse than prior to any rehabilitation effort.

There is nothing more disillusioning than having put considerable effort into developing and implementing works for little or no benefit in the medium to long term.

6.4 Surrounding landuse

Adjacent land use can have a considerable impact on the riparian zone and waterway health. Different land uses have different implications for stream health and therefore the appropriate management regimes will vary.

Riparian zones are often highly degraded. Foreshore vegetation is frequently reduced to a few metres either side of the watercourse. It is important to provide information to landholders and land managers about the benefits of undertaking remedial works along foreshores, emphasising the importance of fencing off riparian areas and excluding stock. Obtaining funds and providing support may encourage interested landholders to undertake intensive weed control and revegetation works.

Foreshores in urban areas are frequently high-use recreation sites. Traditionally, large open areas of maintained lawn were favoured over dense stands of native vegetation. Advertising campaigns and creating signage around project sites can increase community awareness. Providing detailed information on the benefits of replanting native species such as stabilising foreshore banks and increasing stream cover and habitat diversity will increase awareness and may encourage local residents to become involved in the projects.

Sedimentation of watercourses is generally an indication of erosion occurring further upstream. No system can be considered in total isolation, as there will always be impacts from activities further upstream. When undertaking any projects it is essential that groups have a clear understanding of the surrounding land use and the condition of any tributaries feeding into the main waterway.



The impact of new subdivisions or earthworks upstream should be carefully monitored. Weeds may invade from nearby residential housing. Subdivisions can also have a huge impact on water regimes and sediment loads entering streams and tributaries. Early detection of potential threats minimises the impact on foreshore health in the long term if remedial action is undertaken immediately.

6.5 Gaining support from state and local government

State and local government have a significant role to play in supporting foreshore rehabilitation. Many agencies are directly involved in managing waterways and foreshore areas. The Water Corporation, the Water and Rivers Commission, the Swan River Trust, Agriculture WA and local government authorities all actively manage some waterways within the State.

Many of these agencies also have statutory requirements to meet, which relate to the management of these areas. The Swan River Trust management area, for example, relates to the bed and banks of the Swan and Canning Rivers extending across the riparian zone to the limit of the parks and recreation reservation. It is illegal to undertake any works within the Swan River Trust management area without notifying the Swan River Trust.

Some agencies have community support functions to assist groups to undertake hands-on work and prepare management and rehabilitation plans, and can also provide some support for administrative and information requirements.

Key contacts include:

Contact	Agency	Contact Number
Ecoplan	Department of Environmental Protection	9222 7000
	Swan Catchment Centre	9221 5300
	Water and Rivers Commission	9278 0300
	Swan River Trust	9278 0400
	Agriculture WA	9368 3333
	Relevant local government authority	White pages

There may be contacts within each agency for on-ground support. The Swan Catchment Centre has a Landcare

trailer that is fully rigged for landcare activities and provides equipment for site preparation, weed control and planting.

Where reserves are managed by a State or local government authority, it is essential that the community liaise with the land manager to develop and implement any assessment proforma and rehabilitation projects.

Support from agencies also improves the opportunities for gaining funding from external sources such as Greening Australia (WA), Lotteries WA and the Natural Heritage Trust.

6.7 Fire management

Fire is not recommended as a management technique for riparian zones, particularly in the Scarp region and areas with peaty soils. Should fire occur as a result of vandalism or an accidental burn, then advantage should be taken of the increased access to the area for weed control.

Over burning is likely to significantly damage fringing vegetation, depleting the seed bank of some species, and may result in reduced bank stability and higher levels of erosion. Excess fire may encourage further weed invasion and the spread of existing weed species. Autumn burns are particularly risky.

Areas deemed to be at risk of fire should have a detailed fire management plan in place. This plan should detail actions required in the event of a fire, locations of water available for fire fighting and access routes for fire fighters to enter the area. This is especially important if foreshore areas have been fenced off to prevent stock access or unauthorised access, thus hindering fire services from entering the area. The fire management plan should be prepared in conjunction with representatives from Fire and Emergency Services Association.

6.8 Notes on reclamation of salt affected land

Surface expressions of salinity can be due to a number of causes. In Western Australia much of the salinity can be attributed to the rising watertable bringing salt, stored in the soil profile, to the surface. One of the main reasons for the rise in watertable levels is the large scale removal of the native, deep-rooted perennial plants.

Areas affected by salinity are capable of being a productive resource. To facilitate the return of salt



affected land to a productive state, a number of factors need to be considered. These include desired land use (grazing, agroforestry, recreational etc.), current salinity levels, availability of financial and logistical resources and the identification of recharge/discharge areas.

Revegetation using appropriate salt tolerant native species is recommended for the amelioration of salt affected lands. Attention should also be paid to addressing the cause of the rising watertable. This may involve using revegetation techniques at the point of recharge, which is often in areas of permeable soils higher in the topography of the area. This is a priority in areas where clearing of the native vegetation has

previously occurred. High water use plants can be used lower in the topography, where over time they may aid in reducing the watertable levels.

Amelioration of salt affected lands within riparian zones is especially important, as the scalding associated with the surface expression of salinity leaves areas devoid of vegetative cover. The removal of the fringing vegetation exacerbates the problems of erosion and bank destabilisation, reduces the levels of stream cover and results in a loss of the habitat values of waterways.

Agriculture WA and scientists from the University of Western Australia suggest a number of salt tolerant species. The following table contains some of these.

Table 5: Some suggested salt tolerant species

BOTANICAL NAME	COMMON NAME	COMMENTS
Understorey species		
* <i>Paspalum vaginatum</i>	Saltwater couch	Very high waterlogging tolerance, no drought. Needs summer moisture.
* <i>Thinopyrum elongatum</i>	Tall wheat grass	Moderate waterlogging tolerance, weed potential.
* <i>Trifolium michelianum</i>	Balansa clover	Weed potential.
* <i>Trifolium fragiferum</i>	Strawberry clover	High waterlogging tolerance. Best on summer moisture, weed potential.
<i>Halosarcia</i> spp.		Many species are very tolerant of waterlogging and salinity.
<i>Sarcocornia blackiana</i>		Combined salt and waterlogging tolerance is particularly high. Can tolerate periodic inundation.
<i>Sarcocornia quinqueflora</i> sub sp. <i>quinqueflora</i>	Glasswort, Samphire	Combined salt and waterlogging tolerance is particularly high. Can tolerate periodic inundation.
<i>Sporobolus virginicus</i>	Marine couch	Reports tolerance to 25-50 dS/m on alkaline duplex soils and wet sites.
Middlestorey species		
<i>Baumea juncea</i>	Bare Twigrush	Limited salt tolerance and prefers seasonally moist soils.
<i>Isolepis nodosa</i>	Nodding Club Rush	Very drought tolerant but not indigenous to the hills area.
<i>Schoenoplectus validus</i>	Lake Club Rush	Requires permanent waterlogging or shallow water.
<i>Atriplex</i> spp.	Saltbush spp.	Generally require well-drained sites, some salinity tolerance.
<i>Acacia cyclops</i>	Coastal wattle	Severe to extreme tolerance. Sensitive to waterlogging.
<i>Acacia saligna</i>	Golden wreath wattle	Variation in provenances. Very good tolerance for salt and some waterlogging.
<i>Melaleuca lateriflora</i>		
Overstorey species		
<i>Casuarina obesa</i>	Salt sheoak	
* <i>Eucalyptus halophila</i>	Salt lake mallee	
* <i>Eucalyptus platypus</i> var. <i>heterophylla</i>	Coastal moort	Could have very high salt tolerance.
<i>Eucalyptus rudis</i>	Flooded gum	
<i>Melaleuca cuticularis</i>	Saltwater paperbark	

NB: Asterix (*) denotes non-local Western Australian species



Before selecting species for revegetation programs, especially within the riparian zone, salinity levels should be determined and appropriate species, which are unlikely to become a weed species, should be selected. Selection of species should be made in conjunction with a Landcare, Agriculture WA or other authority on appropriate local species. Plants or seed should be sourced from within the local provenance, where possible.

6.9 Access to information

State and local government authorities have considerable information resources about waterways and should be contacted. Many agencies also have libraries

that the community can access, however borrowing books is generally not permitted.

Existing information about any particular waterway should be collated prior to development of management plans.

General information about weed control techniques, site preparation and stream and foreshore restoration needs to be obtained prior to the development of rehabilitation plans. The Water and Rivers Commission has prepared a number of Factsheets, Waternotes and a River Restoration Manual that are available from the offices.



7. Matters for Consideration

7.1 Liaison with government agencies

A number of recommendations cited throughout this report require substantial technical assistance or additional funds to implement. Consequently, it may be beyond the scope of many community groups to undertake these projects due to a lack of available resources. Further, in many instances approval from the appropriate authority is required before any works can progress. Liaison with government agencies at the local and State level is an important step in determining if these remedial strategies can be implemented. Therefore, even though these recommendations can often not be addressed immediately, they can become a focus for future works when funds and assistance become available.

7.1.2 Water and Rivers Commission and the Swan River Trust

The Water and Rivers Commission and the Swan River Trust play an integral role in the management and protection of our waterways. Many of the recommendations suggest that community groups liaise with these agencies to determine opportunities to investigate the following:

- Monitor stream health at a catchment level to assess erosion events, sediment loads, peak flow rates and pollution levels.
- Determine opportunities to retain water upslope when flow rates are high by increasing groundwater use through planting trees or to investigate the feasibility of diverting water flow into holding ponds.
- Assess the potential to minimise the amount of saline water entering waterways by installing upslope interception banks.
- Determine the legality of all off-take pipes, pumps and water containment structures (ponds and dams) located along waterways to investigate the level of water extraction.
- Assess the impact of dams and ponds on stream flow and sedimentation, ensuring that these structures meet

with stipulated conditions of construction and design and do not impact on stream hydrology or foreshore stability.

7.1.3 Local Government Authority

Community groups need to establish close links with their local government authorities when aiming to undertake any rehabilitation works on foreshore areas, as approval and support is required. It is important to understand the current policies and requirements of these authorities and to undertake works within a framework that complements their own aims for the management of these riparian areas.

Work with the local government authorities to:

- Review current structures that may be exacerbating erosion and address these problems using appropriate water sensitive urban design principles.
- Determine the possibility to construct where required, crossover points, drainage outfalls, rock spillways and riffle zones that promote the stabilisation of foreshore areas.
- Assess the provision of recreational facilities such as bins to limit rubbish entering the waterway.
- Provide guideways using bollards and woodchip pathways to minimise the trampling of vegetation, particularly near revegetation works or valuable remnant vegetation.
- Promote careful management of recreational parks, ensuring mowing and other maintenance work does not threaten native plants.
- Encourage the use of appropriate native species in any planting works associated with foreshore areas.
- Assess and limit access to areas if required.
- Install signage to inform the local community and promote care of the foreshore environment.
- Ensure that any prescribed burns are undertaken in a mosaic pattern to provide sufficient cover and habitat for fauna while the vegetation is regenerating.



7.1.4 Department of Environmental Protection

The primary responsibility of the Department of Environmental Protection is to monitor and protect the environment. This department will provide information to the community about numerous issues such as stating appropriate guidelines for development proposals, environmental protection and management rules, policy directions and will undertake assessment of reports of pollution or environmental damage.

Contact the Department of Environmental Protection to assess:

- Potential source points of nutrient or chemical pollutants entering the waterway from surrounding residential, business (such as petrol stations) or rural developments.

7.1.5 Ministry for Planning

The Ministry for Planning is the government agency responsible for landuse planning and therefore the community should liaise with this department (and the Department of Environmental Protection) to ensure:

- Any future subdivisions and residential developments close to foreshore areas have suitable management systems and infrastructure in place, to prevent degradation of the foreshore and stream environments.
- The use of water sensitive urban design principles to aid in decreasing potential water and sediment loads to waterways when developing drainage infrastructure close to waterways.

