

# Gawler River/ Kadlitpari Restoration Guide



GREEN  
A  ELAIDE



Figure 1: Artwork co-designed by Kaurua Plains School and developed by Artist Violet Buckskin

Aboriginal and Torres Strait Islander people should be aware that this guide may contain images or names of deceased persons in photographs or printed material.



Figure 2: Second from left Violet Buckskin, artist, with students and teachers from Kurna Plains School



Published by Green Adelaide with draft document prepared by Catherine Miles – Miles Environmental, in partnership with:



Published by Green Adelaide with draft document prepared by Catherine Miles with contributions from Graham Carpenter, Kurna Representatives, Neale Draper and Associates, Harrison Kent, Jade Kruk, Monica Seiler, Adrian Shackley, Alex Stolarski, Max Tibby, Jason Van Weenen, Renae Williams.

We would like to acknowledge the passion and guiding contributions of the late Garth Agius, Kurna Elder

# Foreword

*We acknowledge and pay our respects to the native title holders and traditional owners of the Gawler River / Kadlitpari Restoration project area - the Kurna Meyunna (Kurna people) - and pay homage to their ancestors who maintained the natural processes of the land and whose spirits still dwell on Yerta (Country).*

Welcome to the Gawler River / Kadlitpari Restoration Guide, a resource developed to support councils, land managers, and other partners in revitalising the Gawler River—a vital waterway that serves nature, people, and food production. Known as Kadlitpari (Wild Dog or Dingo River), the Gawler River, along with the South Para River, holds profound cultural significance for the Kurna people, the Traditional Owners and Native Title Holders of this region.

In this guide, we offer practical strategies and guidance on the restoration and biodiversity conservation opportunities that exist in the area. Together, we can work towards creating a thriving Gawler River, preserving this iconic landscape and protecting its unique cultural heritage for generations to come.

## How to use the guide

The guide is arranged in sections. Practical advice about restoring and managing your sites is in sections 2 and 3 and detailed information about the Gawler River system is in sections 4-6.

A range of decision-making tools will guide your process, including steps, flow charts, tables, species lists, targets, risks, and considerations.

- Section 1: Introduction
- Section 2: Planning river restoration
- Section 3: Weed management
- Section 4: Native vegetation communities (of the region)
- Section 5: Understanding the Gawler River system
- Section 6: References and further reading

For help with plant identification, try free apps like PlantNet and iNaturalist, field guidebooks, web resources, or speak with local landscape board staff (listed in Section 6).



## Key messages of the guide

### **Acknowledge Aboriginal heritage**

Ensure cultural values are protected, especially when working with soil or native plants.

### **Make space for the river to breathe**

Occasional flooding is natural and needed for plants and wildlife—work with the water pulses to allow the river to flow.

### **Link the river with surrounding plant communities**

Healthy ecosystems depend on connections between the river and nearby vegetation.

### **Protect and connect plant communities**

Maintaining and linking different vegetation types supports biodiversity.

### **Support diverse animal species**

Native plants provide essential habitat for a wide range of wildlife.

### **Use Open Space planning**

New developments should include green spaces that protect and connect natural areas.



# Contents

Foreword .....	4	Step 9: Consider your legal responsibilities .....	26
<b>1. Introduction</b> .....	<b>8</b>	Step 10: Gawler River Restoration Guide checklist ....	27
The Gawler River .....	9	<b>3. Weed management</b> .....	<b>28</b>
Developing the guide .....	10	Planning weed control .....	32
The restoration planning process .....	11	<b>4. Vegetation communities</b> .....	<b>36</b>
<b>2. Planning site restoration</b> .....	<b>12</b>	Pre-European vegetation communities of the Gawler River Region.....	40
Step 1: Choose which site to start with .....	13	<b>4.1 River Red Gum riverine forest</b> .....	<b>42</b>
Step 2: Select a restoration approach.....	15	Description.....	43
Step 3: Assess your sites.....	16	Restoration requirements .....	46
Step 4: Speak with Kurna representatives .....	20	Vegetation management .....	48
Step 5: Choose vegetation management target levels .....	21	Other considerations.....	54
Step 6: Establishing and supporting native vegetation.....	22	<b>4.2 Black Box floodplain woodlands</b> .....	<b>56</b>
Step 7: Consider wildlife and future developments ...	24	Description.....	57
Step 8: Plan to monitor your progress .....	25	Restoration requirements .....	60
		Vegetation management .....	61



<b>4.3 River Red Gum floodplain woodlands.....</b>	<b>68</b>	Major changes – 1836 to 2025.....	112
Description.....	69	The Gawler River today.....	113
Restoration requirements.....	72	Future development.....	118
Vegetation management.....	73	Administrative boundaries.....	119
<b>4.4 Floodplain shrublands.....</b>	<b>80</b>	More information.....	120
Description.....	81	<b>6. References and further reading.....</b>	<b>122</b>
Restoration requirements.....	85	Appendix 1: Priority level and control methods for common weeds.....	126
Vegetation management.....	86	Appendix 2: Fauna surveys summary.....	131
<b>4.5 Grasslands.....</b>	<b>94</b>	Gawler River / Kadlitpari – 10-step restoration planning worksheet.....	140
Description.....	95		
Restoration requirements.....	97		
Vegetation management.....	98		
<b>5. Understanding the Gawler River system.....</b>	<b>104</b>		
Flows, floods and groundwater.....	107		
Pre-European fauna.....	110		

# 1. Introduction

## Aim for river restoration

To protect and restore ecological diversity and function of the Gawler River and floodplains and to provide opportunities for cultural and social connections.

## A shared vision for the Gawler River

Healthy River, Healthy Communities

A healthy river supporting nature, people and food production

## In this section

- A brief overview of the Gawler River system.
- A map of the area relevant to the guide.
- A description on how the guide was developed.
- An example of a restoration decision flow-chart.





Figure 3: The Gawler River in 2025 between Angle Vale and Port Wakefield Road.

## The Gawler River

The river is formed by the convergence of the North and South Para Rivers at Paridla Taikunthi (joining of rivers) in Gawler, then flows 42 kilometres across the Adelaide Plains, eventually reaching the mangroves and tidal flats of Gulf St Vincent. For thousands of years, the Kurna people have maintained a rich cultural and physical connection to this landscape, evidenced by traditional sites, burial grounds, and sacred places across the Northern Adelaide Plains, the river's floodplains, and extending to the foothills of the Mount Lofty Ranges—an embodiment of Yura, the Rainbow Serpent.

Historically, early European colonists like George Milner Stephen described the Gawler River in 1839 as lush and vibrant, with “alluvial banks...adorned with magnificent River Red Gums and other trees.”<sup>1</sup> Early records speak of rich, grassy floodplains and abundant native wildlife, creating a striking image of the landscape.

In contrast, today's river faces numerous pressures. Invasive weeds now dominate the understory in many areas, native flora and wildlife populations have declined, and riverbanks have been altered. However, the river retains crucial ecological features; old-growth trees with habitat hollows form a continuous green corridor from the hills to the coast, and intermittent river flows still flush the river and rejuvenate floodplain pools. Amid what is seasonally a hot, dry landscape, the river's presence supports a unique forest and floodplain ecosystem that persists against the odds.

While acknowledging the value of all cultural heritage in the region, for simplicity, the terms *culture* and *cultural heritage* in this document refer specifically to Kurna and Aboriginal culture.

# Developing the guide

For years, dedicated land managers, community groups, local councils, and landscape boards have worked to restore sections of the Gawler River, focusing on removing weeds and rubbish, restoring native plants, creating wetlands, and improving stormwater quality. This guide aims to build on previous restoration efforts and strengthen the environmental and social connections to the river and surrounding communities.

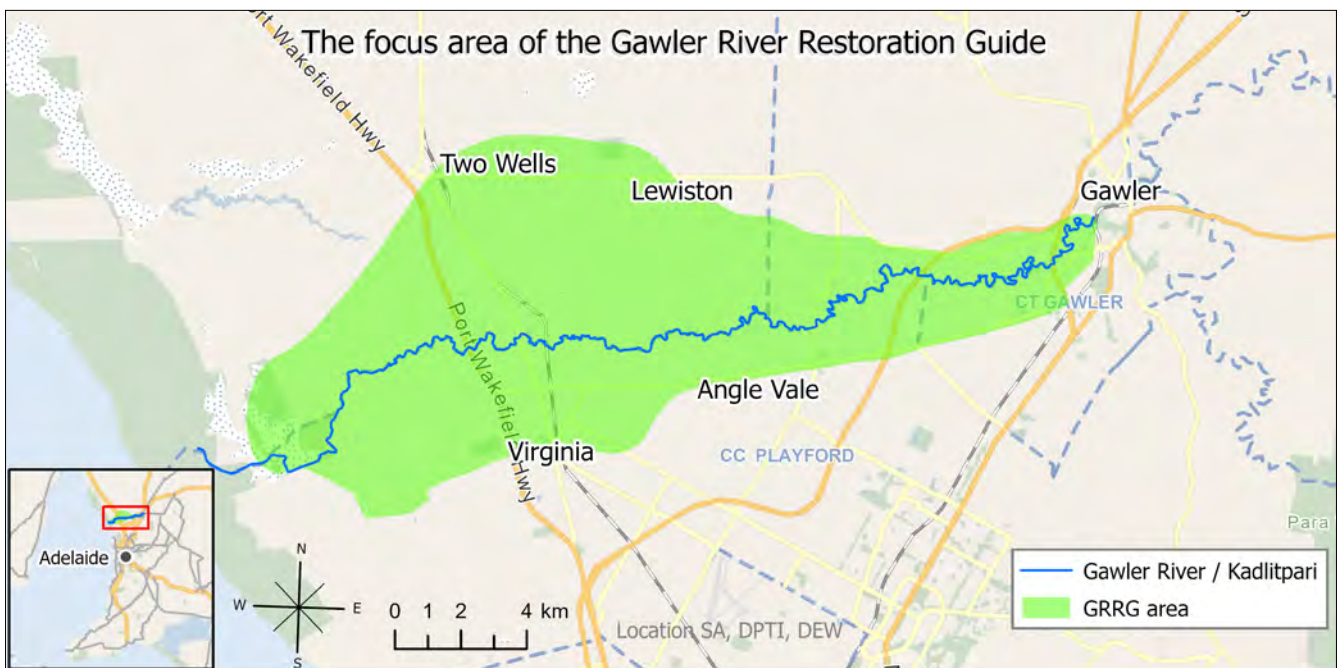
The guide also aims to highlight values along the Gawler River corridor, its floodplains and adjoining habitats from the junction of the North and South Para Rivers to Buckland Park Lake (Map 1). By working together on a shared restoration vision, it is hoped that this iconic waterway can be best conserved into the future.

The Guide has been developed and funded by Green Adelaide in partnership with City of Playford, and is informed by:

- landholder and community stakeholder workshops
- discussions with Kurna Meyunna
- reviews of previous surveys, reports and plans
- the following field surveys:
  - Kurna heritage management (Draper et al. 2024)
  - Vegetation (Miles 2024)
  - Reptiles (Kent & Tibby 2024)
  - Birds (Carpenter 2024)
  - Insects and other invertebrates (Stolarski 2025)

All biological data (species lists) have been, or are in the process of being, submitted to the Biological Database of SA and will be publicly accessible from Naturemaps <https://data.environment.sa.gov.au/NatureMaps/Pages/default.aspx>.

Survey species lists are found in Appendix 2: Fauna surveys summary



Map 1: Shows the location of the Gawler River and general surrounds covered by the guide.