7.1.6 Main Roads Western Australia

Main Roads Western Australia manages the road and transport network and associated road reserves. Encourage Main Roads WA to:

- Install gross pollutant or sand/silt traps on stormwater system outfalls into waterways to collect rubbish and sediment.
- Maintain weed management in road reserves adjacent to riparian areas.

7.1.7 Department of Conservation and Land Management

The Department of Conservation and Land Management (CALM) is the State government agency that manages our national parks and reserves. Foreshore areas on reserve land are protected by legislation and managed by the department and therefore approval is required if community groups wish to undertake any works in these areas. CALM also provides a wide range of information and support to community groups. Contact the department to find out information about the:

- Western Shield Program to control feral animals.
- Detection and management of Jarrah dieback or other plant diseases.

7.1.8 Agriculture Western Australia (AGWEST)

Agriculture Western Australia has a great deal of information that is available to the community including pamphlets and publications on a range of landcare subjects. They also provide a number of services. Liaise with AGWEST to:

- Gain advice on the identification and control of pest insects.
- Assess salinity levels in salt affected areas and investigate mechanisms to contain saline runoff upslope, away from waterways to protect vegetation from the hypersaline waters.
- Determine if it is appropriate to establish perennial pastures associated with foreshore areas to provide an alternative to landholders that currently allow stock to freely graze these areas. Ensure that the management of such a cropping system prevents the plants from seeding, and that plant fragments are trapped to prevent these species from invading the riparian zone.



7.1.9 Fire & Emergency Services Authority of WA

It is essential that community groups ensure that appropriate fire management plans are developed for foreshore areas, as these sites are often in close proximity to high-density residential areas and may pose a threat to public safety. Community groups should liaise with the Fire & Emergency Services Authority of WA to ensure a comprehensive plan is maintained. It is important that all associated agencies such as the Department of Conservation and Land Management, the local volunteer fire brigade and the State Emergency Service are informed of any changes to access to sites. It is also important to ensure that firebreaks are maintained.

7.2 Further information

The world wide web can provide a wealth of information and useful contacts. Following are some URL addresses that may be of use:

The Government of Western Australia:
<http://www.wa.gov.au/>

Water and Rivers Commission:

<http://www.wrc.wa.gov.au/>

Swan River Trust:

<http://www.wrc.wa.gov.au/srt/index.html>

Water Corporation:

<http://www.watercorporation.com.au/>

Department of Environmental Protection:

<http://www.environ.wa.gov.au/>

Main Roads WA:

<http://website.mrwa.wa.gov.au/>

Ministry for Planning:

<http://www.planning.wa.gov.au/index.html>

Department of Conservation and Land Management:

<http://www.calm.wa.gov.au/>

Agriculture Western Australia:

<http://www.agric.wa.gov.au/agency/index.htm>

Fire and Emergency Services Western Australia:

<http://www.fire.wa.gov.au/>

WA online: <http://www.onlinewa.com.au/enhanced/>



8. Summary

This document provides the results of the second series of foreshore assessments undertaken along selected sections within the Blackadder/Woodbridge Creek catchment in accordance with the Shepherd and Siemon 1999; WRC Report RR2 foreshore condition assessment proforma. Testing and refining the assessment protocol in this work was intended to identify any shortcomings or limitations of the proforma.

The foreshore assessment process has been developed to aid interested community groups, officers of State and local government authorities and private landholders in urban and semi-rural areas to gain an understanding of the condition of foreshore areas within their own community. By using a standard methodology to gather information it is possible to compare and contrast the foreshore condition of the same area over time, or of different sites in the same survey season to prioritise works.

The key findings of the study showed that the health of the Blackadder/Woodbridge Creeks, rated using the Stream Condition Index, ranged from Red (Poor) to Yellow (Moderate). This was one of the few tributaries of the Swan River that included tidal areas, Ridge Hill Shelf vegetation communities and upland areas.

The key areas on which to focus rehabilitation works are:

- controlling access in the Talbot Road Reserve and working to control weeds in this area,
- working to protect and restore native vegetation,
- preparing management plans for sections of the creeks that flow through public open space to balance conservation and recreation needs,
- liaising with the local government authorities to encourage the development of policies that ensure subdivision designs retain water in the upper parts of the catchment, and
- encouraging private landholders to protect and improve the waterways backing on to their properties by linking it with land values and selling the aesthetic appeal of native bushland.

Many of the issues require all landholders and the wider community to work collectively in order to make a difference. The importance of catchment groups in raising awareness, providing technical and on-ground support and encouraging all landholders to become involved, cannot be stressed enough.

This report of foreshore condition will be one of many, as the process continues to evolve and be implemented across urban and semi-rural areas Statewide.



9. References and recommended reading

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Appendix 1

Native species identified
during the foreshore assessment –
Stage 2



Appendix 1a: Native species identified during the foreshore assessment process (1999)

Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Acacia alata</i>	Winged Wattle				
<i>Acacia pulchella</i>	Prickly Moses				
<i>Acacia saligna</i>	Coojong				
<i>Acacia</i> sp.					
<i>Acacia teretifolia</i>					
<i>Agonis flexuosa</i>	WA Peppermint				
<i>Agonis linearifolia</i>	Swamp Peppermint				
<i>Alexgeorgea arenicola</i>					
<i>Allocasuarina fraseriana</i>	Sheoak				
<i>Allocasuarina humilis</i>	Dwarf Sheoak				
<i>Andersonia aristata</i>	Rice Flower				
<i>Andersonia lehmanniana</i>					
<i>Anigozanthos</i> sp.	Kangaroo Paw				
<i>Astartea fascicularis</i>	Common Astartea				
<i>Astroloma ciliatum</i>	Moss-Leaved Heath				
<i>Astroloma foliosum</i>	Candle Cranberry				
<i>Astroloma pallidum</i>	Kick Bush				
<i>Azolla</i> sp.					
<i>Baeckea camphorosmae</i>	Camphor Myrtle				
<i>Banksia littoralis</i>	Swamp Banksia				
<i>Baumea articulata</i>	Jointed Twig Rush				
<i>Baumea juncea</i>	Bare Twigrush				
<i>Baumea rubiginosa</i>	River Twigrush				
<i>Baumea</i> sp.					
<i>Borya sphaerocephala</i>	Pincushions				
<i>Borya</i> sp.					
<i>Bossiaea aquifolium</i>	Water Bush				
<i>Bossiaea</i> sp					
<i>Caladenia</i> spp.	Orchids				
<i>Callistemon</i> sp.					
<i>Calothamnus quadrifidus</i>	One Sided Bottlebrush				
<i>Calothamnus sanguineus</i>	Pindak				
<i>Calytrix variabilis</i>	Star Flowers				
<i>Carex appressa</i>	Tall Sedge				
<i>Carex fascicularis</i>	Tassel Sedge				
<i>Carex</i> sp.					
<i>Cassytha flava</i>	Dodder Laurel				



Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Cassytha</i> sp.					
<i>Casuarina obesa</i>	Swamp Sheoak				
<i>Centella cordifolia</i>	Centella				
<i>Centrolepis</i> sp.	Centrolepis				
<i>Cheilanthes austrotenuifolia</i>	Rock Fern				
<i>Cheilanthes distans</i>	Bristly Cloak Fern				
<i>Chenopodium glaucum</i>	Glaucous Goosefoot				
<i>Clematis microphylla</i>	Old Mans Beard				
<i>Clematis pubescens</i>	Common Clematis				
<i>Conostylis setigera</i>	Bristly Conostylis				
<i>Conostylis setosa</i>	White Cottonhead				
<i>Conostylis</i> sp.					
<i>Convolvulus erubescens</i>	Pink Bindweed				
<i>Corymbia calophylla</i>	Marri				
<i>Corynotheca micrantha</i>	Sand Lily				
<i>Cryptandra arbutiflora</i>	Waxy Cryptandra				
<i>Dampiera alata</i>	Winged stem Dampiera				
<i>Darwinia citriodora</i>	Lemon Scented Darwinia				
<i>Darwinia thymoides</i>					
<i>Daviesia decurrens</i>	Prickly Bitter Pea				
<i>Daviesia horrida</i>					
<i>Daviesia preissii</i>					
<i>Dianella revoluta</i>	Spreading Flax Lily				
<i>Dianella</i> sp.					
<i>Dillwynia</i> sp.					
<i>Drosera glanduligera</i>	Pimpernel Sundew				
<i>Drosera macrantha</i>	Climbing Drosera				
<i>Drosera microphylla</i>	Purple Rainbow				
<i>Drosera pallida</i>	Pale Rainbow				
<i>Dryandra armata</i>	Prickly Dryandra				
<i>Dryandra bipinnatifida</i>					
<i>Dryandra nivea</i>	Couch Honeypots				
<i>Dryandra sessilis</i>	Parrot Bush				
<i>Eucalyptus laeliae</i>	Darling Range Ghost Gum				
<i>Eucalyptus marginata</i>	Jarrah				
<i>Eucalyptus patens</i>	Black Butt				
<i>Eucalyptus rudis</i>	Flooded Gum				
<i>Eucalyptus wandoo</i>	Wandoo				



Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Gompholobium tomentosum</i>	Hairy Yellow Pea				
<i>Goodenia fasciculata</i>					
<i>Grevillea bipinnatifida</i>	Native Fuchsia				
<i>Grevillea diversifolia</i>	Variable Leaf Grevillea				
<i>Grevillea endlicheriana</i>	Spindly Grevillea				
<i>Grevillea glabrata</i>	Smooth Grevillea				
<i>Grevillea pilulifera</i>	Woolly Grevillea				
<i>Grevillea quercifolia</i>	Oak-leaved Grevillea				
<i>Grevillea</i> sp.					
<i>Grevillea synapheae</i>	Catkin Grevillea				
<i>Grevillea wilsonii</i>	Wilson's Grevillea				
<i>Haemodorum</i> sp.	Mene				
<i>Hakea amplexicaulis</i>	Prickly Hakea				
<i>Hakea cristata</i>	Snail Hakea				
<i>Hakea erinacea</i>	Hedge-hog Hakea				
<i>Hakea lissocarpha</i>	Honeybush				
<i>Hakea petiolaris</i>	Sea-Urchin Hakea				
<i>Hakea prostrata</i>	Harsh Hakea				
<i>Hakea ruscifolia</i>	Candle Hakea				
<i>Hakea trifurcata</i>	Two-Leaved Hakea				
<i>Hakea undulata</i>	Wavy-Leafed Hakea				
<i>Hakea varia</i>	Variable Leaf Hakea				
<i>Hardenbergia comptoniana</i>	Native Wisteria				
<i>Hemiandra pungens</i>	Snake Bush				
<i>Hemiandra sericea</i>					
<i>Hibbertia spicata</i>					
<i>Hibbertia hypericoides</i>	Yellow Buttercup				
<i>Hibbertia</i> sp.	Native Buttercups				
<i>Hibbertia subvaginata</i>					
<i>Hovea chorizemifolia</i>	Holly-leaved Hovea				
<i>Hovea pungens</i>	Devils Pins				
<i>Hovea trisperma</i>	Common Hovea				
<i>Hybanthus floribundus</i>					
<i>Hypocalymma angustifolium</i>	White Myrtle				
<i>Hypocalymma robustum</i>	Swan River Myrtle				
<i>Hypolaena</i> sp.					
<i>Isolepis nodosa</i>	Knotted Club Rush				
<i>Isolepis setiformis</i>	Tufted Sedge				
<i>Isolepis</i> sp.	Club Rushes				
<i>Isopogon sphaerocephalus</i>	Drum Stick Isopogon				



Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Jacksonia furcellata</i>	Grey Stinkwood				
<i>Jacksonia sternbergiana</i>	Green Stinkwood				
<i>Juncus holoschoenus</i>	Jointed Rush				
<i>Juncus kraussii</i>	Shore Rush				
<i>Juncus pallidus</i>	Pale Rush				
<i>Juncus</i> sp.					
<i>Kennedia prostrata</i>	Running Postman				
<i>Kennedia stirlingii</i>	Bushy Kennedia				
<i>Kunzea</i> sp.					
<i>Labichea lanceolata</i>	Tall Labichea				
<i>Labichea punctata</i>	Lance Leaved Cassia				
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush				
<i>Lasiopetalum</i> sp.					
<i>Laxmannia squarrosa</i>					
<i>Lechenaultia biloba</i>	Blue Lechenaultia				
<i>Lepidosperma angustatum</i>					
<i>Lepidosperma effusum</i>	Spreading Sword Sedge				
<i>Lepidosperma longitudinale</i>	Pithy Sword Sedge				
<i>Lepidosperma scabrum</i>					
<i>Lepidosperma</i> sp.					
<i>Lepidosperma tetraquetrum</i>	Angle Sword Sedge				
<i>Leptospermum ellipticum</i>	Tea Tree				
<i>Leucopogon</i> sp.	Bearded Heath				
<i>Leucopogon verticillatus</i>	Tassel Flower				
<i>Lomandra odora</i>	Tiered Mat Rush				
<i>Lomandra preissii</i>					
<i>Macrozamia riedlei</i>	Zamia				
<i>Melaleuca cuticularis</i>	Salt Water Paperbark				
<i>Melaleuca lateritia</i>	Robin Redbreast Bush				
<i>Melaleuca preissiana</i>	Modong				
<i>Melaleuca raphiophylla</i>	Swamp Paperbark				
<i>Melaleuca scabra</i>	Rough Honey Myrtle				
<i>Melaleuca viminea</i>	Mohan				
<i>Mesomelaena preissii</i>					
<i>Mesomelaena pseudostygia</i>					
<i>Mesomelaena stygia</i>					
<i>Mesomelaena tetragona</i>	Semaphore Sedge				
<i>Notodanthonia</i> sp.					
<i>Nuytsia floribunda</i>	WA Christmas Tree				



Scientific name	Common Name	Jane Brook	Blackadder-Woodbridge Creeks	Helena River	Wooroloo Brook
<i>Oxylobium lineare</i>	Narrow-leaved Oxylobium				
<i>Paraserianthes lophantha</i>	Albizia				
<i>Patersonia occidentalis</i>	Purple Flag				
<i>Patersonia umbrosa</i>	Shade Patersonia				
<i>Pentapeltis peltigera</i>					
<i>Pericalymma ellipticum</i>	Swamp Teatree				
<i>Petrophile stricta</i>					
<i>Pimelea ciliata</i>	White Banjine				
<i>Pimelea spectabilis</i>	Banjine				
<i>Pimelea suaveolens</i>	Scented Banjine				
<i>Pronaya fraseri</i>	Elegant Pronaya				
<i>Pteridium esculentum</i>	Bracken Fern				
<i>Ptilotus esquamatus</i>					
<i>Ptilotus manglesii</i>	Mulla Mulla				
<i>Regelia ciliata</i>					
<i>Restio</i> sp.					
<i>Rulingia cygnorum</i>					
<i>Schoenoplectus validus</i>	Lake Club Rush				
<i>Schoenus grandiflorus</i>	Large Flowered Rush				
<i>Schoenus</i> sp.					
<i>Stirlingia latifolia</i>	Blueboy				
<i>Stylidium</i> sp.					
<i>Styphelia tenuiflora</i>	Common Pinheath				
<i>Synaphea petiolaris</i>	Granite Synaphea				
<i>Templetonia biloba</i>					
<i>Themeda australis</i>	Kangaroo Grass				
<i>Thomasia foliosa</i>					
<i>Thomasia macrocarpa</i>	Large Fruited Macrocarpa				
<i>Tricoryne elatior</i>	Yellow Autumn Lily				
<i>Triglochin procera</i>	Arrowgrass				
<i>Trymalium ledifolium</i>					
<i>Typha domingensis</i>	Bulrush				
<i>Verticordia huegelii</i>	Variegated Feather Flower				
<i>Verticordia</i> sp.	Feather Flowers				
<i>Viminaria juncea</i>	Swishbush				
<i>Xanthorrhoea gracilis</i>	Slender Grass Tree				
<i>Xanthorrhoea preissii</i>	Grass Tree				



Appendix 1b: Weed species identified during the foreshore assessment process (1999)

Scientific name	Common Name	Jane Brook	Helena River	Wooroloo Brook	Blackadder-Woodbridge Creeks
<i>Acacia</i> spp	Introduced Wattles				
<i>Alocasia brisbanensis</i>	Elephant Ear				
<i>Alternanthera</i> sp.	Joyweed				
<i>Aponogeton elongatus</i>					
<i>Arundo donax</i>	Giant Reed				
<i>Asparagus asparagoides</i>	Bridal Creeper				
<i>Aster subulatus</i>	Bushy Starwort				
<i>Avena fatua</i>	Wild Oats				
<i>Briza maxima</i>	Blowfly Grass				
<i>Briza minor</i>	Shivery Grass				
<i>Carex divisa</i>	Divided Sedge				
<i>Centaurea</i> spp.	Thistles				
<i>Chenopodium album</i>	Fat Hen				
<i>Conyza</i> spp	Fleabane				
<i>Cortaderia selloana</i>	Pampas Grass				
<i>Cynodon dactylon</i>	Couch Grass				
<i>Cyperus</i> spp.					
<i>Cytisus proliferus</i>	Tagasaste				
<i>Echium plantagineum</i>	Patersons Curse				
<i>Eragrostis curvula</i>	African Lovegrass				
<i>Ficus carica</i>	Edible Fig Tree				
<i>Foeniculum vulgare</i>	Fennel				
<i>Freesia</i> aff. <i>leichtlinii</i>	Freesia				
<i>Fumaria capreolata</i>	Whiteflower Fumitory				
<i>Gladiolus</i> sp.	Gladiolus				
<i>Gomphocarpus fruticosus</i>	Cotton Bush				
<i>Hedra helix</i>	Ivy				
<i>Hypochaeris radicata</i>	Flatweed				
<i>Ipomoea</i> sp.	Morning Glory				
<i>Juncus acutus</i>	Spiny Rush				
<i>Juncus microcephalus</i>					
<i>Lolium</i> sp.	Ryegrass				
<i>Lupinus angustifolia</i>	Lupins				
<i>Mentha pulegium</i>	Pennyroyal				
<i>Olea europaea</i>	Olive Tree				
<i>Opuntia</i> sp.	Prickly Pear				
<i>Oxalis pes-caprae</i>	Soursob				
<i>Oxalis glabra</i>					



Scientific name	Common Name	Jane Brook	Helena River	Wooroloo Brook	Blackadder-Woodbridge Creeks
<i>Oxalis purpurea</i>	Purple Wood Sorrel				
<i>Paspalum</i> spp.	Paspalum				
<i>Pennisetum clandestinum</i>	Kikuyu				
<i>Pennisetum setaceum</i>	Fountain Grass				
<i>Phalaris</i> spp.	Phalaris				
<i>Phytolacca octandra</i>	Inkweed				
<i>Pinus radiata</i>	Radiata Pine				
<i>Plantago lanceolata</i>	Ribwort Plantain				
<i>Populus</i> sp	Poplars				
<i>Quercus</i> sp.	Oak Tree				
<i>Raphanus raphanistrum</i>	Wild Radish				
<i>Rhynchelytrum repens</i>	Red Natal Grass				
<i>Ricinus communis</i>	Castor Oil				
<i>Romulea rosea</i>	Guildford Grass				
<i>Rosa</i> sp.	Rose				
<i>Rubus fruticosus</i>	Blackberry				
<i>Rumex</i> spp.	Dock				
<i>Salix</i> sp	Willows				
<i>Schinus terebinthifolia</i>	Japanese Pepper				
<i>Solanum nigrum</i>	Deadly Nightshade				
<i>Stenotaphrum secundatum</i>	Buffalo Grass				
<i>Trifolium</i> sp.	Clover				
<i>Typha orientalis</i>	Bulrush				
<i>Vicia sativa</i>	Vetch				
<i>Watsonia bulbifera</i>	Watsonia				
<i>Zantedeschia aethiopica</i>	Arum Lily				



Appendix 2

Suggested weed control methods



Appendix 2: Suggested weed control methods

Some of the information contained in this report has been taken from Dixon and Keighery (1995) in Managing Perth's Bushlands or referenced to Kings Park Board.

Species Name:	Acacia spp	Control Priority	Location	Habit	Form
Common Name:	Weed wattles	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input checked="" type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Species dependent - prior to flowering				Grass <input type="checkbox"/>
Method of Control:	Hand weed juvenile plants. Small plants means they are relatively easy to remove. Once plants are mature or woody stemmed, cut the main trunk/stem below the widest part of the stem beneath the ground. This will effectively kill all wattles.				

Species Name:	Allium triquetrum	Control Priority	Location	Habit	Form
Common Name:	Three cornered garlic	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Apply Glyphosate 1 in 50 or Glean whilst plants are in flower. Repeat applications will be necessary.				

Species Name:	Alopecurus myosuroides	Control Priority	Location	Habit	Form
Common Name:	Slender foxtail	3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:					Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding prior to seeding is effective. Herbicides are not recommended as this plant occurs in wetlands and there is a threat of contamination.				

Repeated brushcutting prior to seeding is effective and reduces the rate of spread of this plant.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name:	<i>Alternanthera nodiflora</i>	Control Priority	Location	Habit	Form
Common Name:	Joyweed	1	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March-April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct-Nov				Grass <input type="checkbox"/>
Method of Control:	Hand weed plants in strips up to 2 m perpendicular to water flow and replace immediately with native emergent species. Carefully bag and remove weed material from the site.				

Any segment which is broken from this plant is likely to regenerate into a new plant, so using a floating bund with netting or similar device downstream to trap any segments missed.

Species Name:	<i>Anagallis arvensis</i>	Control Priority	Location	Habit	Form
Common Name:	Pimpernel	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:					Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Hand weeding small populations is effective. Alternatively treat with Glyphosate or Glean at 15g per ha.				

Species Name:	<i>Aponogeton elongatus</i>	Control Priority	Location	Habit	Form
Common Name:		2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input checked="" type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Nov - Mar (access dependent)				Grass <input type="checkbox"/>
Method of Control:	This aquatic weed is difficult to control because it slows water movement, increases sedimentation and reduces erosion which affects bed and bank stability following removal. The recommended removal technique involves manual clearing of a channel and also clearing 5 to 10 m wide bands, 20 metres apart which are perpendicular to the stream flow. This will minimise the potential for de-stabilising the stream bed.				

Seek expert advice and approvals from the relevant government agencies prior to implementing broad scale works. Herbicides should not be used for this weed. Shading out and planting dense clumps of indigenous plants are the most effective management techniques.

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available

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Species Name:	Arctotheca calendula	Control Priority	Location	Habit	Form
Common Name:	Capeweed	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct - Feb				Grass <input type="checkbox"/>
Method of Control:	Hand weeding small populations of this plant is effective. Rotary hoeing broadscale infestations repeatedly can also work. Kings Park Board recommends glyphosate at 100ml in 15l water. Lontrel 1 in 100 has been successful on larger plants in areas without any native vegetation.				

Species Name:	Arundo donax	Control Priority	Location	Habit	Form
Common Name:	Giant reed	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept - Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year				Grass <input checked="" type="checkbox"/>
Method of Control:	Cut down and spray regrowth when 0.5 - 1.0m high with Glyphosate 360 100ml in 10l of water. An alternative technique is to remove bulk of plant material and pour herbicide down each tube.				