# The restoration planning process

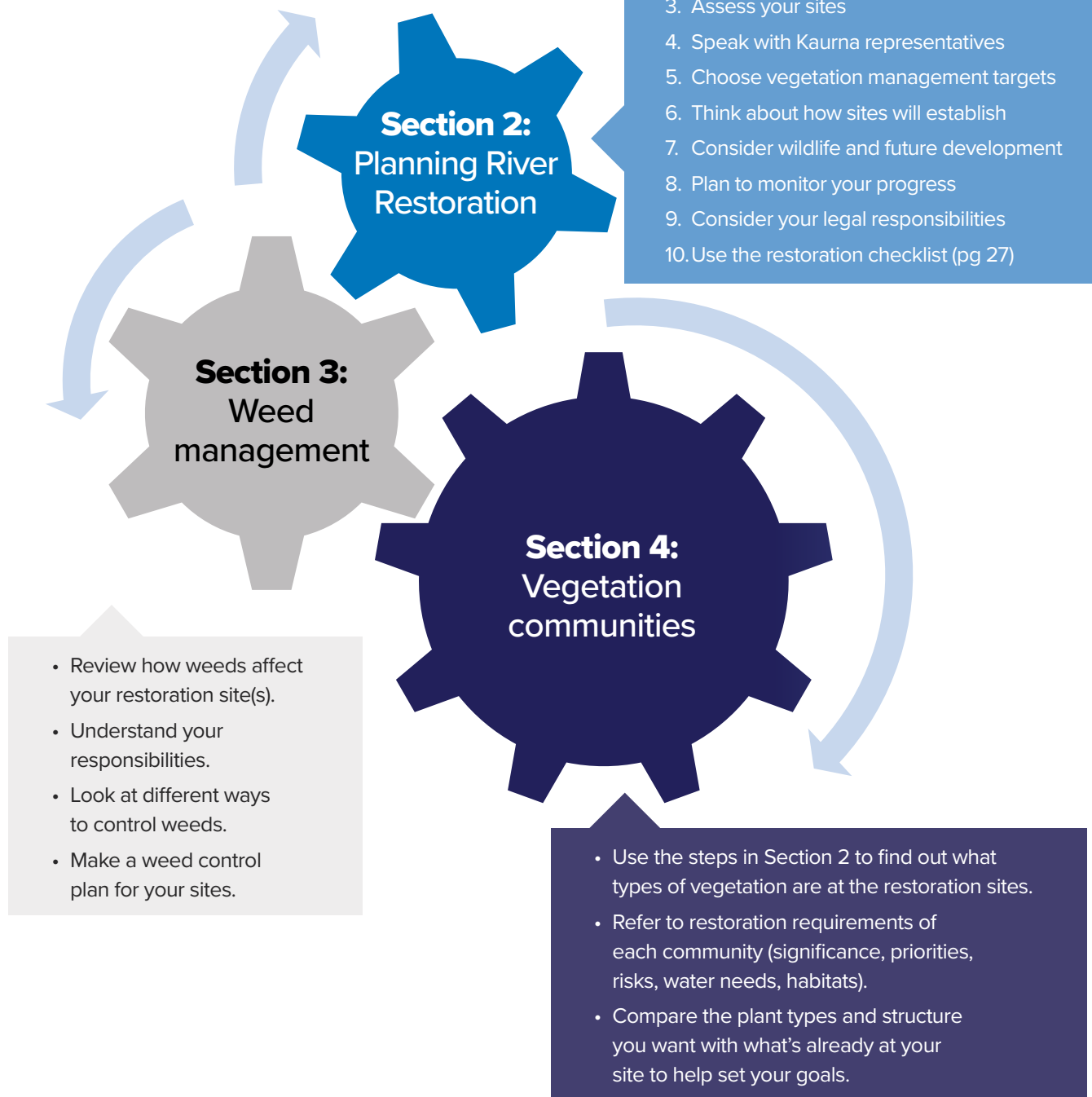
Restoration planning can seem complex, but this guide breaks it into manageable sections:

- Step-by-step planning (Section 2)
- Weed management (Section 3)
- Regional native vegetation communities (Section 4)
- Read Chapter 5 to get an understanding of the way the Gawler River catchment functions

You can use each section as needed to support the development of your restoration plan.

Start here - Proceed through the 10 steps and refer to Sections 3 and 4 as you go. Use the worksheet (Attachment 1) to keep track of thoughts and decisions.

1. Prioritise sites
2. Select a restoration approach
3. Assess your sites
4. Speak with Kaurna representatives
5. Choose vegetation management targets
6. Think about how sites will establish
7. Consider wildlife and future development
8. Plan to monitor your progress
9. Consider your legal responsibilities
10. Use the restoration checklist (pg 27)



# 2. Planning site restoration

## In this section

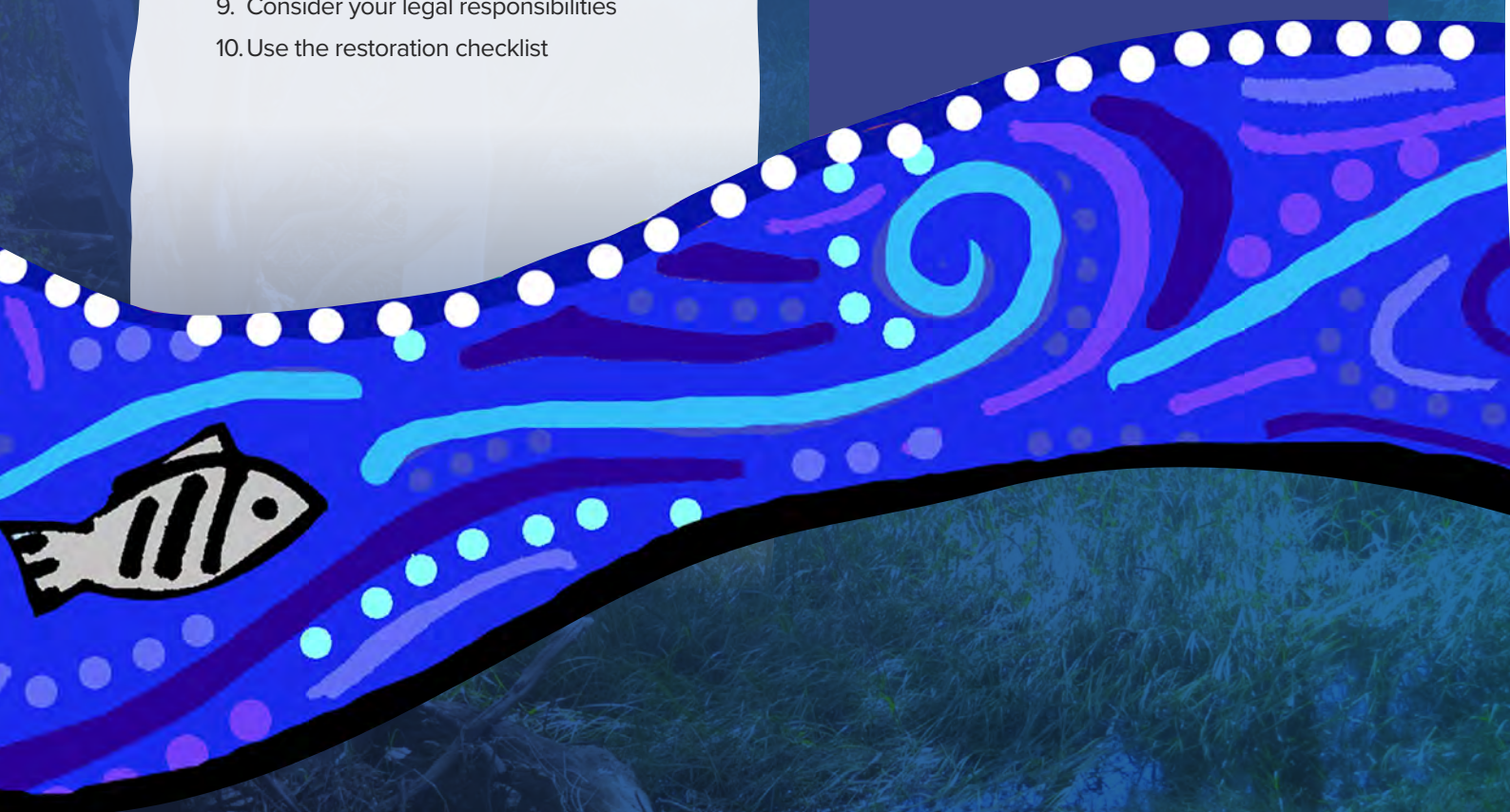
This section will help identify your options and steer you towards a solution that benefits river ecosystem health. Work through these 10 steps when planning restoration on your site(s):

1. Prioritise sites
2. Select a restoration approach
3. Assess your sites
4. Speak with Kaurna representatives
5. Choose vegetation management targets
6. Think about how sites will establish
7. Consider wildlife and future development
8. Plan to monitor your progress
9. Consider your legal responsibilities
10. Use the restoration checklist

You can complete it in several ways:

- **Fill in the worksheet included in this Guide** (Attachment 1).
- **Create your own document** using the same headings if you prefer to record information digitally or in a different format.
- **Download a copy** from the **Green Adelaide website** or participating **local councils' websites** if you'd like a fresh printable or digital version.

The worksheet helps you move step-by-step through planning, making it easier to understand your site, choose the right restoration actions, and keep track of decisions as you go.



# Step 1: Choose which site to start with

If you have several areas on your land parcel that could be restored, it can be hard to know where to begin. The prioritisation chart (Figure 4) can help guide your decision.

As a general rule:

- **Start with areas that are already in good condition.** These usually need less work and give you the best environmental results for your effort.
- **Avoid starting with isolated or badly degraded areas.** These take much more time and resources to improve and may not deliver the same benefits.
- **Complete a Kaurna cultural heritage assessment if ground-disturbing work is planned within 500 metres of the river.** This ensures cultural values are respected and protected during restoration.
- All other things being equal, start higher in the catchment to lessen the natural movement of weeds downstream

**Multiple sites:** If restoration work is being considered across several sites, prioritise those that are larger, located near existing high-quality native habitats, or already contain healthy native vegetation. These sites are more likely to support successful and lasting restoration outcomes.

**Highly threatened vegetation** types should be prioritised regardless of the size or location.

**Single site:** If you're working within a single site, start by identifying areas in the best condition—those with minimal weeds and some native vegetation. Focus your efforts on protecting and enhancing these areas first, before moving on to those in poorer condition.



Priority level	Site characteristics	Size and location	Work
<p>Highest</p> <p>Lowest</p>	<ul style="list-style-type: none"> <li>Cultural heritage and/or remnant vegetation</li> <li>High quality habitats (e.g. permanent pools)</li> <li>Rare or under protected plant communities (e.g. fringing shrublands or grasslands)</li> </ul>	<ul style="list-style-type: none"> <li>Large site</li> <li>Several adjoining sites</li> <li>Smaller sites with Rare or under protected plant communities</li> </ul>	Manage threats to the site and surroundings (e.g. WoNS*, declared weeds, pest animals, erosion risks)
	<ul style="list-style-type: none"> <li>Remnant vegetation in poor condition</li> <li>Degraded habitat</li> </ul>	Smaller	Control threats to the site (e.g. other env. weeds; grazing; withholding natural flows)
	Scattered native plants that are well represented in other parts of the system	Long but narrow (e.g. roadside)	Enhance habitat(s) by: <ul style="list-style-type: none"> <li>allowing natural regeneration (fencing, grazing zones)</li> <li>providing nesting boxes, fallen timber, and/or hollows</li> <li>removing lower threat weeds.</li> </ul>
	Site with no native vegetation (note that some wildlife rely on exotic plants)	Sites that are far from any other native vegetation	Reconstruct new habitats to connect remnant sites directly or create stepping stones between remnants (e.g. revegetation, wetland construction).

Figure 4: Priorities for river restoration based on site, spatial attributes and work required.

\* Weed of National Significance

## Step 2: Select a restoration approach

Once you have your site chosen, the figure below offers guidance on where to begin in a way that is cost effective, meets legislative requirements and achieves the best environmental and cultural outcomes. Further sections on each vegetation type – sections 4.1-4.5 – provide detail on how to implement the approach.

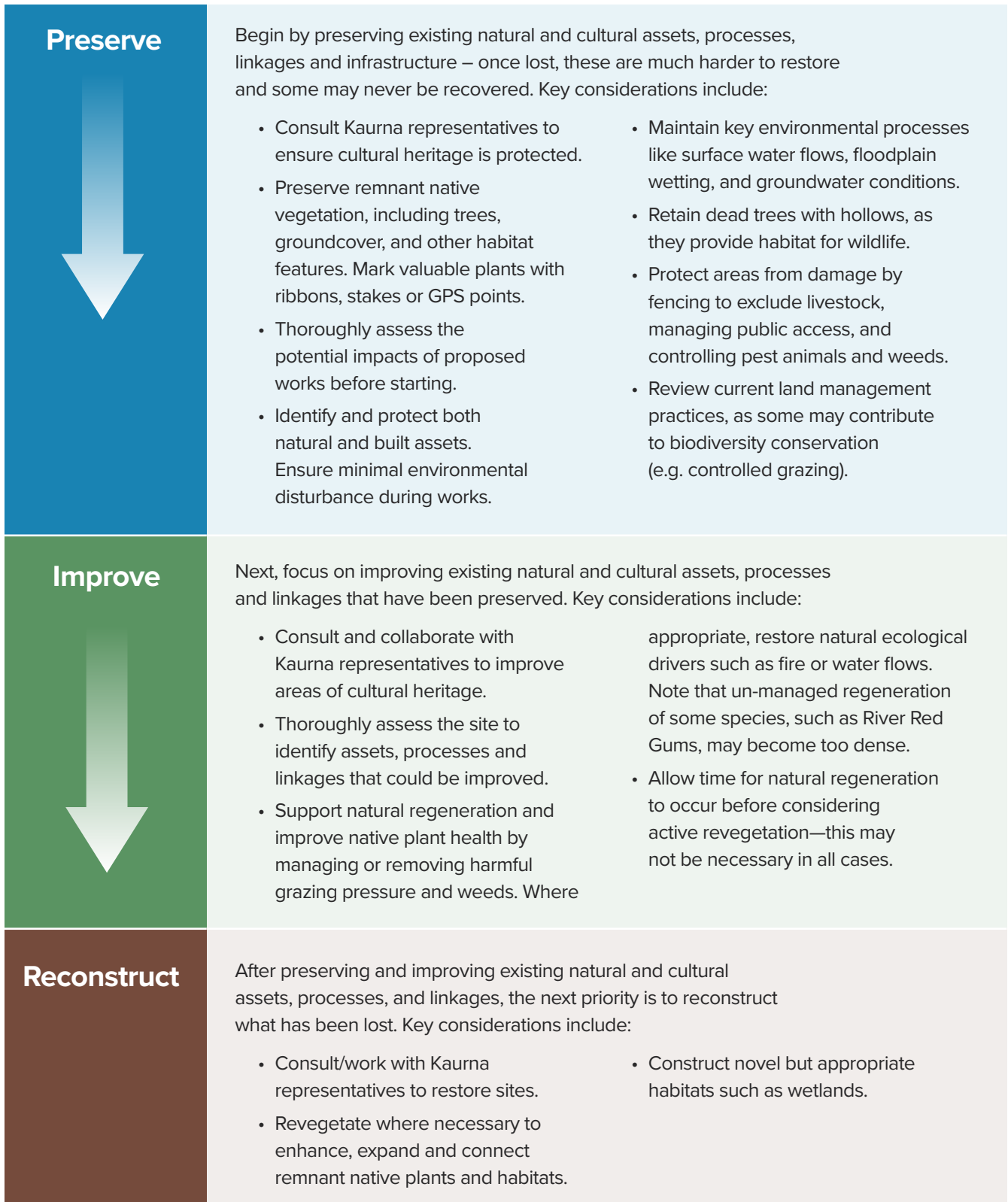


Figure 5: Gawler River System care hierarchy.