Ensure removal of seed heads prior to ripening if plant control is not possible. Generally this plant occurs on the banks of streams and rivers. It is important not to dig this plant out if there is a risk of increasing erosion. Onsite poisoning is the preferred option leaving the dense rhizome mat intact.

Species Name:	Aster subulatus	Control Priority	Location	Habit	Form
Common Name:	Bushy starwort	3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Mar				Grass <input type="checkbox"/>
Method of Control:	Hand weeding these plants is easy and effective. It is essential to weed them prior to flowering and fruiting to reduce their spread.				

Species Name:	Avena spp.	Control Priority	Location	Habit	Form
Common Name:	Wild Oats	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	March - June		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Oct				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding small plants in winter is effective for small populations. Blanket/Spot spraying at 2l Fusillade per ha is effective. Brushcutting plants with immature seed heads will aid control in the longer term by minimizing seed spread.				

Dense populations represent a significant fire hazard and threat to remnant vegetation, so repeated brushcutting also assists in reduction of fire hazard.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Briza maxima* **Control Priority** **Location** **Habit** **Form**

Common Name: Blowfly grass **2** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: Sept - Nov **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: June - Aug **Grass**

Method of Control: Hand weeding is effective. **Climber**

Control may be achieved by spot/blanket spraying Sertin or similar at 2l per ha.

Species Name: *Briza minor* **Control Priority** **Location** **Habit** **Form**

Common Name: Shivery grass **2** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: Sept - Oct **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: June - Aug **Grass**

Method of Control: Hand weeding is effective. **Climber**

Control may be achieved by spot/blanket spraying Sertin or similar at 2l per ha.

Species Name: *Bromus diandrus* **Control Priority** **Location** **Habit** **Form**

Common Name: Great brome **2** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Coarse seed **Riparian** **Perennial** **Shrub**

Seeding Time: Sept - Nov **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: June - Aug **Grass**

Method of Control: Hand weeding is easy and effective for small populations. The most frequently recommended treatment is Fusillade at between 2-4l per ha, when the plants are actively growing in winter. Repeated brushcutting can also be effective. **Climber**

Note: Correct identification of grasses is important to protect native grasses from removal. The presence of native grasses should be investigated prior to spraying herbicides.

Species Name: *Canna spp.* **Control Priority** **Location** **Habit** **Form**

Common Name: Canna **3** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Heavy seed **Riparian** **Perennial** **Shrub**

Seeding Time: **Aquatic** **Annual** **Herb**

Method of Spread: Spreads readily from rhizome growth **Rush/Sedge**

Best Time of Control: Sept - Apr **Grass**

Method of Control: Dig out small infestations. Selectively spraying the leaves with a systemic herbicide can be effective. **Climber**

Encourage residents to harvest the flowers to reduce seed production.

Broadscale removal of dense stands may threaten bank stability. Remove in nodes perpendicular to the water course or remove the bulk of biomass then treat with herbicide. Ensure the dense rhizome mat intact.

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available

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Species Name: ***Centaurea spp*** **Control Priority** **Location** **Habit** **Form**

Common Name: Thistles **2** **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Light, easily spread by wind **Rush/Sedge**
Seeding Time: April - July **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: Spring / summer

Method of Control: Hand weeding is effective for this group of plants. Vigilance is required to ensure removal prior to seeding.

Some people have adverse reactions to the sap and prickles of these plants. Care should be taken to minimise contact with bare skin and eyes.

Species Name: ***Chenopodium album*** **Control Priority** **Location** **Habit** **Form**

Common Name: Goosefoot **3** **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Heavy seed **Rush/Sedge**
Seeding Time: April - June and Sept - Oct **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: All year.

Method of Control: Hand weeding is easy and effective prior to seeding.

Make sure that this species is correctly identified as *Chenopodium glaucum* is a similar native species.

Species Name: ***Conyza spp*** **Control Priority** **Location** **Habit** **Form**

Common Name: Fleabane **3** **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Light, easily spread by wind **Rush/Sedge**
Seeding Time: April - Dec and July - Feb **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: Oct - Mar

Method of Control: Hand weeding is effective prior to seeding. Needs to be ongoing. Ensure any seed heads present are bagged prior to removal if hand weeding has not occurred prior to this time.

Common on roadsides and disturbed areas as a primary coloniser. This species is tolerant of salt, wind and is adaptable to variable soil types and therefore represents a long term problem. It is easy to control and a difference can easily be seen when controlled in bushland communities.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name:	Cortaderia selloana	Control Priority	Location	Habit	Form
Common Name:	Pampas Grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Nov				Grass <input checked="" type="checkbox"/>
Method of Control:	Cut plumes before seed ripens to limit spread. Remove most leaf material with a heavy duty brushcutter and paint regrowth with Glyphosate 1 in 2. Thoroughly wet both sides of the leaf.				
	In riparian situations do not attempt to dig out these plants, due to the potential to affect bank stability. Should fire occur in a riparian zone, then treat the plants as soon as they reshoot to take advantage of easy access.				

Species Name:	Cynodon dactylon	Control Priority	Location	Habit	Form
Common Name:	Couch	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	May, April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Oct - Feb and April - May				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is very difficult, labour intensive and rarely effective. The most effective method is to spot/blanket spray in late spring - autumn using Fusillade or Targa at 4l per ha. Brushcutting and raking off bulk of plant material prior to treatment often improves ease of removal and spraying.				
	Do not spray over winter as this plant does not actively grow at this time. Flauzifop-butyl can be used on couch occurring amongst native rushes and sedges as they are tolerant of this chemical. Ensure that the population requiring treatment is not Sporobolus virginicus, the native salt water couch.				

Species Name:	Cyperus spp	Control Priority	Location	Habit	Form
Common Name:		2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	May - July Oct - Jan		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth and seed				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Nov - Jan				Grass <input type="checkbox"/>
Method of Control:	Spot spraying in summer using 150ml of Roundup in 15l of water + Pulse. Note, Biactive is more acceptable than other forms of Glyphosate for use over waterlogged areas. Repeated brushcutting to prevent flowering is also effective in the long term.				
	Identification is frequently difficult with these species so it is important to ensure that the plant to be controlled is a weed and not native to the area. Remove seed heads as a minimum control technique until such time as identification has been achieved.				

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available

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Species Name:	Cytisus proliferus	Control Priority	Location	Habit	Form
Common Name:	Tree lucerne	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input checked="" type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	All year				Grass <input type="checkbox"/>
Method of Control:	The most effective method is to cut the plant off at ground level. Treating the stump with chemical is not usually necessary, unless the stump is cut more than 20mm above ground level. Remove all plant material from the site.				
	Kings Park recommends using Glyphosate at 1:15 on the cut stump.				

Species Name:	Dipogon lignosus	Control Priority	Location	Habit	Form
Common Name:	Dolichos pea	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Hand removal of small populations. Spot spraying with Glyphosate 1 in 50 or 1:100, can be effective.				
	At the moment, this plant is not extensively distributed around the waterways in the Perth Metropolitan area. It does have the potential however, to become a serious weed in this region - so works should focus where this species is present.				

Species Name:	Echinochloa telmatophila	Control Priority	Location	Habit	Form
Common Name:	Barnyard grass	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Dec		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	July - Sept				Grass <input checked="" type="checkbox"/>
Method of Control:	Remove small populations by hand. Hand weeding is preferred provided it will not increase erosion potential of any areas. As this plant occurs in wetlands, herbicide use is not preferred.				
	Alternatively treat with Fusillade or equivalent prior to flowering. Herbicide rates of 750ml to 2l dependent on plant size - prior to flowering.				

Species Name:	Echlum plantagineum	Control Priority	Location	Habit	Form
Common Name:	Paterson's curse	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Jan		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	July - Oct				Grass <input type="checkbox"/>
Method of Control:	Hand weed small populations. Broader scale populations can be sprayed with Glyphosate. A rate of 75-100 ml per 15l of water is recommended by Kings Park Board staff.				

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available



Species Name: *Ehrharta calycina* **Control Priority** **Location** **Habit** **Form**

Common Name: Veldtgrass **1** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: March, April and Sept, Oct **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: Aug - Dec **Grass**

Method of Control: Hand weed localised infestations. Repeated brushcutting of larger stands of the weed, close to root base has been effective, followed by spot/blanket spraying using Fusillade at 4l per ha or Sertin/Targa. It is important to tag any native plants persisting amongst stands of Veldtgrass to protect them from brushcutting activities. Hand weed grasses close to any native plants. **Climber**

This plant represents a significant fire hazard in dense, extensive populations which generally occurs along disturbed road verges and fire access tracks.

Species Name: *Eragrostis curvula* **Control Priority** **Location** **Habit** **Form**

Common Name: African love grass **1** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: June - Nov **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: Nov - March **Grass**

Method of Control: Hand weed small infestations prior to mulching. Kings Park have found complete foliar spraying after fire or in summer months using Glyphosate 1l in 100l water and wetter e.g. Agral 60, X77 to be effective. Repeated brushcutting can be effective combined with herbicide treatment of regrowth. This minimises herbicide required by a reducing the amount of leaf material. **Climber**

This plant represents a significant fire hazard and therefore a major threat to native vegetation. Do not set fire to on purpose but take advantage of easier access should any wildfire occur over summer.

Species Name: *Erodium moschatum* **Control Priority** **Location** **Habit** **Form**

Common Name: Musky crowfoot **2** **Dryland** **Bulb/Corm** **Tree**

Seed Form: Coarse seed **Riparian** **Perennial** **Shrub**

Seeding Time: **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: June - Sept **Grass**

Method of Control: Hand weeding is effective in predominantly native vegetation zones. This species is difficult to control due to the widespread nature of the populations. **Climber**

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name:	<i>Erythrina x sykesii</i>	Control Priority	Location	Habit	Form
Common Name:	Coral Tree	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from suckers				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Mar				Grass <input type="checkbox"/>
Method of Control:	Inject tree with systemic herbicide at 10 - 15 cm intervals around the trunk. Treatment may be required several times. Cut and paint any suckers with Glyphosate.				
	Remove any branches which fall from the tree, as these can take root. Ensure bank stability is not threatened when removing the dead trunk.				

Species Name:	<i>Ferraria crispa</i>	Control Priority	Location	Habit	Form
Common Name:	Black flag	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Oct				Grass <input type="checkbox"/>
Method of Control:	Hand weed using gloves as this species is highly toxic. Kings Park suggests spot spraying Glyphosate 1 in 100 for control or using Ally/Brushoff and Glean at flowering time.				

Species Name:	<i>Ficus spp.</i>	Control Priority	Location	Habit	Form
Common Name:	Edible fig tree	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input checked="" type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Mar		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Nov				Grass <input type="checkbox"/>
Method of Control:	Small plants can be removed by hand. Mature plants can be injected with full strength Glyphosate at 15 cm intervals around the trunk. Fruit removal effectively reduces the rate of spread of this weed.				

These plants are common in riparian zones. It is important not to disturb their root structure as generally these plants provide considerable bank stability in the absence of native plants. Removing the bulk of the branches and stems in dense areas may be appropriate.

Species Name:	<i>Foeniculum vulgare</i>	Control Priority	Location	Habit	Form
Common Name:	Fennel	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Feb		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Sept				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is effective for small plants. For large plants, cut the stems below ground and remove plant material prior to fruiting to reduce future spread. Alternatively, this weed can be controlled by applying Glyphosate 1 in 100 before or at flowering or repeated brushcutting.				

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available

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Species Name:	<i>Freesia aff leichtinii</i>	Control Priority	Location	Habit	Form
Common Name:	Freesia	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Nov		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Sept				Grass <input type="checkbox"/>
Method of Control:	Small infestations can be dug out, bagged and removed from site. The sieving method outlined for <i>Watsonia</i> can be effective. Care needs to be taken to ensure that no corms are dropped when removing the plants from site - otherwise it will create more work in the future.				
	For large infestations Kings Park Board Staff recommend applying Glyphosate 1 in 100 or Brushoff 5g per ha just prior to flowering (August).				

Species Name:	<i>Fumaria capreolata</i>	Control Priority	Location	Habit	Form
Common Name:	Whiteflower fumitory	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Mar		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	May - Sept				Grass <input type="checkbox"/>
Method of Control:	Hand weed prior to seeding.				

Species Name:	<i>Gladiolus spp</i>	Control Priority	Location	Habit	Form
Common Name:	Gladiolus	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Feb-June		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb/corm growth and seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Dec				Grass <input type="checkbox"/>
Method of Control:	Remove flower heads to prevent seed production. In heavy soils, handweed by digging around clump, sieving and shaking back sand. Can hand weed easily in dryland areas (Aug-Sept). Bag all the corms and dispose of carefully. It is possible to use herbicide for severe infestations including Glean, Brushoff and Glyphosate - using hand wiping technique.				

Species Name:	<i>Gomphocarpus fruticosus</i>	Control Priority	Location	Habit	Form
Common Name:	Cotton bush	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light and easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Dec				Grass <input type="checkbox"/>
Method of Control:	Hand weed small plants prior to fruiting. Alternatively cut at or slightly below ground level and remove plant material. Selectively spraying the leaves with Glyphosate 1 in 100 is the suggested herbicide treatment.				
	Some people have adverse reactions to the sap of this plant. Wear gloves and take care when handling plant material.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name:	Hesperantha falcata	Control Priority	Location	Habit	Form
Common Name:		<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Kings Park Board staff have been unable to find little information about controlling this weed. This agency recommends using Glyphosate at a rate of 1 to 100 at flowering time, but because this plant has small leaves it is difficult to target. Trialling Glean/Brushoff is also recommended.				

Species Name:	Homeria flaccida	Control Priority	Location	Habit	Form
Common Name:	One leaf cape tulip	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:			Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Removing these plants by hand can be effective if care is taken to remove all corms. For extensive populations, it is recommended that the plants are wiped with Glyphosate 1 in 10. It is important to note that not all corms re-shoot in a given year so it is essential to monitor and treat re-growth annually. This plant is toxic to stock.				

Species Name:	Hordeum leporinum	Control Priority	Location	Habit	Form
Common Name:	Barley grass	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Sept - Oct		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	July - August				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is effective for small populations. Herbicide treatment using Fusillade at 2l per ha can work in bushland environments. Kings Park recommends spraying in July-Aug. It is important that hand weeding or spraying occurs before seed set.				

Species Name:	Hyparrhenia hirta	Control Priority	Location	Habit	Form
Common Name:	Tambooke grass	<input type="checkbox"/> 1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Nov - Mar				Grass <input type="checkbox"/>
Method of Control:	Hand weeding small plants prior to flowering is relatively easy. Brushcutting to remove most leaf material prior to herbicide treatment improves the effectiveness of the application. Fusillade at 4l per ha works best on new growth. Repeat treatments are likely to be required. This is a WA native grass which is extending its distribution as a result of disturbance and vehicle movement.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Hypochaeris radicata* **Control Priority** **Location** **Habit** **Form**

Common Name: Flatweed 3 Dryland Bulb/Corm Tree

Seed Form: Light and easily spread by wind Riparian Perennial Shrub

Seeding Time: Oct - Mar Aquatic Annual Herb

Method of Spread: Spreads mostly from seed Rush/Sedge

Best Time of Control: All year Grass

Method of Control: Hand weeding is fast and effective prior to, or during flowering. Climber

Species Name: *Ipomoea spp* **Control Priority** **Location** **Habit** **Form**

Common Name: Morning glory 1 Dryland Bulb/Corm Tree

Seed Form: Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads from both seed and vegetative growth Rush/Sedge

Best Time of Control: Grass

Method of Control: Cut and remove existing growth, and then treat regrowth as it develops with Glyphosate at 300ml per 15l water with Pulse. This technique is preferred by the Kings Park Board staff. Climber

Continued effort to remove the bulk of the vegetative material, taking care not to drop segments, can also be helpful in minimising the need for herbicide use.

This plant is becoming increasingly dominant in highly urbanised streams and should be controlled.

Species Name: *Isolepis prolfera* **Control Priority** **Location** **Habit** **Form**

Common Name: Budding club rush 2 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Dec - Feb Aquatic Annual Herb

Method of Spread: Spreads from both seed and vegetative growth Rush/Sedge

Best Time of Control: Winter Grass

Method of Control: This plant occurs in homogeneous clumps in seasonally waterlogged area. It may be worth trying to cover this weed with black plastic held down with rocks to drown the plant over winter. Climber

Rotary hoeing and spraying the regrowth with Glyphosate with surfactant can be effective. Kings Park Board suggests Glyphosate 1 to 20 plus Pulse. It is important to do this in summer following the frog breeding season and prior to the bird breeding season. Repeat treatments will be required.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name:	Juncus articulatus	Control Priority	Location	Habit	Form
Common Name:	Articulated rush	<input type="checkbox"/> 2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Mar		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Sept - Mar				Grass <input type="checkbox"/>
Method of Control:	Manually weeding all plants is the preferred method for removing this species.				Climber <input type="checkbox"/>

Ensure that the plants to be controlled have been correctly identified as the weed species. If unsure of weed status then removing the flowering heads to minimise spread is helpful and will not seriously interfere with the plants until they have been correctly identified.

Species Name:	Juncus capitatus	Control Priority	Location	Habit	Form
Common Name:		<input type="checkbox"/> 3	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - mar		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Sept - Nov				Grass <input type="checkbox"/>
Method of Control:	Manually weed small plants. The preferred method for removing larger clumps involves brushcutting to remove the bulk of material and then digging the plants out and removing the base and leaves from the site. Any regrowth from sections missed can then be slashed and treated with Glyphosate applied at half strength. Several applications may be required.				Climber <input type="checkbox"/>

Ensure that the plants to be controlled have been correctly identified as weed species. If unsure of weed status then removing the flowering heads to minimise spread is helpful and will not seriously interfere with the plants until they have been correctly identified.

Species Name:	Juncus microcephalus	Control Priority	Location	Habit	Form
Common Name:		<input type="checkbox"/> 2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Mar		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input checked="" type="checkbox"/>
Best Time of Control:	Sept - Dec				Grass <input type="checkbox"/>
Method of Control:	Manually weed small plants. The preferred method for removing larger clumps involves brushcutting to remove the bulk of material and then digging the plants out and removing the base and leaves from the site. Any regrowth from sections missed can then be slashed and treated with Glyphosate applied at half strength. Several applications may be required.				Climber <input type="checkbox"/>

This plant is a serious weed. Ensure correct identification prior to implementing weed control as this plant is similar to native rush and sedge species. Plants occurring on river banks should not be dug out as removal may create a new erosion problem. Use extra care when using herbicides close to the water.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Lantana camara* **Control Priority** 3 **Location** **Habit** **Form**

Common Name: Lantana **Dryland** **Bulb/Corm** **Tree**

Seed Form: **Riparian** **Perennial** **Shrub**

Seeding Time: **Aquatic** **Annual** **Herb**

Method of Spread: Spreads from both seed and vegetative growth **Rush/Sedge**

Best Time of Control: **Grass**

Method of Control: Hand weed (grub out) small communities. Spray localised populations with Glyphosate 1 in 10 covering all foliage. **Climber**

Monitoring re-occurrence of this plant in areas where previous control work has been undertaken is essential.

Species Name: *Leptospermum laevigatum* **Control Priority** 1 **Location** **Habit** **Form**

Common Name: Victorian coastal teatree **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: April - October **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: All year **Grass**

Method of Control: Hand weed seedlings. For mature plants, cut stems to ground level annually until control is achieved. Remove flowering branches when possible. **Climber**

Note, in some cases where this weed provides shelter this should be done only after native plants have grown sufficiently to take their place.

Species Name: *Lolium spp.* **Control Priority** 2 **Location** **Habit** **Form**

Common Name: Rye grass **Dryland** **Bulb/Corm** **Tree**

Seed Form: Light, easily spread by wind **Riparian** **Perennial** **Shrub**

Seeding Time: March - June **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: Dec - Mar **Grass**

Method of Control: Handweeding is preferred, except for extensive populations. Spot spraying of Sertin, Targa or similar at 4l per ha prior to flowering can be effective. **Climber**

In areas where steep banks are present and this species is dominant removing the seed heads to limit spread is preferred to complete removal, in order to ensure that bank stability is protected.

Species Name: *Lupinus angustifolia* **Control Priority** 2 **Location** **Habit** **Form**

Common Name: Lupin **Dryland** **Bulb/Corm** **Tree**

Seed Form: Heavy seed **Riparian** **Perennial** **Shrub**

Seeding Time: Oct - Dec **Aquatic** **Annual** **Herb**

Method of Spread: Spreads mostly from seed **Rush/Sedge**

Best Time of Control: Aug - Oct **Grass**

Method of Control: Handweed small populations. Alternatively, spray the plants selectively with Glyphosate 2% solution. **Climber**

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name: **Medicago spp** **Control Priority** **3** **Location** **Dryland** **Riparian** **Aquatic** **Habit** **Bulb/Corm** **Perennial** **Annual** **Form** **Tree** **Shrub** **Herb** **Rush/Sedge** **Grass** **Climber**

Common Name: Medics

Seed Form: Light seed

Seeding Time:

Method of Spread: Spreads mostly from seed

Best Time of Control: June - Sept

Method of Control: This plant may be controlled effectively with Glyphosate. Kings Park Board recommends a rate of 75-100ml in 15l of water.

Species Name: **Monopsis debilis** **Control Priority** **3** **Location** **Dryland** **Riparian** **Aquatic** **Habit** **Bulb/Corm** **Perennial** **Annual** **Form** **Tree** **Shrub** **Herb** **Rush/Sedge** **Grass** **Climber**

Common Name:

Seed Form:

Seeding Time:

Method of Spread:

Best Time of Control:

Method of Control: Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful.
Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.

Species Name: **Myrsiphyllum asparagoides** **Control Priority** **1** **Location** **Dryland** **Riparian** **Aquatic** **Habit** **Bulb/Corm** **Perennial** **Annual** **Form** **Tree** **Shrub** **Herb** **Rush/Sedge** **Grass** **Climber**

Common Name: Bridal Creeper

Seed Form: Light seed

Seeding Time: Oct - Dec

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control: Jul - Sept

Method of Control: Remove young plants by hand as they appear. If spraying, remove the bulk of the plant material prior to spraying then treat the smaller biomass of plants approximately a fortnight later. Kings Park currently recommends using either Glyphosate 360 at a rate of 1 in 100, or 2.5 to 5g per ha in 250l of water. Repeat applications will be required for either chemical.
Kings Park may have more up to date control measures. It is essential to take extreme care when treating this plant as it generally occurs within close proximity of native plants, and causing the unintentional death of non-target plants is possible.