# Step 3: Assess your sites

## Native vegetation community

Assess and identify the native vegetation communities present on the site. The map provided at the start of Section 4 (Map 2) shows the distribution of different communities. *For example, if your site is in the Angle Vale area and does not contain any remnant Black Box trees, it is likely you have a combination of River Red Gum Forest in the river channel / adjacent banks, moving into Grassland vegetation communities.*

See the 10-Step Restoration Planning Worksheet (Attachment 1) to assist with planning for the site

- improving plant diversity, or encouraging the regeneration of a particular species
- improving water quality or site amenity.

Think about how the site fits into the broader landscape—this will help make sure the work supports the bigger goals for the area. Goals and targets for the site explain why the work is being done there and how success can be measured. The following hierarchy and Figure 6 may assist:

- **Objectives** are the overarching outcomes of environmental restoration, like restoring habitats, improving water quality, or making the air cleaner.
- **Goals** break down big objectives into smaller, measurable aims—like growing more of a certain plant or improving aspects of water quality (e.g. nutrient load).
- **Targets** are the concrete benchmarks used to track progress toward goals, such as planting a set number of native plants or eradicating a specific weed species.

## Setting goals and targets

The vision, aim and objectives for the Gawler River Restoration Project were developed through consultation with a range of stakeholders and can be adopted as an overarching objective for restoration projects (see Foreword and Introduction), but there may be more specific goals you want to achieve at a location such as:

- protecting specific cultural heritage (e.g. a culturally significant tree from fire)
- creating habitat to attract certain native species or groups of species

Category	Example goals	Example targets
Cultural Heritage	Protect culturally significant features	Engage Kurna; install firebreaks around heritage trees; avoid disturbance during works
Habitat Creation	Attract specific native species or groups	Install 10 nest boxes; retain 80% of fallen timber
Plant Diversity	Increase native plant diversity or regenerate key species	Plant 500 native grasses; monitor regeneration of River Red Gum trees
Water Quality & Amenity	Improve water quality or visual/functional site value	Reduce visible erosion by 50%; establish vegetated buffer zones
Pest Animal Control	Reduce impact of pest species on native flora and fauna	Coordinate rabbit control with 3 neighbouring properties; monitor burrow activity
Weed Management	Control declared and environmental weeds	Eradicate 3 priority weed species; implement seasonal follow-up treatments
Environmental Water	Support natural hydrological cycles and vegetation water needs	Integrate stormwater inputs; assess floodplain inundation frequency

Figure 6: Examples of goals and targets for site restoration

## Know your native vegetation

Understanding the native vegetation on your site is essential for planning effective restoration or management actions. Begin with a thorough assessment to identify:

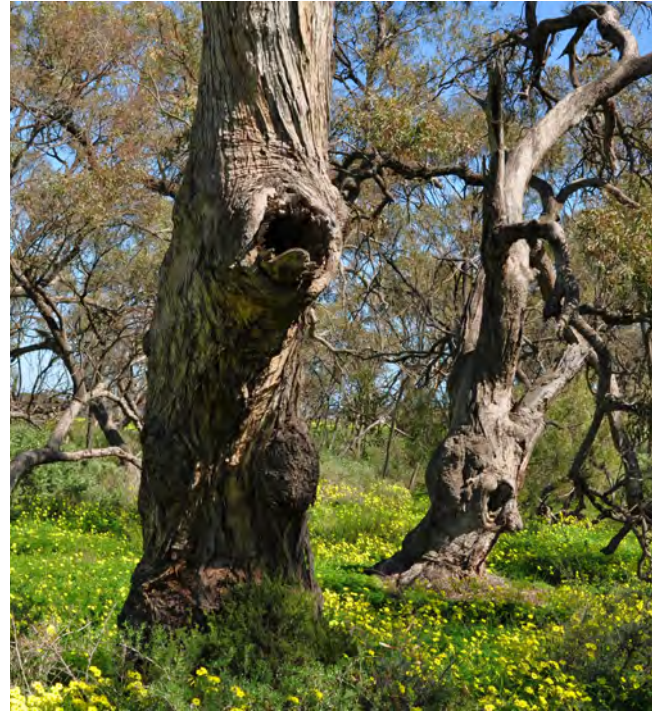
- Trees
- Shrubs
- Groundcovers
- Grasses
- Annual plants

Take note of whether these species are part of an intact vegetation community or appear as scattered individuals. Some native species are seasonal and may not be visible year-round, so timing your surveys is critical. While surveying across multiple seasons is ideal, spring is typically the best time to identify the widest range of plant species.

Knowing what native vegetation is present helps determine what actions are needed to meet your project goals. For example:

- If the site already has a good mix of target tree species, additional planting may not be necessary.
- Sites with at least 10% native ground layer grasses may be able to reach an advanced vegetation target through methods like:
  - Careful weed control
  - Cultural burning
  - Adjusted grazing management
- If restoration or management work is planned, consider marking native vegetation to avoid accidental damage during implementation.

**For help with plant identification, try free apps like PlantNet and iNaturalist, or speak with local landscape board staff (listed in Section 6)**



*Figure 7: Eucalypt trees such as this Black Box take hundreds of years to grow hollows and crevices and produce large fallen logs that make them such important habitat for native animals; they cannot be replaced with revegetation. Preservation of these assets is a very high priority.*

## Coordinate pest animal control

Pest animal management is most effective when coordinated across neighbouring parcels, as pest species do not recognize parcel boundaries.

Animals such as rabbits and deer can have detrimental effects on restoration efforts whilst other species can displace native animals from their habitats. Land managers working together can develop coordinated strategies, such as synchronised control programs and shared resources which can help achieve better outcomes in reducing pest animal populations.

Pest animals and weeds are declared under the *Landscape SA Act 2019*. Land managers have a legal responsibility to control declared species on the land they manage.

For more information, contact your local landscape board or PIRSA website <https://pir.sa.gov.au/biosecurity>.

## Native wildlife and habitats

Understanding how native animals interact with a site can help maximise the environmental benefits of a project. While many wildlife surveys require specialist expertise and should be a core component of larger projects, there are also habitat features that can be easily identified and considered during planning and implementation of your restoration plan. These include:

- leaf litter and fallen timber of various sizes
- tree hollows and crevices
- soil cracks
- areas of bare ground, such as sloping banks or spaces between grass tussocks.

In the absence of high-quality natural habitat, some animals may rely on alternative resources such as weeds or fallen timber. If these artificial or substitute habitats are being used, it's important to provide suitable alternatives before removing them. This ensures continuity of habitat and minimises disruption to local wildlife.

## Weeds

Identify what weeds are present that need to be controlled to meet your goals and targets. Plan for their removal that limits impacts on wildlife. Like pest animals, pest plants are declared under the *Landscape South Australia Act 2019*. **Section 3: Weed management** explores this topic in depth.



*Figure 8: In the absence of native ground layer vegetation, annual weeds can provide resources for native wildlife.*

## Water erosion

Assess whether water erosion is present at the site or if your planned activities could potentially cause erosion. Existing erosion should generally be addressed before—or alongside—other vegetation management works, and ideally under the guidance of engineers or other qualified professionals. While erosion is a natural process in dynamic waterways, especially as rivers shift over time, management efforts should focus on new or unnatural erosion rather than natural changes.

In some cases, steep eroded banks can provide important habitat for native wildlife. For example, Tree Martins and Rainbow Bee-eaters may use these banks for nesting, creating burrows that are protected from predators (Figure 9). Where erosion provides habitat, consider its ecological value before undertaking remediation.



*Figure 9: Rainbow Bee-eaters are common visitors to the Gawler River. Photo: John Robert McPherson, CC BY-SA 4.0 <<https://creativecommons.org/licenses/by-sa/4.0/>>, via Wikimedia Commons*

## Environmental water requirements

Consider that many of the vegetation communities of the area are shaped by and rely on how often water floods the land. When planning restoration, consider the site's water needs and how natural wet and dry cycles—like through stormwater management—can benefit the whole plant community. Consider what the current and likely future flow and flood patterns could be.

In addition to the effects of climate change, both existing and future development in the Gawler River area may alter how far and how long floods extend. In some cases, major changes to water flow patterns and land use—such as converting former grasslands into loam pits—can significantly change the local environment. As a result, restoration goals for certain sites may need to be adjusted to better align with these new conditions.

Sections 4.1 to 4.5 provide a brief outline of the water requirements of different vegetation communities. However, there has not been a comprehensive and specific assessment of environmental water requirements for the Gawler River catchment in recent years.

New developments and stormwater management projects may be able to provide environmental water requirements in some situations. This requires careful planning and a thorough assessment of the needs of the site and potential off-site impacts. An important reference document is the most recent Gawler River

Stormwater Management Plan, that will give indications of potential current and future flow patterns.

## Practical considerations

Several logistical factors need to be addressed early when planning restoration works.

- Physical access to the site is critical, equipment and personnel must be able to reach the site safely without causing additional environmental damage.
- Neighbouring properties should also be considered, particularly where access may require crossing private land or where activities could impact adjoining landholders. Clear communication and agreements with neighbours can prevent conflicts and ensure cooperation.
- While potentially only for the first few years, reliable access to water for watering-in newly planted vegetation may be required. Consider from where the water would be sourced and how target plants could be watered (e.g. backpack sprayer, vehicle-mounted tank and hose).
- If required, plan for the disposal of unwanted material - such as weeds and litter. Options should comply with biosecurity and waste management regulations to prevent the spread of invasive species and minimize environmental risks.
- Finally, find out about [current or planned flood or levee maintenance projects](#) that could impact your site.

## Site assessment checklist

Task		Task	
Identify vegetation communities	<input type="checkbox"/>	Plan for substitute habitat continuity	<input type="checkbox"/>
Confirm presence of remnant species	<input type="checkbox"/>	Identify and prioritise weed species	<input type="checkbox"/>
Define site-specific goals and targets	<input type="checkbox"/>	Develop weed control strategy	<input type="checkbox"/>
Conduct seasonal vegetation surveys	<input type="checkbox"/>	Assess erosion risks and existing erosion	<input type="checkbox"/>
Mark native vegetation for protection	<input type="checkbox"/>	Evaluate ecological value of eroded banks	<input type="checkbox"/>
Coordinate pest animal control with neighbours	<input type="checkbox"/>	Review site's environmental water needs	<input type="checkbox"/>
Identify key habitat features	<input type="checkbox"/>	Consider future flood and flow patterns	<input type="checkbox"/>

# Step 4: Speak with Kurna representatives

## Why this matters

The river and surrounding areas are profoundly important to Kurna people. This is because the area holds high heritage sensitivity and significant cultural value. This section helps ensure that cultural heritage is respected and protected during any work near the river.

## What needs to happen

Kurna elders advise that if you're planning any major ground-disturbing work within 500 metres of the river—whether it's for development or conservation—a cultural heritage assessment should be completed.