Species Name: **Narcissus tazetta** **Control Priority** **2** **Location** **Dryland** **Riparian** **Aquatic** **Habit** **Bulb/Corm** **Perennial** **Annual** **Form** **Tree** **Shrub** **Herb** **Rush/Sedge** **Grass** **Climber**

Common Name: Jonquil

Seed Form: Coarse seed

Seeding Time:

Method of Spread: Spreads by bulb or corm growth

Best Time of Control: Winter - Spring

Method of Control: Removing these plants by hand can be effective if care is taken to remove all corms. For extensive populations, it is recommended that the plants are wiped with Glyphosate 1 in 10.
It is important to note that not all corms re-shoot in a given year so it is essential to monitor and treat re-growth annually. This plant is toxic to stock.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name: *Nerium oleander* **Control Priority** 3 **Location** **Habit** **Form**

Common Name: Oleander **Location** **Habit** **Form**

	Dryland	<input checked="" type="checkbox"/>	Bulb/Corm	<input type="checkbox"/>	Tree	<input type="checkbox"/>
	Riparian	<input type="checkbox"/>	Perennial	<input checked="" type="checkbox"/>	Shrub	<input checked="" type="checkbox"/>
	Aquatic	<input type="checkbox"/>	Annual	<input type="checkbox"/>	Herb	<input type="checkbox"/>

Seed Form: Coarse seed **Form**

	Rush/Sedge	<input type="checkbox"/>
	Grass	<input type="checkbox"/>
	Climber	<input type="checkbox"/>

Seeding Time:

Method of Spread: Spreads from both seed and vegetative growth

Best Time of Control: All year

Method of Control: Dig out the individual plants. Otherwise cut the stumps and paint with full strength systemic herbicide.

Species Name: *Olea europaea* **Control Priority** 2 **Location** **Habit** **Form**

Common Name: Olive tree **Location** **Habit** **Form**

	Dryland	<input checked="" type="checkbox"/>	Bulb/Corm	<input type="checkbox"/>	Tree	<input checked="" type="checkbox"/>
	Riparian	<input type="checkbox"/>	Perennial	<input checked="" type="checkbox"/>	Shrub	<input type="checkbox"/>
	Aquatic	<input type="checkbox"/>	Annual	<input type="checkbox"/>	Herb	<input type="checkbox"/>

Seed Form: Heavy seed **Form**

	Rush/Sedge	<input type="checkbox"/>
	Grass	<input type="checkbox"/>
	Climber	<input type="checkbox"/>

Seeding Time: Nov - Jan

Method of Spread: Spreads mostly from seed

Best Time of Control:

Method of Control: Hand weed juvenile plants. For small plants, selectively spray foliage with full strength Glyphosate. Larger trees can be managed by either cutting the stump and painting with Glyphosate or Garlon (recommended by Kings Park Board staff), or alternatively injecting into the stem at 15 cm intervals. Follow up treatments may be required.

Encouraging fruit harvesting by residents will reduce the rate of spread of this weed.

Species Name: *Oxalis pes-caprae* **Control Priority** 2 **Location** **Habit** **Form**

Common Name: Soursob **Location** **Habit** **Form**

	Dryland	<input type="checkbox"/>	Bulb/Corm	<input type="checkbox"/>	Tree	<input type="checkbox"/>
	Riparian	<input type="checkbox"/>	Perennial	<input type="checkbox"/>	Shrub	<input type="checkbox"/>
	Aquatic	<input type="checkbox"/>	Annual	<input type="checkbox"/>	Herb	<input type="checkbox"/>

Seed Form: Light seed **Form**

	Rush/Sedge	<input type="checkbox"/>
	Grass	<input type="checkbox"/>
	Climber	<input type="checkbox"/>

Seeding Time: Sept

Method of Spread: Spreads by runners

Best Time of Control: July - Sept

Method of Control: Hand weeding can be effective provided that care is taken to trace all runners from the parent plant and that no stem and root is left behind.

Apply Glyphosate 75ml in 10l in winter or before foliage starts to yellow.

Species Name: *Panicum capillare* **Control Priority** 3 **Location** **Habit** **Form**

Common Name: Witchgrass **Location** **Habit** **Form**

	Dryland	<input checked="" type="checkbox"/>	Bulb/Corm	<input type="checkbox"/>	Tree	<input type="checkbox"/>
	Riparian	<input type="checkbox"/>	Perennial	<input type="checkbox"/>	Shrub	<input type="checkbox"/>
	Aquatic	<input type="checkbox"/>	Annual	<input checked="" type="checkbox"/>	Herb	<input type="checkbox"/>

Seed Form: **Form**

	Rush/Sedge	<input type="checkbox"/>
	Grass	<input checked="" type="checkbox"/>
	Climber	<input type="checkbox"/>

Seeding Time:

Method of Spread: Spreads mostly from seed

Best Time of Control:

Method of Control: As with most introduced grasses, Fusillade at 2l per ha can be effective. The herbicide should be applied prior to flowering.

This species has the potential to spread rapidly through wetland environments.

Control priority 1 - Major environmental weed, urgent control required
 Control priority 2 - Nuisance weed, control as soon as possible
 Control priority 3 - Minor weed, control as resources become available



Species Name:	<i>Paspalum spp</i>	Control Priority	Location	Habit	Form
Common Name:	Paspalum	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Dec - Jan		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Mar				Grass <input checked="" type="checkbox"/>
Method of Control:	Repeated brushcutting/slashing can be effective in controlling this plant - provided it occurs prior to seed development. The accepted herbicide treatment is the application of Fusillade at 4l per ha.				
	It is possible to reduce the volume of herbicide required by slashing/rotary hoeing and then treating the regrowth.				

Species Name:	<i>Pelargonium capftatum</i>	Control Priority	Location	Habit	Form
Common Name:	Rose pelargonium	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Jan - April		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Spring				Grass <input type="checkbox"/>
Method of Control:	Hand weed in autumn / winter, trying very hard not leave any stem or root behind as the plants will reshoot. Kings Park suggests the two herbicide treatments listed. Spot Spray with Ally/Brush 5g per ha or spray with Glyphosate 1 in 100 with wetting agent in early September.				
	This plant is an effective coloniser and it may smother any small native plants present.				

Species Name:	<i>Pennisetum clandestinum</i>	Control Priority	Location	Habit	Form
Common Name:	Kikuyu	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Sterile or non seed producing		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Dec				Grass <input checked="" type="checkbox"/>
Method of Control:	The most effective technique recognised is the application of Fusillade at a rate of 4l per ha while the plant is actively growing.				
	Fusillade should not be applied over open water. Native rushes and sedges are not at risk when using this chemical.				

Species Name:	<i>Plantago lanceolata</i>	Control Priority	Location	Habit	Form
Common Name:	Ribwort plantain	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Nov - Dec				Grass <input type="checkbox"/>
Method of Control:	Pull Ribwort by hand ensuring that tap root is properly removed. Generally populations of this weed are limited and can be managed effectively using manual weed control methods. Kings Park Board recommends wiping with Glyphosate 100ml in 15l water.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Populus spp* **Control Priority** 2 **Location** **Habit** **Form**

Common Name: Poplar **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: **Rush/Sedge**
Seeding Time: **Grass**
Method of Spread: Spreads from suckers **Climber**

Best Time of Control: Oct - Feb

Method of Control: Experience indicates that injecting concentrated systemic herbicide at 10 - 15 cm intervals around the trunk can be effective, and reduces the number of suckers which can occur following the cut stump technique. Kings Park considers this plant difficult to control and recommends the cut stump method with Garlon 600.

Species Name: *Raphanus raphanistrum* **Control Priority** 3 **Location** **Habit** **Form**

Common Name: Wild radish **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Light seed **Rush/Sedge**
Seeding Time: Dec **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: Sept - Nov

Method of Control: Removing these species by hand is easy and can be done very quickly. Removal should occur prior to the plants flowering and seeding to reduce the rate of spread. Bagging and cutting the seeding stems, from any plants, should be undertaken prior to removal.

The alternative is to paint with Glyphosate 1 in 10.

Species Name: *Rhynchelytrum repens* **Control Priority** 1 **Location** **Habit** **Form**

Common Name: Red natal grass **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Light and easily spread by wind **Rush/Sedge**
Seeding Time: Sept - Nov **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: June to Aug

Method of Control: This plant is effectively controlled using Fusillade at a rate of 4l per ha (as for most other introduced grasses).

Species Name: *Ricinus communis* **Control Priority** 1 **Location** **Habit** **Form**

Common Name: Castor Oil **Dryland** **Bulb/Corm** **Tree**
Riparian **Perennial** **Shrub**
Aquatic **Annual** **Herb**
Seed Form: Heavy seed **Rush/Sedge**
Seeding Time: Nov - Jan **Grass**
Method of Spread: Spreads mostly from seed **Climber**

Best Time of Control: Any time but best prior to fruiting

Method of Control: Small populations can be removed by hand. Individual plants can be cut and painted with Glyphosate. Populations of seedlings can be sprayed with Glyphosate 1 in 80, while injecting large plants with a systemic herbicide is effective.

The seed from this plant has been shown to be viable more than 1 000 years later, so vigilance is required to remove plants prior to seeding.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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Species Name:	Romulea rosea	Control Priority	Location	Habit	Form
Common Name:	Guildford grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads by bulb or corm growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input checked="" type="checkbox"/>
Method of Control:	In areas with homogeneous populations, Kings Park Board suggests Brushoff / Ally can give good control and can be used over some turf species. Repeated rotary hoeing and slashing prior to flowering can assist in managing populations.				

Species Name:	Rorippa nasturtium-aquaticum	Control Priority	Location	Habit	Form
Common Name:	Watercress	2	Dryland <input type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light seed		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input checked="" type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Access dependent				Grass <input type="checkbox"/>
Method of Control:	This aquatic weed is difficult to control because it slows water movement, increases sedimentation and reduces erosion which means implementing control can affect bed and bank stability. The recommended removal technique involves manual clearing of a channel and also clearing 5 to 10 m wide bands, 20 metres apart which are perpendicular to the stream flow. This will minimise the potential for de-stabilising the stream bed.				
	Seek expert advice and approvals from the relevant government agencies prior to implementing broad scale works.				

Species Name:	Rubus spp	Control Priority	Location	Habit	Form
Common Name:	Blackberry	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input checked="" type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Dec - April				Grass <input type="checkbox"/>
Method of Control:	Brush cut and remove brambles. Hand weed removing knotty stumps and as much root as possible. Paint regrowth with Glyphosate 12ml to 1l of water. Better control is often achieved with a combination of Brushoff, Garlon or blackberry and tree killer. Biological controls using a rust fungus have been successful. Agriculture WA may be able to assist with this.				
	Brushcutting these plants can provide very difficult and using a team of goats as the first method of attack can prove very useful in terms of increasing access and removing the bulk of the vegetative material. It is important that any blackberry control takes into consideration fauna corridors in continuous strips of sufficient width to discourage predators, particularly to protect birds and bandicoots.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Rumex spp* **Control Priority** 2 **Location** *Dryland* *Riparian* *Aquatic* **Habit** *Bulb/Corm* *Perennial* *Annual* **Form** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Dock

Seed Form: Light and easily spread by wind

Seeding Time: March - June

Method of Spread: Spreads mostly from seed

Best Time of Control: Nov - Mar

Method of Control: These plants are readily eradicated through hand weeding. Remove flowering heads prior to seed ripening if complete plant removal is not possible.

Always bag plants with seeds and dispose of carefully.

Species Name: *Salix spp* **Control Priority** 1 **Location** *Dryland* *Riparian* *Aquatic* **Habit** *Bulb/Corm* *Perennial* *Annual* **Form** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Willow

Seed Form: Heavy seed

Seeding Time:

Method of Spread: Spreads from suckers

Best Time of Control: Dec - Mar

Method of Control: Small plants can be removed by hand. Mature plants can be injected with full strength Glyphosate at 10 - 15 cm intervals around the trunk. Any suckers which appear can be painted with systemic herbicide. It is important not to remove the parent plant until it is dead and no more suckers are being produced.

Removal of willows along watercourses can have a detrimental effect through loss of habitat, streamside erosion and exposure of understorey. Consideration should be given to replacing the plants to be removed two years prior to undertaking removal.