## Who to contact

- Contact the [Register for Aboriginal Sites and Objects](#) to request a search to see if your site has been assessed.
- For large-scale projects, contact Kurna Yerta Aboriginal Corporation (KYAC). They represent Kurna as native title holders and manage Aboriginal heritage matters.
- Also, large-scale projects are best coordinated with other key stakeholders including: local councils, Green Adelaide or Northern & Yorke landscape board, and other relevant state agencies.
- For small-scale projects, contact your local landscape board for advice.

## Working with Kurna

- Start early: Engage with Kurna representatives early in the planning process.
- Development projects may also need Kurna heritage monitoring during construction.
- Conservation projects should be co-managed with Kurna from start to finish.
- Wherever possible, Kurna people should lead or be directly involved in conservation and restoration work. This can be coordinated through the KYAC.
- Traditional practices, like cultural burning, should be considered where appropriate.

Best practice includes:

- Cultural heritage surveys along the river
- Engage Kurna businesses to assist with the on-ground work
- Follow-up assessments
- Ongoing monitoring during ground-disturbing work

For further information and assistance see:  
Four Nations NRM Governance Group  
-Consultation and Engagement Protocols  
Or contact your local landscape board



*“Kurna people still have a strong spiritual connection with the river... it’s a special place... we all need to work together to look after it...healthy river, healthy people...”*

Daniel NAYLOR, Trevor Jnr WANGANEEN, Jeffrey NEWCHURCH, Alison HARVEY and Linda CROTHERS

# Step 5: Choose vegetation management target levels

This Guide sets two vegetation management target levels – Basic and Advanced – to support restoration efforts, recognising that land managers have varied levels of financial resources and ecological expertise. These targets specify:

- the number of different species required for each plant type (trees, shrubs, ground-layer)
- the number of individual plants for each type
- essential and optional species for different planting zones.

**Detailed vegetation targets for each community type are provided in target diversity tables and species lists in Sections 4.1 to 4.5.**

The targets may be achieved progressively over several years using a combination of methods including grazing management, cultural burns, and targeted weed control.

The site assessment may identify that some vegetation targets are already met – for example, adequate tree canopy or a good base level of native ground cover. This means no further work is required for these components.

## Basic vegetation target



**Basic** vegetation target is intended to be achievable for private land managers, public land managers, or community groups with limited financial resources. While less intensive than **Advanced** vegetation targets, it still delivers

meaningful habitat and environmental benefits. Sites restored to this level would typically be considered to have moderate vegetation condition (Figure 10).

## Advanced vegetation target



**Advanced** vegetation target represents vegetation structure and species composition similar to a native community in good condition. The main difference from the Basic level is the ground layer, which aims for:

- **High species diversity** – typically 20+ native grasses, herbs, and sedges
- **High native cover** – ideally 80% or more of ground layer vegetation

Achieving this requires sustained effort, especially on sites lacking native species. Time is needed for slow-growing or hard-to-establish plants to regenerate. The result is high-quality habitat that supports diverse native wildlife and contributes meaningfully to ecological restoration.



*Figure 10: Example of Basic level (above). This site at Sharpe Almonds, Virginia had the highest bird diversity of all the sites surveyed due to the range of different habitats while having a ground-layer of mown exotic grasses on the banks.*



*Figure 11: Example of a good condition remnant site (during summer) at Lewiston Wetlands Pederick Rd, with a high diversity of native grasses and other ground-layer species. This site had the highest number of reptiles of the sites surveyed for this project.*

# Step 6: Establishing and supporting native vegetation

The three main techniques of establishing native vegetation are:

- natural regeneration
- revegetation via direct seeding
- revegetation via planting seedlings.



## Is revegetation required?

If a site already has a **Basic** level of species diversity or plant numbers, natural regeneration should be prioritised over active revegetation. Sites with at least 10% native ground layer grasses may be able to achieve natural regeneration supported by weed control, appropriate grazing management, cultural burns, and other threat management.

Broadscale revegetation (e.g. planting all species at once across the site) should only be considered for highly modified sites (e.g. ex-cropping or pasture).



## Revegetation method

For most sites on the Gawler River, planting seedlings of local native species is the most suitable revegetation method. Hand spreading seed heads of native grasses and other species is also a low input option, though success rates can vary.

For large sites with little native vegetation, machine direct seeding offers a cost-effective solution. However, this method involves soil disturbance, which may impact cultural heritage. Engagement with Kaurna representatives is essential to determine its appropriateness.



## Determining the right mix of plants

Nurseries and seed suppliers usually require a minimum of 6 months – ideally 12 months – to prepare large quantities of local native seedlings or seed.

Refer to sections 4.1 to 4.5 for detailed descriptions of the five main vegetation communities, including recommended species diversity and density numbers.



## Site preparation

Before targeted regeneration / revegetation begins, fencing to exclude stock, pest animal control and weed control may be required. Depending on the weed types, native plant presence, and chosen restoration method, multiple rounds of weed control may be needed – usually starting the year before planting begins.

It is important to assess what native wildlife species may be using weed species as habitat before control methods are implemented.

Ripping the soil is sometimes used for compacted soils but may impact cultural heritage and is therefore not appropriate for most sites.



## Plant seedlings

Create a shallow planting bowl around each seedling to capture rainfall and direct water to roots. Avoid deep bowls that cause waterlogging. Use biodegradable weed matting to suppress competition and conserve moisture. Fit tree guards to help protect plants from rabbits, other herbivores and wind, and to create a microclimate. Secure guards and check regularly.



## Site maintenance

Ongoing weed and pest animal control is critical to revegetation success, especially in the first few years. Seedlings should have a 3-5 litre watering bowl and be watered in at time of planting. Watering is required in the first year and the amount of watering will depend on seasonal conditions. Deep watering is better than frequent light watering.

## Timing

Year	Time of year*	Step
<b>Year before planting (or earlier)</b>	Late winter – early spring	Site evaluation and planning.  Assess if and where revegetation is required and what combination of species and methods are appropriate for the site. Identify weed control requirements.  Control winter-active weeds (e.g. grassy weeds)
	Late spring	Order seedlings / seed.  Begin control of summer active weeds (most perennial woody weeds and exotic trees).
	Summer	Control summer active weeds
<b>Year of planting</b>	Autumn	Control annual and winter active weeds in planting areas, ideally at least twice before planting, depending on planting style this may be large blobs for planting multiple seedlings or 1 m rows for direct seeding.
	Late autumn / early winter - after the break of the season	Plant seedlings / direct seed.  Early winter is generally the best time for revegetation in dryland areas, but wetland and other areas subject to flooding or water-logging may need to be planted later.
	Late Winter – early spring	Follow-up weed control spot weeding around plantings.
	Spring – summer	Follow-up control of summer active weeds. Watering is required to increase plant survival.
<b>Year after planting</b>	Summer	Continue summer weed control.
	Autumn	Evaluate planting success and plan if infill planting is required (note this may occur in later years as well).
	Winter – early spring	Follow-up weed control spot weeding around plantings.

Figure 12: Revegetation Basic Timeframe. \*Exact timing will depend on the site and season.

For more information on revegetating watercourses see: <https://cdn.environment.sa.gov.au/landscape/docs/ny/revegetating-watercourses.pdf>

<https://hf.landscape.sa.gov.au/land-manager-support/vegetation/revegetation>

## Step 7: Consider wildlife and future developments

The surrounding landscape influences river habitats and their wildlife. For example, orchards and remnant woodlands adjacent riverine forest enhance native bird populations, while dense housing, watered lawns and glasshouses offer minimal ecological value. This challenge underscores the need for Water and Biodiversity Sensitive Urban Design in new developments, as set out in the *Blueprint for a Nature-Positive Adelaide*.

Open native grasslands are very important. For example, large trees with adjoining open grassland areas are ideal habitat for many raptors, with a particularly large diversity recorded along the river corridor (including state-listed Peregrine Falcon, Black Falcon and Little Eagle). Increased residential development along the river will impact on most of these species. Careful planning of grassland areas, with an understanding that they are specifically designated for this purpose, is crucial for preserving these rare vegetation communities – and the wildlife they support. Avoid planting trees in areas where they would not naturally occur. Introducing trees into open grassy or low-shrub habitats can disrupt the ecosystem and negatively affect bird species that rely on these open spaces for feeding and nesting.

As discussed in Step 3, different land uses can alter both the quality and volume of water entering rivers, as well as affect groundwater recharge. These changes can also increase the risk of weed invasion and soil erosion. When planning changes to land use, it's important to consider the full range of potential environmental impacts—on water movement, water quality, soil stability, and surrounding ecosystems.

### Checklist for land managers

- Keep **open native grasslands** near river corridors.
- Retain **large trees with adjoining grasslands** for raptor habitat.
- Apply **Water/Biodiversity Sensitive Urban Design principles** in all developments.
- Stage restoration gradually to maintain **pollinator** habitat and food sources.
- Consider how **land-use changes** will affect water, soil, and vegetation.
- Maintain **connectivity** between grasslands and riverine habitats.



Figure 13: An open grassland adjacent revegetated shrubland (right) and remnant riverine forest (background) - Wingate Road Wetlands, Buchfelde.

## Step 8: Plan to monitor your progress

Monitoring can help track progress and assess whether a project is achieving its goals; the type of monitoring will depend on what those goals are.

### **For small projects or Basic Vegetation Target:**

land managers may set up a photo point where they can take photos before, after works and annually to see the change over time.

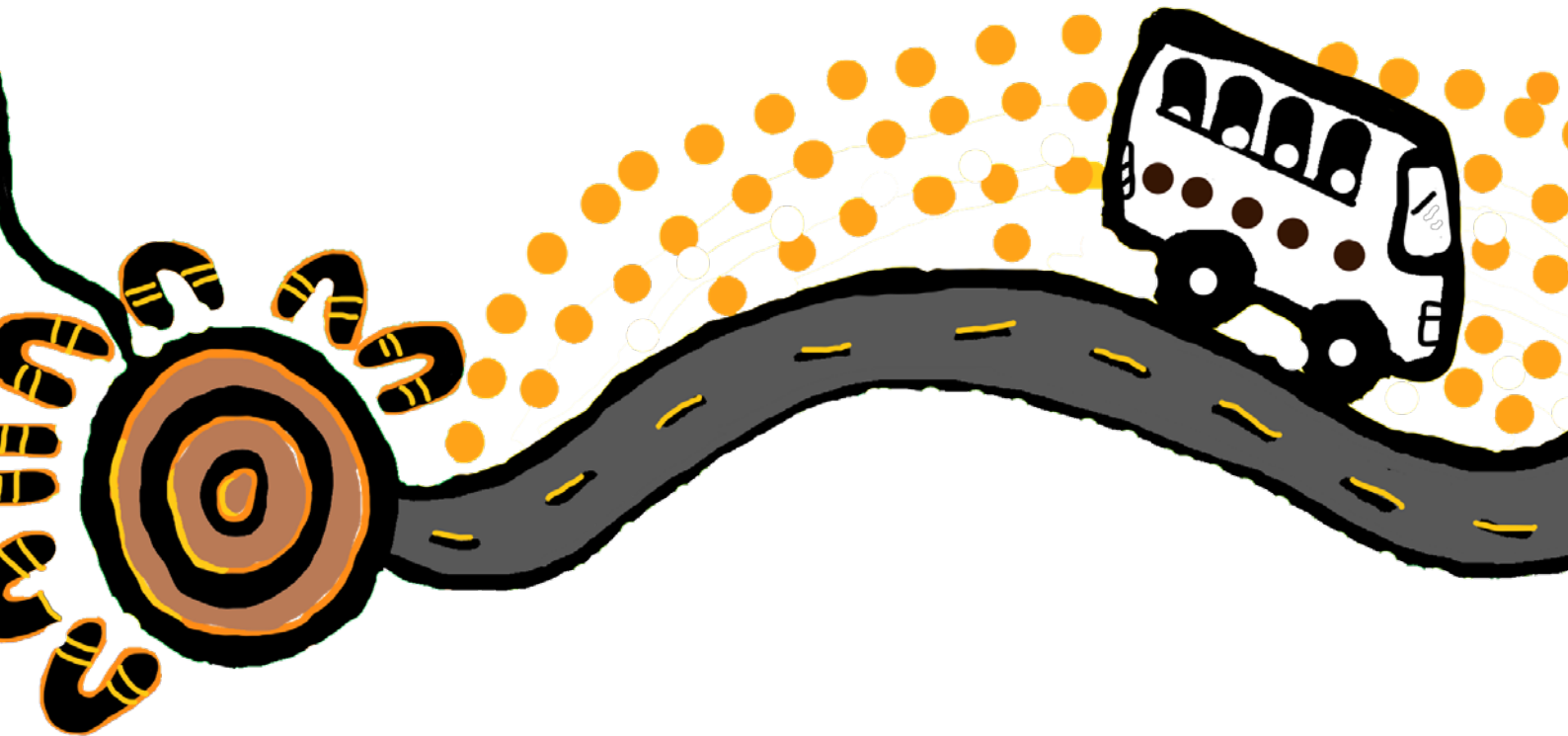
### **For larger projects or Advanced Vegetation**

**Target:** in South Australia there are two common methods for assessing and monitoring native vegetation condition and habitat quality:

- **Bushland Assessment Monitoring** – a relatively rapid assessment undertaken over one hectare, with results compared against benchmarks for the relevant vegetation association ([https://cdn.environment.sa.gov.au/environment/docs/bushland\\_assessment\\_manual\\_1\\_july\\_2020.pdf](https://cdn.environment.sa.gov.au/environment/docs/bushland_assessment_manual_1_july_2020.pdf))
- **Bushland Condition Monitoring** – a more detailed survey over a 30 x 30 metres quadrat and 10 nearest trees (<https://www.ncssa.asn.au/bushland-health-and-condition/>)

Various programs may also help with monitoring the health of the river and wildlife such as Frogwatch: <https://www.frogwatchsa.com.au/>. Contact your local Landscape Board for assistance or go to Section 6 for further information.