Species Name: *Schinus terebinthifolia* **Control Priority** 1 **Location** *Dryland* *Riparian* *Aquatic* **Habit** *Bulb/Corm* *Perennial* *Annual* **Form** *Tree* *Shrub* *Herb* *Rush/Sedge* *Grass* *Climber*

Common Name: Japanese pepper

Seed Form: Coarse seed

Seeding Time: Sept

Method of Spread: Spreads from suckers and seed

Best Time of Control: All year, but in wetlands treat in summer

Method of Control: Hand weed small seedlings. It is important to monitor for any new germinants to enable rapid removal from the site. Treating the large plants can be undertaken either by cutting the trunk and immediately painting the stump, or alternatively injecting systemic herbicide at 10 - 15 cm intervals around the trunk. Kings Park recommends either Glyphosate, Velpar or Garlon.

The seed is spread predominantly by introduced birds and there is some anecdotal evidence that many native birds are poisoned by the seeds.

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name:	Solanum nigrum	Control Priority	Location	Habit	Form
Common Name:	Deadly nightshade	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Oct - Dec		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Oct				Grass <input type="checkbox"/>
Method of Control:	Hand weed small infestations. Kings Park Board recommends using Glyphosate 1 in 100. Dessicant herbicides applied to all parts of the plant can be effective on warm to hot days.				

Species Name:	Stachys arvensis	Control Priority	Location	Habit	Form
Common Name:	Staggerweed	3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful where there are no remnant native species. Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.				

Species Name:	Stenotaphrum secundatum	Control Priority	Location	Habit	Form
Common Name:	Buffalo grass	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Sterile or non seed producing		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads readily from rhizome growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug - Sept				Grass <input checked="" type="checkbox"/>
Method of Control:	Hand weeding is very difficult, labour intensive and rarely successful. The most effective method is to implement a minimum of two spot/blanket treatments in Aug-Oct and April-May using Fusillade or Targa at 4l per ha. Brushcutting often improves ease of removal and spraying. This process typically requires more than two treatments. Can implement spraying amongst native rushes and sedges which have been demonstrated to tolerate flauzifop-butyl.				

Species Name:	Taraxacum officinale	Control Priority	Location	Habit	Form
Common Name:	Dandelion	2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Light, easily spread by wind		Riparian <input type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	All year round		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Sept - Nov				Grass <input type="checkbox"/>
Method of Control:	Hand weeding is the most effective means of control ensuring that if seed heads are present, they are carefully bagged prior to removal of the plant. Wiping with Glyphosate is also effective.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name:	<i>Thunbergia alata</i>	Control Priority	Location	Habit	Form
Common Name:	Black-eyed Susan	<input type="checkbox"/> 2	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Remove small plants manually. Spot spraying with Glyphosate at a rate of 1 in 50 can be effective.				Climber <input checked="" type="checkbox"/>
	This plant poses a serious threat to the State's waterways and any small populations should be worked on quickly to reduce the potential spread.				

Species Name:	<i>Trifolium spp.</i>	Control Priority	Location	Habit	Form
Common Name:	Clovers	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:			Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:					Grass <input type="checkbox"/>
Method of Control:	Hand weed small populations. Spraying populations with Glyphosate at 75 - 100 ml in 15l of water is recommended by Kings Park Board. Repeated rotary hoeing with follow up spraying can be effective in pasture situations.				Climber <input type="checkbox"/>

Species Name:	<i>Tropaeolum majus</i>	Control Priority	Location	Habit	Form
Common Name:	Nasturtium	<input type="checkbox"/> 3	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
Seed Form:	Heavy seed		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
Seeding Time:	Nov - Jan		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input type="checkbox"/>
Method of Spread:	Spreads mostly from seed				Rush/Sedge <input type="checkbox"/>
Best Time of Control:	Aug / Sept				Grass <input type="checkbox"/>
Method of Control:	Removing this species by hand is effective. Selectively applying Glyphosate 1 in 100 can be effective.				Climber <input checked="" type="checkbox"/>
	Awareness campaigns about the implications of dumping garden waste in reserves need to be upgraded and implemented intensively to discourage such activities.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Species Name: *Typha orientalis* **Control Priority** **Location** **Habit** **Form**

Common Name: Bulrush 1 Dryland Bulb/Corm Tree

Seed Form: Light, easily spread by wind Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads readily from rhizome growth and seed Rush/Sedge

Best Time of Control: Winter Grass

Method of Control: Remove seed heads prior to ripening in September - December. Cut stems below water level in May, if sufficient water is present, monitor regrowth and continue to cut until September to drown the plants. Climber

For populations occurring in waterlogged areas only use Glyphosate BioActive 1 to 10 in spring, after slashing plants first and wipe new growth when plants are 1m tall. Take care when using herbicide over water.

The native cumbungi, *Typha domingensis*, looks similar to Bulrush and it is important to ensure that the population being controlled is in fact the weed species.

Species Name: *Ursinia anthemoides* **Control Priority** **Location** **Habit** **Form**

Common Name: Ursinia 3 Dryland Bulb/Corm Tree

Seed Form: Light seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Rush/Sedge

Best Time of Control: Grass

Method of Control: Pull out small populations to prevent them from spreading. Repeated rotary hoeing/mowing to prevent flowering can be helpful. Climber

Kings Park Board staff suggest Glyphosate at 75-100ml in 15l of water prior to flowering.

Species Name: *Vicia sativa* **Control Priority** **Location** **Habit** **Form**

Common Name: Vetch 3 Dryland Bulb/Corm Tree

Seed Form: Heavy seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads from both seed and vegetative growth Rush/Sedge

Best Time of Control: Grass

Method of Control: Kings Park recommends trying Glyphosate 75ml in 15 l when the plants are actively growing. Hand weeding small populations is possible and effective. Climber

Species Name: *Vinca major* **Control Priority** **Location** **Habit** **Form**

Common Name: Periwinkle 3 Dryland Bulb/Corm Tree

Seed Form: Coarse seed Riparian Perennial Shrub

Seeding Time: Aquatic Annual Herb

Method of Spread: Spreads by runners Rush/Sedge

Best Time of Control: June - Aug Grass

Method of Control: It is generally recommended that this weed is managed by applying Glyphosate at 1 in 10 with surfactant. Climber

Applications will need to be repeated several times at intervals of one month.

Control priority 1 - Major environmental weed, urgent control required
Control priority 2 - Nuisance weed, control as soon as possible
Control priority 3 - Minor weed, control as resources become available

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<i>Species Name:</i>	Watsonia bulbifera	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Watsonia	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input checked="" type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Light and easily spread by wind and wat		Riparian <input checked="" type="checkbox"/>	Perennial <input type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	March - May		Aquatic <input type="checkbox"/>	Annual <input checked="" type="checkbox"/>	Herb <input checked="" type="checkbox"/>
<i>Method of Spread:</i>	Spreads by bulb/corm growth				Rush/Sedge <input type="checkbox"/>
<i>Best Time of Control:</i>					Grass <input type="checkbox"/>
<i>Method of Control:</i>	Remove corms by carefully digging a large area around each plant, putting the sand onto flywire, sieving and collecting all the corms. Flowers should also be harvested to prevent the production of seed and subsequent spread. The collected corms should be disposed of carefully.				
	Broadscale removal of dense stands may threaten bank stability. Remove in nodes along the waterway.				
	Selectively spray a combination of herbicides between July to August using Glean and Ally/Brushoff and subsequently painting leaf with Glyphosate in September to November can be effective. Remove the bulk of dead biomass leaving the rhizome mats in tact.				

<i>Species Name:</i>	Zantedeschia aethiopica	<i>Control Priority</i>	<i>Location</i>	<i>Habit</i>	<i>Form</i>
<i>Common Name:</i>	Arum lily	1	Dryland <input checked="" type="checkbox"/>	Bulb/Corm <input type="checkbox"/>	Tree <input type="checkbox"/>
<i>Seed Form:</i>	Coarse seed		Riparian <input checked="" type="checkbox"/>	Perennial <input checked="" type="checkbox"/>	Shrub <input type="checkbox"/>
<i>Seeding Time:</i>	Dec		Aquatic <input type="checkbox"/>	Annual <input type="checkbox"/>	Herb <input checked="" type="checkbox"/>
<i>Method of Spread:</i>	Spreads from both seed and vegetative growth				Rush/Sedge <input type="checkbox"/>
<i>Best Time of Control:</i>	April - Nov				Grass <input type="checkbox"/>
<i>Method of Control:</i>	Entire plants can be removed by digging - make sure to remove all of the rhizome. Spot spray from April to November using Glyphosate 1in 100 or Glean Ally/Brushoff 1in 50 (20g per ha). Respraying is likely to be required 8 weeks later.				
	In wetland environments Roundup Biactive should be used to minimise fauna losses.				

Control priority 1 - Major environmental weed, urgent control required

Control priority 2 - Nuisance weed, control as soon as possible

Control priority 3 - Minor weed, control as resources become available

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Appendix 3

Suggested species for revegetation works



Appendix 3: Suggested species for revegetation works

Species	CommonName	Location							Habitat			
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Eilen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<u>1. Spreading tree</u>												
<i>Banksia attenuata</i>	Slender banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Banksia littoralis</i>	Swamp banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Banksia menziesii</i>	Firewood banksia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Casuarina obesa</i>	Saltwater sheoak	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Corymbia calophylla</i>	Marri	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Eucalyptus marginata</i>	Jarra	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Eucalyptus rudis</i>	Flooded gum	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Eucalyptus wandoo</i>	Wandoo	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Parasenthanthes lophantha</i>	Native albizia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>2. Compact tree</u>												
<i>Eucalyptus toditiana</i>	Coastal blackbutt	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca cuticularis</i>	Saltwater paperbark	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca preissiana</i>	Modong	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca thaphiophylla</i>	Swamp paperbark	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>					
<i>Nuytsia floribunda</i>	Christmas tree	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
<u>3. Large shrub</u>												
<i>Acacia saligna</i>	Coojong	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
<i>Agonis linearifolia</i>	Swamp peppermint	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Dryandra sessilis</i>	Parrot bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Grevillea diversifolia</i>	Variable leaved grevillea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca incana</i>	Grey honeymyrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca teretifolia</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This information is site specific to the sections of assessed foreshore. Please seek expert advice if placing these species outside of the surveyed sections.