For projects seeking to achieve an advanced level of vegetation restoration, engaging professional ecologists for assistance with monitoring is recommended.



# Step 9: Consider your legal responsibilities

Under the *Landscape South Australia Act 2019*, land managers with a watercourse are required to take reasonable steps to prevent damage to the bed and banks of the watercourse, as well as to the ecosystems dependent on it. Additionally, native vegetation along the river and in part of the surrounding plains is protected under the *Native Vegetation Act 1991*(NV Act).

The *Aboriginal Heritage Act 1988* (SA) outlines a requirement to avoid harm which means land managers must not damage, disturb, or interfere with Aboriginal sites, objects, or ancestral remains without authorisation from the Minister for Aboriginal Affairs. This includes: Excavation (Section 21) and Physical disturbance or removal of objects, or ancestral remains (Section 23).

The recent *Biodiversity Act 2025* (SA) will absorb the NV Act and part of the *National Parks and Wildlife Act 1972*. Different parts of the new Act will be proclaimed gradually between 2025 and 2027. In the meantime, the *National Parks and Wildlife Act 1972* and the NV Act will continue to work the same way they currently do.

Figure 14 identifies a range of activities regularly undertaken as part of river restoration projects, and which may require permits or other approvals. This list is not professional legal advice.

Legislation is regularly reviewed and updated, and land managers should seek their own advice. The Legal Services Commission of South Australia Law Handbook provides further information and can be accessed at: [https://lsc.sa.gov.au/handbook\\_index.php](https://lsc.sa.gov.au/handbook_index.php)

Relevant Act (not including <i>Biodiversity Act 2025, SA</i> )				
Type of activity	AHA	PDIA	LSA	NVA
Removal of trees of native vegetation	✓	✓	✓	✓
Removal of weeds and other exotic vegetation	✓	✓	✓	
Ground disturbing activities (new wetland, tree pulling, new river crossing)	✓	✓	✓	
Working withing a watercourse	✓		✓	
Work within 500 m from a river	✓		✓	
Management of pest animals*	✓		✓	
Work affecting water flow		✓	✓	✓
Work near or at a registered Cultural Heritage Site	✓			

Figure 14: Summary of common river restoration activities and potential relevant legislation. '✓' - Legislation is likely to apply to this activity. For further detail on the act see Appendix 2 in section 6.

*Aboriginal Heritage Act 1988* (SA) – AHA, *Planning, Development and Infrastructure Act 2016* (SA) – PDIA, *Landscape South Australia Act 2019* (SA) – LSA, *Native Vegetation Act 1991*(SA) – NVA

\* if the control methods involve digging, fencing, baiting, or trapping, this may require ground disturbance and trigger the AHA Act.

# Step 10: Gawler River Restoration Guide checklist

To assist in the process of developing a local restoration plan, working through these steps below can help to reach your goal.

**What vegetation community is the site located in?** (See map 2 and section 4 for clarification)

River Red Gum channel forest <b>(Section 4.1)</b> pg 42	Black Box woodlands <b>(Section 4.2)</b> pg 56	Red Gum floodplain woodlands <b>(Section 4.3)</b> pg 68	Floodplain shrublands <b>(Section 4.4)</b> pg 80	Grasslands <b>(Section 4.5)</b> pg 94
---	--	---	--	---

**Do you have a restoration goal?**

**YES**

List some things you are aiming to achieve:

.....

.....

.....

Continue on to see if there are other things to consider

**NO**

Continue on to see what needs to be considered in planning for restoration

Unsure?  
Contact Green Adelaide for more information

<b>What features are at the site?</b>	<input type="checkbox"/> Map waterways	<input type="checkbox"/> Identify soil type	<input type="checkbox"/> Record fauna	<input type="checkbox"/> List remnant vegetation
<b>Do you need permits or approvals (see Figure 14)?</b>	<input type="checkbox"/> Water affecting activity	<input type="checkbox"/> Cultural heritage consultation	<input type="checkbox"/> Native vegetation clearance	<input type="checkbox"/> Development approval
<b>Do you need to engage with other stakeholders?</b>	<input type="checkbox"/> Neighbours	<input type="checkbox"/> Council	<input type="checkbox"/> Landscape Board	<input type="checkbox"/> Community groups
<b>Do you have or are likely to have cultural heritage on site?</b>	<input type="checkbox"/> Yes – consult with Kaurna		<input type="checkbox"/> No	<input type="checkbox"/> Unsure
<b>Have you undertaken a site survey to create a</b>	<input type="checkbox"/> Flora list	<input type="checkbox"/> Fauna list including invertebrates		

Now you have an understanding of what is likely to be at the site, cross reference the vegetation community sections to your site to confirm it is the most appropriate vegetation type.

Still unsure about any of these areas? Contact your local landscape board or your local council for further advice.

# 3. Weed management

## In this section

- A brief overview of weeds the Gawler River system
- Considerations, strategies and principles of weed control, including a weed control planning template
- Details on weed control methods relevant to the area



## Key points

### 1. Ecological impact

Weeds outcompete native plants, reduce biodiversity, and disrupt habitats for native wildlife, especially in riverine forests.

### 2. River vulnerability

Weeds spread easily downstream, obstruct water flow, and increase nutrient loads, making river systems particularly sensitive.

### 3. Management challenges

Steep banks, limited access, parcel boundaries, and upstream seedbanks complicate effective weed control.

### 4. Wildlife and habitat considerations

Some weeds provide temporary habitat for native species. Weed removal should be staged to avoid harming wildlife that rely on them.

### 5. Best practice weed control

- Use minimal-disturbance methods suited to site conditions (e.g. plant size, slope, proximity to water).
- It may be better to leave dead plants/trees standing (if safe) despite potentially looking messy.
- Always follow herbicide labels, consider environmental conditions, and consult local landscape boards or Kurna representatives.



Figure 15: Over 17 months in 2024/25, Cochineal insects (*Dactylopius ceylonicus*)—a natural parasite of prickly pear—was trialled along the Gawler River to control Drooping Prickly Pear (*Opuntia monacantha* – foreground). These invasive cacti often re-establish after high flows, but the insects help suppress new growth. Early results show promise for low-cost, low-risk cactus management. Note the health of the native Lignum plant (centre) remains unchanged from March 2024 (left) and August 2025 (right).

## Weeds and their impact on the Gawler River

Weeds pose a major threat to the ecological and cultural values of the Gawler River and its surrounding areas. However, in some situations, they may provide habitat or food resources for native wildlife, or hold heritage or social value.

In areas of native vegetation, weeds can outcompete native species for light, moisture, and nutrients. This competition can lead to the decline of native plant species, which in turn affects the wildlife that depend on them. Over time, this can result in a shift toward less diverse plant communities and an increase in introduced animals that are better suited to the altered environment. While mature native trees may persist, they often struggle to reproduce and may suffer from moisture stress during dry periods.

River environments are particularly vulnerable to weed impacts due to several factors:

- Weed seeds can easily spread downstream.
- Large weed species may obstruct water flow in channels.
- Deciduous weed species drop leaves that increase nutrient loads in the water.

Managing weeds in the Gawler River channel presents unique challenges, including the following:

- **Limited impact:** Parcel boundaries along the channel mean a land manager can only manage one river bank.
- **Access challenges:** Steep and inaccessible banks, often made more challenging with levee banks.
- **Limited methods:** Water and muddy soil limits the range of suitable management options that can be used and is an additional safety hazard.
- **Risk to heritage values:** Soil disturbance can cause bank erosion and/or damage to cultural heritage and other assets.
- **Upstream and legacy weeds:** There is a large weed seed load in the catchment upstream and in soil seedbanks.

## Declared plants

Declared plants are weeds regulated under the *Landscape South Australia Act 2019* due to their potential threat to primary industries, the natural environment, and public safety. Under the LSA Act, land managers have a legal obligation to manage these plants, which may include controlling their spread, preventing their sale or movement, and reporting their presence.

*Appendix 1: Priority level and control methods for common weeds* provides a list of commonly occurring and high threat weeds observed during the ecological surveys for this Guide and identifies which are declared. However, this list is not exhaustive, and the declaration status of weeds is regularly updated. Land managers are encouraged to consult their local landscape board for the most current information, region-specific priorities, and advice on appropriate control methods.

## Weeds as habitat for native wildlife

There are some situations where weeds provide habitat for rare and declining native animals including the following:

- In some floodplain shrubland communities, African Boxthorns are used by White-winged Fairy Wrens (Figure 16). The wrens require dense shelter from predators.
- Herbaceous weeds (e.g. mustard weeds) can provide nectar for insects (Figure 17).
- Exotic grasses may be used by some insects to breed in and feed on.

In most cases, native wildlife use weeds because native habitat is not available. In these locations, alternative habitats need to be established at the same location before habitat weeds are removed, meaning that weed control may need to proceed more slowly and be staged in these areas.

Weeds are most abundant in the Gawler River Red Gum riverine forest compared with other vegetation communities surveyed for this Guide. In some cases, weeds are the only understorey beneath the River Red Gums. In this vegetation community, the dense undergrowth of woody weeds does not provide useful habitat for native wildlife and instead favours introduced

species such as Common Blackbirds. Dense weeds shade the ground and reptiles do not have sunny areas to bask and insects are affected by fewer food plants and reduced area to fly. There is higher native bird species diversity where woody weed and exotic trees have been removed along the river channel, even when the ground layer still comprises mostly exotic species. The needs of many reptiles, however, have not been met. They require native ground layer to be recovered (as well as woody weed removal) to provide feeding opportunities.



Figure 16: White-winged Fairywrens may use African Boxthorns growing in mixed chenopod shrublands. Photo: “White-winged Fairy-Wren (*Malurus leucopterus*)” by Brian McCauley, CC BY-NC 2.0



Figure 17: Mottled Grass Skipper Butterfly is a species of local conservation significance that is dependent on native and introduced grasses as larval host plants. It was found in dense grassy areas in open chenopod shrublands and artificial wetlands. Photo: Martin Stokes.

## Preventing harm when controlling weeds

Immediate eradication of all weeds is not the goal of weed management. Instead, planned and ongoing weed management should be viewed as a required step in achieving the goals and objectives in restoring the ecological values of the Gawler River area (as well as being a legal requirement for some weeds). As mentioned earlier, inappropriate weed control methods can damage cultural heritage sites. Other potential impacts include:

- soil erosion
- over-weeding – removing weeds faster than native regeneration can occur, will often result in new weeds simply replacing the old weeds
- the loss of habitat or resources for some native wildlife
- herbicide spray drift and over-spray can affect surrounding native vegetation and aquatic ecosystems.

Methods of weed control that cause the least amount of disturbance should always be used. Ensure that weeds and native species have been accurately identified. Some native species can look quite weedy, and some weeds have native look-alikes, for example introduced African Boxthorn can be confused with native Australian Boxthorn or Nitrebush.

# Planning weed control

## General principles for weed control

The following are general principles for controlling weeds to protect and restore ecological diversity and function of the Gawler River and floodplains:

- Avoid damage to Kaurna cultural heritage sites and values.
- Use the least disturbance method available for the weed and location.
- Apply appropriate methods for working near or within watercourses.
- Coordinate activities across parcel boundaries to improve effectiveness.
- Begin in areas with the best ecological condition (least weedy) and work progressively toward more degraded areas.

The Bradley Method is recommended in this context. It is a bush regeneration technique that restores by working from the healthiest areas outward, minimizing disturbance, and allowing natural regeneration to guide the process. It emphasizes manual weed removal and relies on the existing seed bank rather than planting new species.

At the catchment scale, working from upstream to downstream is generally an effective approach. However, this is not always feasible, and for individual sites with high upstream weed loads, this sequencing becomes less critical.

## Stages of weed control

- 1. Assess the site:** Accurately identify and map the weeds, native species, sensitive cultural heritage sites/objects, and determine if threatened wildlife rely on weeds.
- 2. Plan the weed control:** Rank weed species by how much of a threat they pose and divide the site into manageable sections based on best time for control, ecological importance, amount of native vegetation, and other site-specific factors. Choose suitable control methods for each section, aiming to minimise disturbance to the environment.
- 3. Control weeds:** Implement the weed control plan.
- 4. Monitor success:** Review effectiveness of weed control and plan future weed control.
- 5. Follow up:** Revisit areas where weeds have been controlled and control any re-growth or newly established weeds (note: some locations will require annual weed control).



Figure 18: Control of Wild Artichoke across the floodplains.

## Weed control planning template

Prioritising what weeds to control and where will help to achieve the goals and objectives for river and floodplain restoration in the most cost-effective way. The prioritisation of locations can be applied within a single site or land parcel (i.e. for a community group

or land manager with a single site) as well as across multiple separate sites (i.e. for a council with multiple sites to manage). Figure 19 provides a simple chart for strategically prioritising what weeds to control and where.

		Location priority		
		Highest priority areas, e.g.: <ul style="list-style-type: none"> <li>• Highest cover and diversity of native plant species</li> <li>• Rare or threatened plant or animal species occur</li> <li>• Few weeds that can be easily and feasibly eradicated from site.</li> </ul>	Middle priority areas, e.g.: <ul style="list-style-type: none"> <li>• Some native plant species present</li> <li>• Rare or threatened plant or animal species could occur</li> <li>• Site adjacent to high priority area that weeds could spread to.</li> </ul>	Lowest priority areas, e.g.: <ul style="list-style-type: none"> <li>• Little to no native plant species present</li> <li>• Site dominated by introduced plants</li> <li>• Not close to valuable ecological areas that weeds could spread to.</li> </ul>
Weed priority (see Appendix 1)	Highest priority weeds, e.g.: <ul style="list-style-type: none"> <li>• Weeds with potential to spread quickly and outcompete native plants</li> <li>• Declared weeds</li> <li>• Weed of National Significance</li> <li>• High environmental threat weeds.</li> </ul>	Highest priority for control.  Note: weeds that provide habitat for rare or threatened animals are still a priority to control but can be done once alternative habitat is established.		
	Middle priority weeds, e.g.: <ul style="list-style-type: none"> <li>• Moderate environmental threat</li> <li>• Moderate potential to spread and outcompete native plants.</li> </ul>		Middle priority for control	
	Lowest priority weeds, e.g.: <ul style="list-style-type: none"> <li>• Low environmental threat</li> <li>• Common and widespread</li> <li>• Low potential to spread quickly and outcompete native plants.</li> </ul>			Lowest priority for control to protect existing environmental values. Weed control may still be required if planning to revegetate the site.

Figure 19: Template for weed control strategy.

## Weed control methods

There are many minimal-disturbance control methods for weeds found in the Gawler River and surrounding areas (Figure 20). The best method for each site will vary depending on factors including the size and life-stage of plants, accessibility and steepness of the site, surrounding vegetation and proximity to water, as well as seasonal conditions.

For detailed guidance on control techniques, registered herbicides, and optimal timing, refer to

PIRSA's "Weeds" webpage and other resources listed in Section 6, or contact your local landscape board. Always follow herbicide label instructions precisely, and always consider environmental conditions—such as the presence of water, expected rainfall, and rising river levels—before application.

Before implementing any control methods, consult your local landscape board or the resources in Section 6, and consider engaging qualified contractors where appropriate.

Method	Details	Types of weeds this method is good for	Types of sites this method is good for	Comments and precautions
<b>Cultural burning</b>	Involves engaging a recognised Kaurna Cultural Burning Team to assess and conduct appropriate weed removal, burning and revegetation process.	Majority of weeds, including but not limited to exotic grasses, herbaceous weeds, medium to large woody weeds.	Most sites that can be accessed by foot Grassland, shrubland, woodland, open forest Disturbed to intact vegetation.	This is a holistic land care practice (beyond weed control) only to be undertaken by certified contractors understanding of the cultural practices.
<b>Drill and fill/frill</b>	Involves using either a drill or small axe to cut into the bark as close to the ground level as possible (below all leaves and branches) and injecting herbicide.	Medium to large exotic trees and shrubs.	Most sites that can be accessed on foot.	Dead trees can be left standing to provide interim habitat provided they do not pose a risk to safety, flooding or fire and does not restrict access for follow up weed control.
<b>Spot spray</b>	Can include spot weeding around remnant native vegetation and revegetation to reduce competition as well as spraying spots, rows or patches prior to and after revegetation.	Most weeds except large woody weeds and exotic trees and other weeds with high foliage.	Revegetation sites: as part of site preparation and post planting weed control. Amongst native vegetation when done by a suitably trained person with excellent native vegetation identification.	Care needs to be taken to avoid spray drift and particularly when working near watercourses and in areas with existing native vegetation. May be used for regrowth after slashing.
<b>Cut and swab</b>	Plants are cut as close to the ground as possible (below all leaves and branches) and the cut stem immediately treated with herbicide.	Plants with woody trunks/stems and multiple stems.	Most sites that can be accessed on foot and in sensitive areas.	A small number of species such as Pine Trees ( <i>Pinus spp.</i> ) usually do not require herbicide treatment.
<b>Hand pull</b>	Pull plants straight up from the ground with one hand and hold soil with other hand. Tree Popper can be used for the same effect for woody weeds and small trees.	Small plants such as herbs and grasses but not bulbs or grasses with underground runners. Seedlings and saplings of woody weeds and exotic trees.	Sites with small weed infestations and or working around sensitive plants. Sites that can be safely accessed on foot.	Best done when the soil is moist so that the roots don't break off. Minimise soil disturbance and don't 'over weed.'

Method	Details	Types of weeds this method is good for	Types of sites this method is good for	Comments and precautions
<b>Hand grub / dig</b>	<p>Various tools can assist to dig out or grub out weeds including: small spade, butter knife, garden fork weeder and small mattock.</p> <p>Ensure all reproductive parts are removed.</p>	Weeds with bulbs, tubers, underground runners, large/ deep tap roots and other underground reproductive parts.	<p>Sites with small weed infestations and or working around sensitive plants.</p> <p>Sites that can be safely accessed on foot.</p>	<p>Assess cultural heritage risks</p> <p>For bulbs, work needs to be timed and carefully done to ensure new bulbs are not left behind.</p> <p>Minimise soil disturbance and don't 'over weed.'</p>
<b>Machinery removal</b>	<p>Specialist machinery designed to pull large weeds out. Types that only cut and remove weeds, leaving stumps and roots (with cut stumps being treated by hand) are better for minimising disturbance.</p> <p>Some have long 'arms' that can reach over levees and down river banks.</p>	Large woody weeds and exotic weeds.	<p>Sites that are difficult to access on foot such as steep river banks or amongst dense reeds.</p> <p>Sites accessible to machinery.</p>	<p>Assess cultural heritage and erosion risks before initiating work and take appropriate action.</p> <p>Minimise soil disturbance and don't 'over weed.'</p> <p>Do not create paths for vehicle access in sensitive areas - especially in the river channel or flood plain. Take care when traversing these areas.</p> <p>Do not store, park or stage vehicles on native grasslands or shrublands.</p>
<b>Slashing and brush-cutting</b>	Can be used to either: stop herbaceous and grassy weeds from setting seed or to encourage new growth of perennial species to be sprayed later.	<p>Annual grasses and herbs.</p> <p>Perennial weeds such as Giant Reed, Blackberry and perennial grasses.</p>	<p>Grasslands and grassy woodlands and shrublands.</p> <p>Patches of perennial weeds.</p> <p>Sites that are accessible to machinery.</p>	High slashing is important for invertebrates. Timing of grazing is important to prevent weed seed set while encouraging native species.
<b>Timed grazing</b>	High intensity and short duration grazing by stock. Additional fencing may be required to subdivide areas or restrict access to certain areas.	Annual grasses and herbs.	<p>Grasslands and grassy woodlands and shrublands.</p> <p>Sites that are not too steep where stock may damage soils (e.g. not river banks).</p>	Introducing grazing to sites with native vegetation that are not currently grazed may require approval under the <i>Native Vegetation Act 1991</i> .
<b>Biological control</b>	Contact your local Landscape Board.	Biological control agents have only been introduced for certain species e.g. Cactus.	Contact your local Landscape Board.	Contact your local Landscape Board.

Figure 20: Summary of weed control methods.

# 4. Vegetation communities

## In this section

- A map and overview of the pre-European vegetation in Gawler River area
- Detailed descriptions of each of the five vegetations communities listed above, this includes:
  - Ecological, cultural and social significance
  - Restoration requirements
  - A detailed info-graphic showing an example of each community
  - A species list for each community that shows essential and optional species.

Choosing how to restore native vegetation can be challenging. A common misstep in restoration is planting as many trees as possible. While well-intentioned, this approach often results in a single vegetation community that supports only a small proportion of the native wildlife that currently lives—or could live—in the area. This approach can inadvertently put other species at risk.

The broader Gawler River landscape historically supported, and in many areas still supports, a diverse mix of vegetation communities. Expert ecologists have identified these, and the five most relevant to the Gawler River area are highlighted and grouped in this guide:

1. River Red Gum riverine forest
2. Black Box floodplain woodland
3. River Red Gum floodplain woodland
4. Floodplain shrublands
5. Grasslands

While some communities may be more common, iconic, or visually prominent than others, each plays a vital role in the local ecosystem—supporting a unique assemblage of native wildlife.



## 1. River Red Gum riverine forest



Figure 21: River Red Gum Riverine Forest at the southern end of Roediger Road, Buchfelde - September 2025

## 2. Black Box floodplain woodland



Figure 22: Black Box Floodplain Woodland at Brownes Road, Port Gawler - September 2025