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Species	CommonName	Location								Habitat		
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<i>Melaleuca viminea</i>	Mohan	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
<i>Oxylobium lineare</i>	River pea	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<i>Viminaria juncea</i>	Swishbush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>							
4. Medium shrub												
<i>Acacia pulchella</i>	Prickly moses	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
<i>Astartea fascicularis</i>	Common Astartea	<input checked="" type="checkbox"/>	<input type="checkbox"/>									
<i>Darwinia citriodora</i>	Lemon scented darwinia	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hakea varia</i>	Harsh hakea	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hibbertia spp</i>	Native buttercups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Jacksonia furcellata</i>	Grey stinkwood	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Jacksonia stembergiana</i>	Green stinkwood	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Kunzea ericifolia</i>	Spearwood	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca lateritia</i>	Robin Red-breast bush	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Melaleuca viminea</i>	Mohan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Pericalymma ellipticum</i>	Swamp teatree	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Pteridium esculentum</i>	Bracken fern	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
<i>Regelia ciliata</i>	Regelia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Thomasia macrocarpa</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Low shrub												
<i>Acacia alata</i>	Winged wattle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Acanthocarpus preissii</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Bossiaea spp</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Corynotheca micrantha</i>	Sand lily	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Gomphobium tomentosum</i>	Hairy yellow pea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Species	CommonName	Location								Habitat		
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	Bennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<i>Hakea prostrata</i>	Harsh Hakea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hypocalymma angustifolium</i>	White myrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hypocalymma robustum</i>	Swan River myrtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Leucopogon spp</i>	Zamia	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Macrozamia riedlei</i>	Featherflowers	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Verticordia spp</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>6. Ground cover</u>												
<i>Centella cordifolia</i>	Centella	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
<i>Conostylis candicans</i>	Grey cottonhead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Cotula coronopifolia</i>	Waterbuttons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Dryandra nivea</i>	Couch honeypots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hemarthria uncinata</i>	Mat grass	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Hemianhra pungens</i>	Snake bush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Patersonia occidentalis</i>	Western iris	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<i>Sporobolus virginicus</i>	Saltwater couch	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>								
<u>7. Climber</u>												
<i>Clematis pubescens</i>	Common clematis	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
<i>Hardenbergia comptoniana</i>	Native wisteria	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<i>Kennedia coccinea</i>	Coral creeper	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Kennedia prostrata</i>	Running postman	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
<u>8. Rush or Sedge</u>												
<i>Juncus subsecundus</i>	Finger rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Baumea articulata</i>	Jointed twig sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Baumea juncea</i>	Bare twig rush	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Baumea pretisii</i>	Broad twig sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Species	CommonName	Location						Habitat				
		Roley Pool	Wright Brook	Breera Brook	Bannister Creek	ennett Brook	Ellen Brook	Southern Wood Creek	Upper Canning	Dryland	Bank	Emergent
<i>Baumea rubiginosa</i>	River twig	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
<i>Bolboschoenus caldwellii</i>	Marsh club rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex appressa</i>	Tall sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex divisa</i>	Divided sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex fascicularis</i>	Tassel sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Carex tereticaulis</i>	Tube sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Centrolepis spp</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Eleocharis acuta</i>	Spike sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<i>Isolepis nodosa</i>	Knotted Club sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Isolepis setiformis</i>	Tufted sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Juncus holoschoenus</i>	Joint-leaf rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Juncus kraussii</i>	Shore rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Juncus pallidus</i>	Pale rush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Juncus pauciflorus</i>	Slender rush	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Lepidosperma effusum</i>	Spreading sword sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Lepidosperma longitundinale</i>	Pilthy sword sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Lepidosperma tetraquetrum</i>	Angle sword sedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Restio spp</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Schoenoplectus validus</i>	Lake Club Sedge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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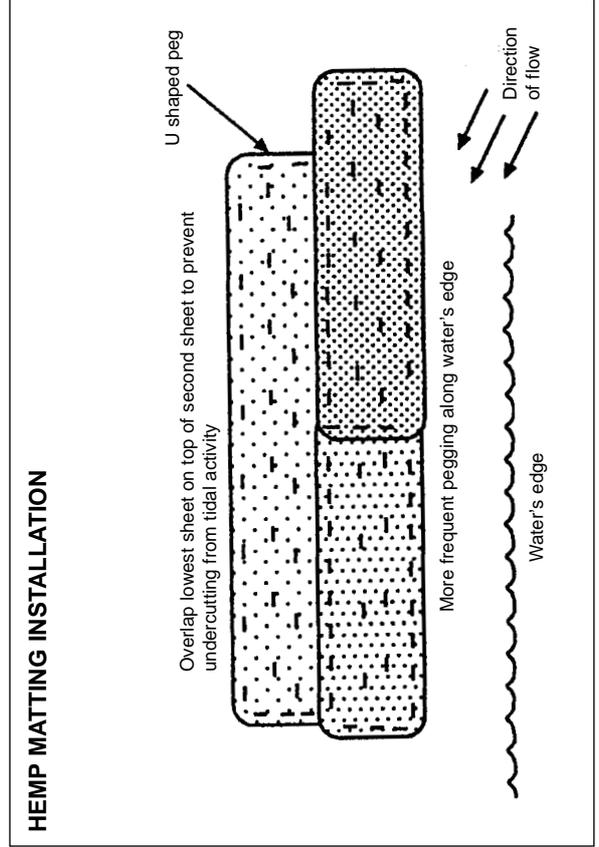
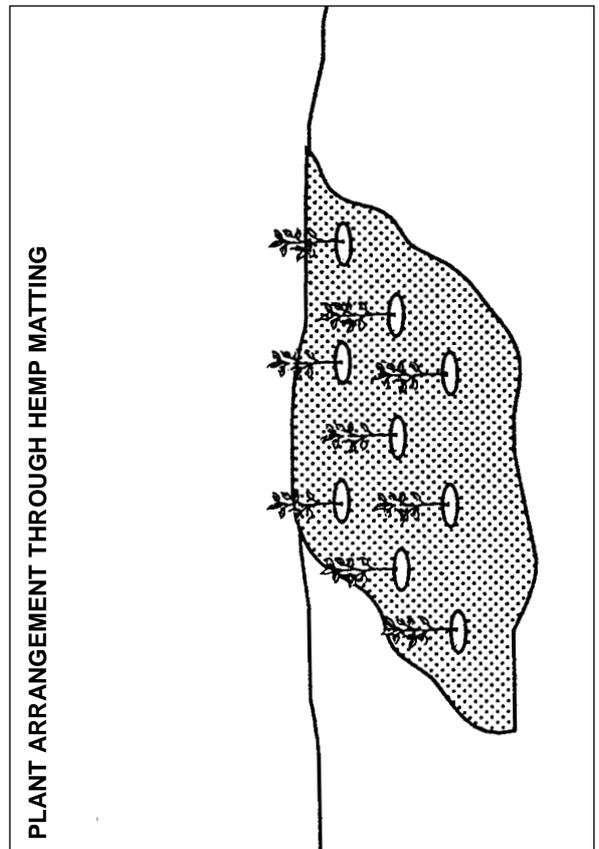
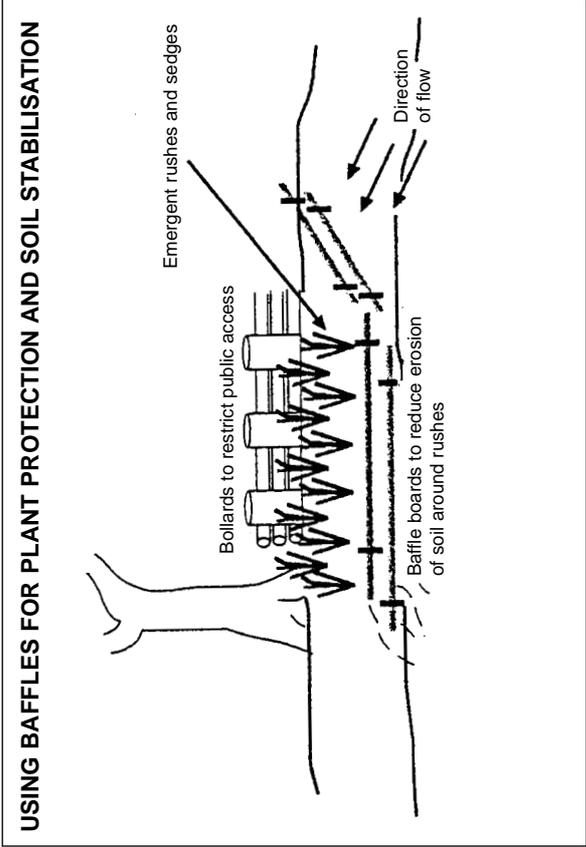
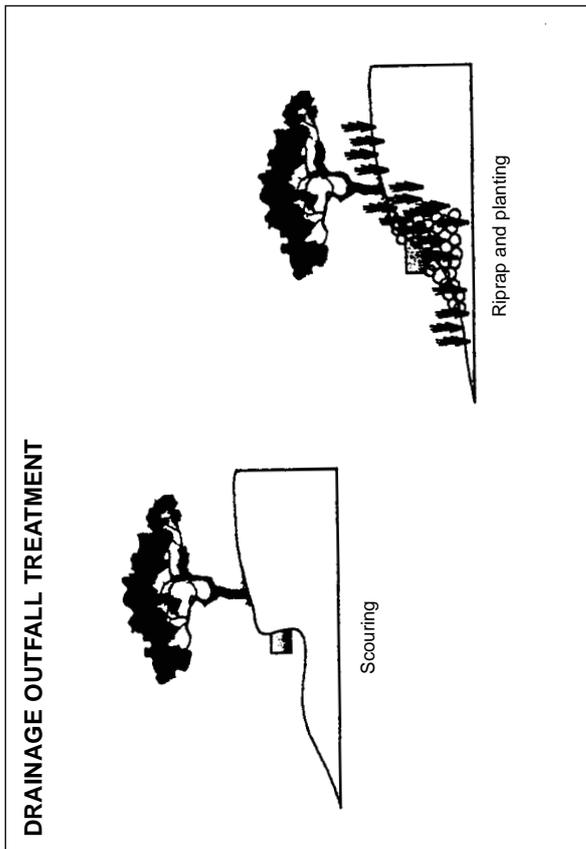


Appendix 4

Suggested soft engineering works



Appendix 4: Suggested soft engineering works



Appendix 5

Condition mapping symbols





Weeds

Symbol	Common name	Scientific name
◄►	Weed wattles	<i>Acacia spp.</i>
	Giant reed	<i>Arundo donax</i>
☞	Canna lily	<i>Canna spp.</i>
*	Pampas grass	<i>Cortaderia selloana</i>
●	Perennial veldtgrass	<i>Ehrharta calycina</i>
⊕	African lovegrass	<i>Eragrostis curvula</i>
C	Coral tree	<i>Erythrina x sykesii</i>
↗	Edible fig tree	<i>Ficus spp.</i>
Z	Cotton bush	<i>Gomphocarpus fruticosus</i>
△	One leaf cape tulip	<i>Homeria flaccida</i>
☞	Morning glory	<i>Ipomoea spp.</i>
⊞		<i>Juncus microcephalus</i>
⊕	Lantana	<i>Lantana camara</i>
◻	Bridal creeper	<i>Myrsiphyllum asparagoides</i>
∞	Paspalum	<i>Paspalum spp.</i>
◆	Castor oil bush	<i>Ricinus communis</i>
#	Blackberry	<i>Rubus fruticosus</i>
↙	Willow	<i>Salix spp.</i>
●	Japanese pepper	<i>Schinus terebinthifolia</i>
8	Deadly nightshade	<i>Solanum nigrum</i>
∞	Nasturtium	<i>Tropeolum spp.</i>
★	Bulrush	<i>Typha orientalis</i>
— —	Vetch	<i>Vicia sativa</i>
≡	Watsonia	<i>Watsonia bulbifera</i>
⊗	Arum lily	<i>Zantedeschia aethiopica</i>

Native Species

Symbol	Common name	Scientific name
Al	Swamp peppermint	<i>Agonis linearifolia</i>
As	Coojong	<i>Acacia saligna</i>
Ba	Slender banksia	<i>Banksia attenuata</i>
Bj	Bare twigrush	<i>Baumea juncea</i>
Ca	Tall sedge	<i>Carex appressa</i>
Cc	Marri	<i>Corymbia calophylla</i>
Er	Flooded gum	<i>Eucalyptus rudis</i>
Hc	Native wisteria	<i>Hardenbergia comptoniana</i>
Jp	Pale rush	<i>Juncus pallidus</i>
Js	Green stinkwood	<i>Jacksonia sternbergiana</i>
Kp	Running postman	<i>Kennedia prostrata</i>
Ll	Pithy sword-sedge	<i>Lepidosperma longitudinale</i>
Lt	Angle sword-sedge	<i>Lepidosperma tetraquetrum</i>
Mr	Swamp paperbark	<i>Melaleuca raphiophylla</i>
OI	Narrow-leaved Oxylobium	<i>Oxylobium lineare</i>
Pe	Bracken fern	<i>Pteridium esculentum</i>
Vj	Swishbush	<i>Viminaria juncea</i>

Cadastral and Streetsmart data supplied by the Dept. of Land Administration (1998)

Map Legend