## 3. River Red Gum floodplain woodland



Figure 23: River Red Gum Floodplain Woodlands at Buckland Park - June 2025

## 4. Floodplain shrublands

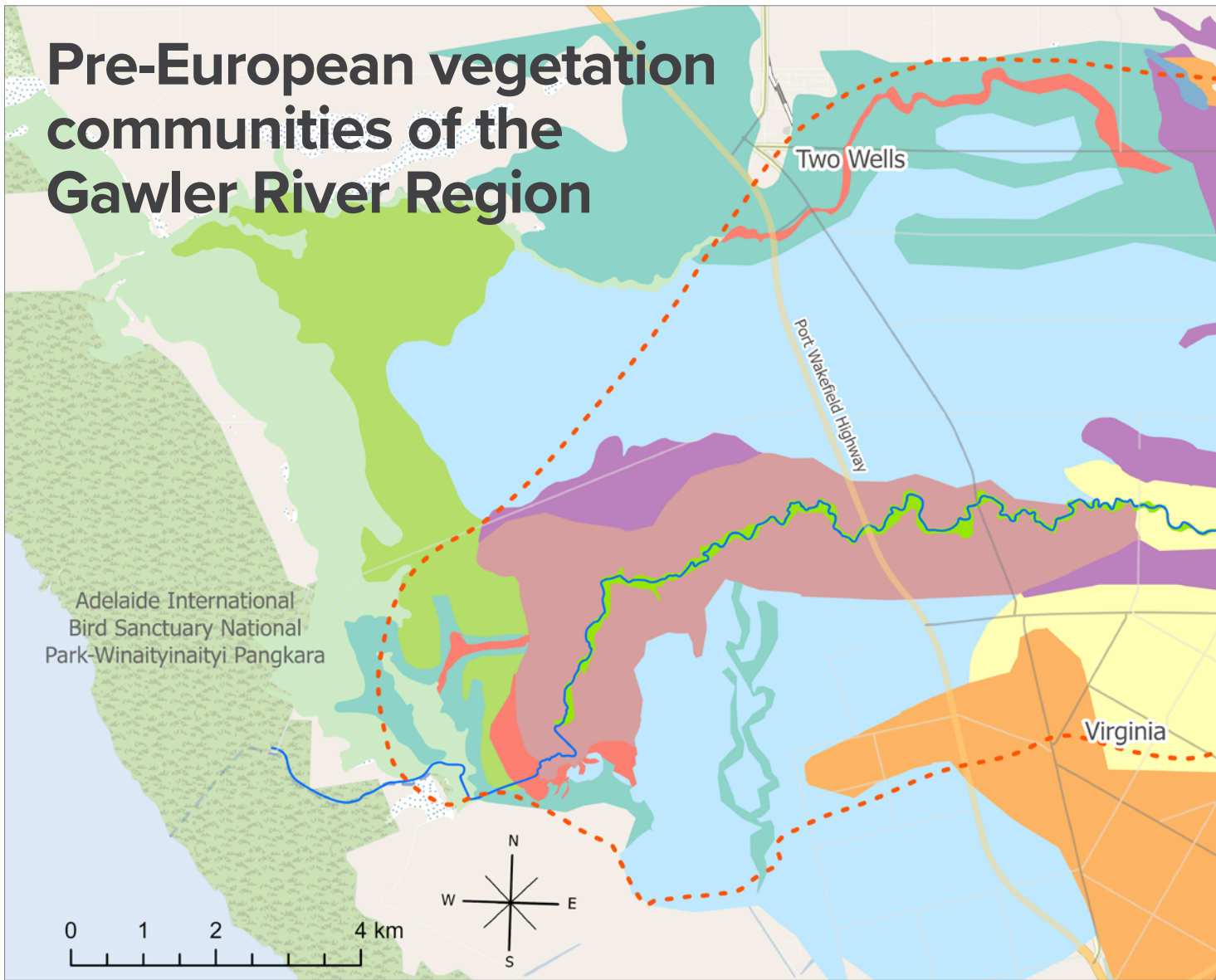


*Figure 24: Floodplain Shrublands adjacent Thompson Creek, Buckland Park*

## 5. Grasslands



*Figure 25: Grasslands at Carmelo Road, Buckland Park*

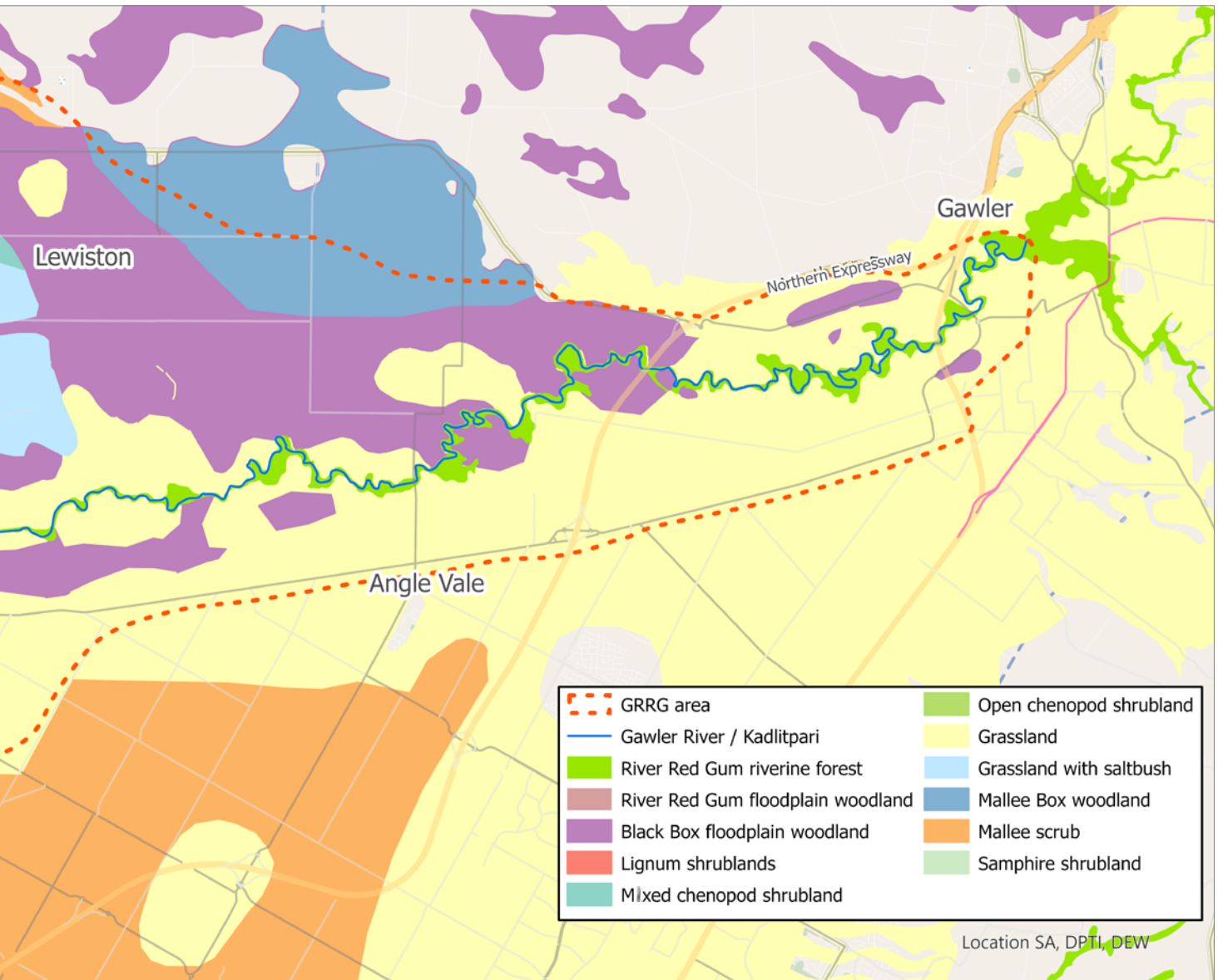


Map 2: Map of pre-European vegetation communities (see section 4 for detailed descriptions of the communities).

Prior to European arrival, the Gawler River supported a flourishing diversity of plant life, mirroring the landscape and ecosystems, and these systems were deeply intertwined with the knowledge and custodianship of the Kurna people.

The riverbanks were lined with expansive River Red Gum forests, which remain today, although their width has reduced. These majestic trees served as both ecological anchors and cultural landmarks, marking sacred sites and providing materials for tools, canoes, and shelter.

In the lower reaches (near the coast), the River Red Gum forest spread out to become a tall woodland of River Red Gums interspersed with Black Box and Mallee Box. Expansive grasslands (without trees) dominated the areas north and south of the Gawler River. In low lying areas, close to the river channel and along regular flood paths there were Black Box and Mallee Box woodlands with an understorey of Lignum, Nardoo, sedges rushes and grasses. The Kurna people understood these plants' roles, utilising them for food, medicine and materials for weaving, etc.



Further downstream and along outer edges of the floodplain, the woodlands gave way to shrublands of Lignum and then Leafless Bluebush (*Maireana aphylla*). These shrubs thrived and provided critical habitat for birds such as the white winged fairy wren, reptiles and small mammals.

The Kurna people had a deep understanding of these ecosystems, managing them through practices including, fire to maintain balance and ensure sustainable food sources, materials and habitats.

Map 2 provides an indication of where the different vegetation communities occurred based on early records, soil and flood mapping.

# 4.1 River Red Gum riverine forest



# Description

The Gawler River features a River Red Gum (*Eucalyptus camaldulensis* var. *camaldulensis*) forest that stretches upstream into the North and South Para River catchments, following the river across the northern Adelaide Plains and ending about 3 kilometres from the coast. Mature River Red Gums, usually 20 to 25 metres tall, grow from the edges of channels or pools, up the banks and across the top, spreading into areas that flood every 1 to 3 years. River Red Gum seedlings have grown or been planted in many places outside their historical locations.

The following can be inferred from historical documents and other sources reviewed for this report. The understorey vegetation on the lower banks and around permanent pools was likely dominated by Common Reed with Club-rush and Flat Sedge, Lesser Joyweed as well as clumps of Lignum. Further up the banks the understorey would have shifted to more drought tolerant species, with Spiny Flat-sedge, Notched Sedge, with some native grasses and saltbushes dominating the ground layer. Shrubs would have been sparse, with mid-storey vegetation being “see through”, with Native Scurf-pea, Native Hollyhock and Mealy Saltbush were likely the more common species. Occasionally dryland species such as Native Apricots and Sweet Bursaria may have occurred, with patches of suckering Broughton Willows forming a sub-canopy.

Most of the surrounding vegetation would have been grasslands, with patches of Black Box floodplain woodlands occurring on heavy soils and low-lying parts of the floodplain (see section 4.2). At the downstream end of the river, a shallow fresh groundwater table supported a wide River Red Gum floodplain woodland on either side of the main channel (see Section 4.3).

## Reference site



Figure 26: Good quality River Red Gum riverine forest in the river channel accessible at the end of Roediger Road.

### Features:

- **Structure:** Widely spaced original River Red Gums with large hollows, no need for additional tree planting because natural regeneration is occurring.
- **Diversity:** Many different types of native grasses on the tops of the banks, with gaps between the grass tussocks where reptiles can bask.
- **Habitat:** Patchy and widely spaced understorey shrub planting so that the site has a “see through” appearance, this provides space for insects to fly, birds to forage, and light to reach the ground.
- **Managed weeds:** Woody weeds, exotic trees and other high threat weeds have been removed from a large part of the site, with on-going work planned.
- **Collaboration:** Adjoining land managers and the community have worked together to create a large area of restored forest.

## Ecological importance

Extending from the hills to the coast, the riverine forest provides a unique habitat for species that are not found elsewhere in the surrounding dry and heavily cleared landscape.

Large trees in these forests contain numerous hollows that serve as important breeding sites for possums and a wide range of bird species, including cockatoos, parrots, lorikeets, kingfishers (such as the Laughing Kookaburra and Sacred Kingfisher Figure 27), and likely nocturnal birds like the Southern Boobook, Barn Owl, and Australian Owlet-nightjar. Trees located near open grassed areas also provide ideal habitat for many raptors, with a particularly high diversity recorded in the study area—including state-listed species such as the Peregrine Falcon, Black Falcon, and Little Eagle, as well as White-bellied Sea Eagles near the coast.

The size of intact woodland areas is critical for species with large territorial needs, such as the Crested Shrike-tit, and for species vulnerable to habitat fragmentation, including Bearded Dragons and Sleepy Lizards.

River pools with nearby perching sites are used by waterbirds such as the state-listed Australasian Darter.

Tangled Lignum in the understorey offers shelter for smaller birds like Fairy-wrens and provides nectar for insects.

The river's cooler microclimate—created by increased moisture and shade—allows reptiles typically found in the hills and further south, such as Garden Skinks, to inhabit the plains.

Each spring, multi-coloured, iridescent Rainbow Bee-eaters migrate to the region to breed. They nest in riverbanks and nearby habitats, feeding on insects including bees, wasps, and semi-aquatic species such as dragonflies and damselflies.



Figure 27: Sacred Kingfisher. Photo: Martin Stokes



Figure 28: River Red Gum trees growing along the Gawler River.

## Cultural and social significance

### Aboriginal culture

The Gawler River holds deep cultural significance for Kaurna people. The River Red Gum also has its own Creation Dreaming, as shared by Jeffrey Newchurch, Draper, Maland, and Donald (2023). In this story, a Creation Ancestor made a pact with the River Red Gums: they would provide shelter, bark, timber, and firewood for the people, and in return, people would care for the trees and their environment. This care includes respectful harvesting, fire use, and other land management practices.

As a result, old-growth River Red Gums—and Black Box trees—along the riverbanks and floodplains are culturally significant. Many of these trees show signs of past cultural use and are considered *culturally modified trees*, which are protected under the South Australian Aboriginal Heritage Act 1988.

The Gawler River is also highly sensitive for buried cultural heritage. Kaurna Elders advise that any major ground-disturbing works—whether for development or conservation—within 500 metres of the river require a cultural heritage assessment due to the area's high sensitivity.

### Social

The closest civic centres to the river are currently Gawler, Evanston and Angle Vale. The Town of Gawler features a well-used network of riparian reserves and trails that are highly valued by the local community. Future developments—including several at Angle Vale, the Kudla Growth Area, and Riverlea Park—are expected to increase the use and social importance of the Gawler River corridor and its iconic River Red Gum forest.

At the time of writing, the Northern Park Lands was identified as a key investment in the Greater Adelaide Regional Plan. This proposal includes major upgrades to public open space, such as a trail network along the Gawler and South Para Rivers and areas further south. This guide can help inform the development by supporting improvements to local vegetation communities.



Figure 29: Weedy understory typical of much of the River Red Gum riverine forest.

### Current state

The current distribution of the River Red Gum forest along the Gawler River is similar to the historical extent, although it may not extend as far out on the banks as it once did due to tree removal for fuel, construction, agriculture, etc. While the canopy of River Red Gums is likely to be relatively unchanged, the understory has been significantly modified.

The understory is now mostly dominated by woody weeds and exotic trees such as Desert Ash, Wild Olives, Peppercorn Trees, various Cactus and Castor Oil Plants (Figure 29). However, the river has also been a focus for landholder and community projects that have included significant restoration efforts with weed removal and revegetation works.

Changes in catchment flows and declining groundwater levels, as well as in-stream structures also mean the river channel is drier than it historically was. Many of the native fauna that once occurred in or visited the River Red Gum forest are now lost (e.g. Pink Cockatoos) or have more restricted distributions such as Rakali.

# Restoration requirements

## Priority areas

Site priority considerations for River Red Gum channel forest conservation and restoration are:

**1<sup>st</sup> High value sites:** Sites with high cultural values or high ecological value (e.g. permanent pools or significant remnant trees).

**2<sup>nd</sup> Sites with good structure and diversity:** Areas with tree canopy and low cover of high threat weeds and/or good native understorey (including areas that have been improved through past restoration efforts).

**3<sup>rd</sup> Sites that support high value sites nearby:** Areas adjacent to important sites or sites with other important vegetation communities that are in moderate to good condition – manage threats to encourage natural regeneration, monitor for a few years and see what happens before deciding if and what revegetation is required. Note: adjacent areas may be a very different looking vegetation community such as grassland.

**4<sup>th</sup> Weedy sites with few native species:** Areas with tree canopy and understorey dominated by high threat weeds with little native understorey.

## Restoration risks

River Red Gum riverine forest		
Risk	Consideration	Mitigate
<b>Converting to the wrong vegetation community</b>	Excess planting of a species that can degrade integrity of the vegetation community.	Take care to correctly identify the site's target vegetation community to avoid restoring to recommendations of a different community. Follow guidelines of recommended plants per hectare.
<b>Planting the wrong species or the wrong amount of a species</b>	Planting unsuitable species for the vegetation community may lead to a struggle to survive. For instance, some species cannot tolerate saline environments.	Follow guidelines of recommended plants per hectare.
<b>Not recognising young trees in structure assessment and overplanting as a result.</b>	Young trees (10–30 years old) are often not recognised as such. This can lead to a belief that more trees need to be planted, resulting in overly dense tree cover that may reduce habitat quality and affect tree health.	After assessment, thinning may be appropriate. Native Vegetation Clearance guidelines will need to be consulted
<b>Doing more harm than good with mulching</b>	Using mulching to deal with weeds and increase amenity of planting will impact plant recruitment and reduce the ability of wildlife to use the habitat. Soil crust is important for biodiversity, and mulch prevents the ability of moss and lichens to thrive.	Plan site maintenance for bare/unmulched ground. Do not fall back on mulching as standard practice – use it sparingly.
<b>Impacting Kaurua culture with inappropriate restoration activities</b>	Planned work could impact culturally significant sites – especially if it includes earthworks within 500 metres from the river.	Seek to learn what may be significant at the site and engaging Kaurua to reduce the impact of works.

## Environmental water requirements

Key points:

- River Red Gums need flooding every 1-3 years for healthy growth unless they access fresh groundwater.
- Aquatic fauna also require environmental water, and stormwater wetlands can help by supporting groundwater recharge, managing flow volumes, and improving water quality to benefit both trees and aquatic habitats.

Healthy stands of River Red Gums along most of the Gawler River system are essential to this ecosystem. Retaining trees and maintaining their condition and a healthy population structure is critical. Core to achieving this is ensuring that the trees' environmental water requirements are met, which includes a combination of in-stream and overbank flows occurring and maintenance (and recovery) of fresh groundwater.

In River Murray floodplains, River Red Gums require flooding every one to three years to maintain their health. It is likely that full channel flows along the Gawler River may perform a similar function for trees lining the river channel in the upper reaches of

the system, while shallow (<10m) groundwater also contributes to meeting tree water needs in the lower reaches (as well as other vegetation and permanent pools). There has not been a specific assessment of water sources used by Gawler River Red Gums.

Aquatic fauna (e.g. fish, turtles and frogs) also have environmental water requirements that include maintenance of permanent pools, in channel flows to allow migration and freshen water quality, and no barriers to movement, especially during low flows. *See SARDI report in Reading and Resources Section for further advice.*

Carefully planned and designed stormwater wetlands may assist in providing environmental flows by facilitating groundwater recharge close to the river and managing the volume and timing of flows as well as improving water quality and extending the area of habitat close to the river.

### Reference site

**Roediger Road Riverine Forest:** River channel accessible from the end of Roediger Road, Buchfelde

# Vegetation management

Section 2 (planning) describes the key priorities for planning vegetation management works, including setting the vegetation management target level for restoration and determining required actions, such as weed control and revegetation. Weed control and conserving any remnant native vegetation are the main priority for the River Red Gum riverine forest. Fencing to prevent or manage stock access is usually required where adjacent areas are used for grazing.

Allow for natural regeneration following weed control, then assess native species cover before planning revegetation; there may be no need for planting more plants. Where revegetation is required (i.e. where the goal is habitat restoration and natural regeneration is limited), then the priority is to increase the native ground layer diversity and improve the cover on the upper banks.

This vegetation community often has too many River Red Gum saplings, which can alter the ecosystem's structure and compete for resources. Natural regeneration may include trees aged 10 to 30 years, so thinning areas with dense seedling growth might be necessary. However, any thinning must follow the Native Vegetation Clearance guidelines.

## Weed control

Weed control in the river corridor needs to be undertaken with care to prevent unintended environmental impacts. In particular:

- careful and appropriate herbicide use when working in and around a watercourse
- use of minimal soil disturbance techniques (e.g. methods that leave the plant root system in place) to prevent bank erosion and damage to cultural heritage
- care taken to avoid off-target and accidental damage to native vegetation.

In many cases, complete eradication of high threat weeds is unlikely due to the abundance of weeds throughout the river system, especially where parcel boundaries split the river and adjacent land managers do not undertake weed control. Controlling weeds on steep banks and/or near deep pools also adds complexity.

Woody weed control will need to be on-going, with regular (ideally at least annual) monitoring and control of any new plants before they set seed.

Slashing or brushcutting can promote native grasses and reduce annual exotic grasses; these activities need to be carefully timed to avoid removing native grass seed heads before they have fully formed and set. The most effective timing is often during late winter or early spring, when annual grass seeds are developing, or after native grasses have dropped their seed, to remove thatch and promote leaf growth. High intensity short duration grazing may also be used, but may be difficult to implement in areas with steep river banks.

Further information about weed control is provided in Section 3.

## Vegetation zones for assessment and revegetation

Table 1 outlines the target diversity and plant density (stems per hectare) needed to achieve the desired vegetation structure, depending on the restoration goals. Figure 30 is an info-graphic that shows the zones within the River Red Gum riverine forest where different species are most commonly found, along with the basic structure of the vegetation community.

The targets represent long-term outcomes that may be reached over time through various methods, including natural regeneration, and should not be interpreted as a planting prescription. Species that commonly occur in each zone are provided in Table 2. The tree canopy layer is present in all sites, and planting new trees should only occur where trees are not present and no natural regeneration is occurring. It is important to consider the future mature spread of the plant and space accordingly.

Table 1: Target diversity (number of different species) and numbers per hectare for different life forms in the River Red Gum riverine forest.

Life form	Target: Basic		Target: Advanced		Comments
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare	
<b>Trees</b>	1	5 to 15	1	10 to 25	Generally canopy trees are always present and only need planting where there is no natural regeneration - regenerating trees can include 10-30 year old plants.
<b>Small trees</b>	1 to 2	10 to 20	2 to 3	10 to 20	Plant in clumps of 5 to 10 plants that are 1 to 3 metres apart; leave long gaps between clumps
<b>Large shrubs</b>	1 to 2	25 to 75	3 to 4	25-75	The shrub layer should be open, avoid the temptation to achieve native species diversity and coverage by planting high numbers of dryland shrubs.
<b>Small shrubs</b>	3 to 5	100 to 150	8	100 to 200	
<b>Ground layer</b>	15+	500 to 1000	30+	2000 to 10,000	Plant clumps of 5 to 10 plants of the same species, at less than 1 metre between plants; this may mean leaving gaps between clumps of groundcover which can be maintained with slashing. High diversity and numbers of ground layer plants are the most challenging to achieve when undertaking revegetation and it may take many years to achieve the "advanced" targets for groundlayer.

Figure 30: Vegetation zones of the River Red Gum riverine forest

## Vegetation zones of the River Red Gum riverine forest

### Adjacent areas

Away from the bank tops, the forest transitioned to a grassland, with occasional patches of Black Box over Lignum, Nardoo, grasses and sedges woodland on heavier soils that held water from local flows and major floods (see section 4.2).



### Mid banks

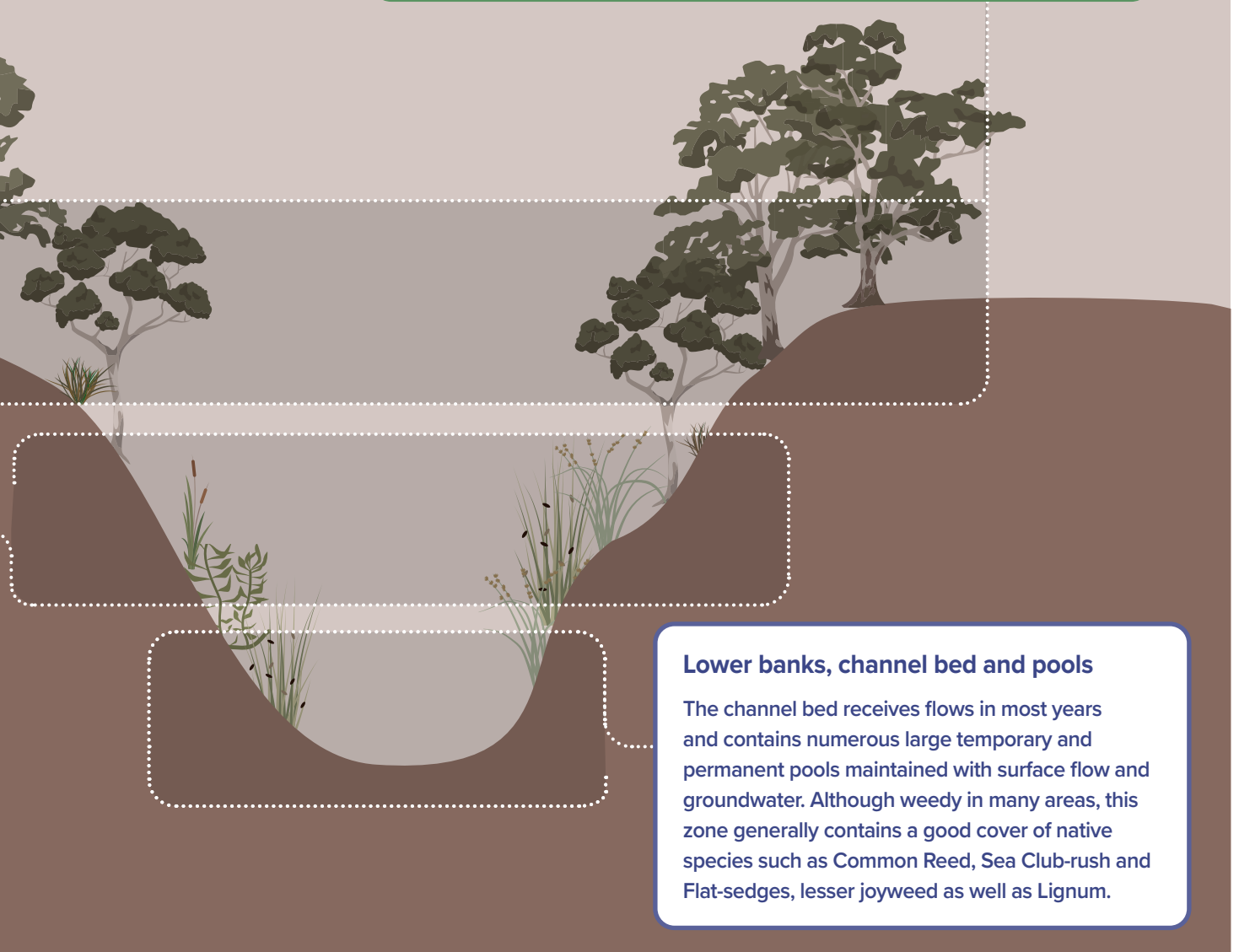
The mid bank zone is inundated on average every 1 to 5 years, depending on the bank height. In many areas the bank is very steep and susceptible to erosion, however on the inside of river bends a flatter 'shelf' often forms that may be accessible. The vegetation is usually a mix of native Red Gums over Lignum and reeds with woody weeds and exotic trees.

In almost all cases revegetation of the lower banks and generally the mid banks is not required due to existing native vegetation being present. Revegetation of the lower banks should only be undertaken where there has been a disturbance such as engineering works and there is a requirement to quickly restore native ground cover.



### Top of bank

Occasional flooding i.e every 5 to 10 years. Red Gums may draw on groundwater as well as soil water replenished during high flows, floods and rainfall, but the soil profile is likely to dry out quickly and therefore the understorey includes many drought tolerant grasses and sedges.



### Lower banks, channel bed and pools

The channel bed receives flows in most years and contains numerous large temporary and permanent pools maintained with surface flow and groundwater. Although weedy in many areas, this zone generally contains a good cover of native species such as Common Reed, Sea Club-rush and Flat-sedges, lesser joyweed as well as Lignum.

Table 2: Native vegetation species list for River Red Gum riverine forest

Form	Scientific name	Common name	Zone				Target*	
			Lower bank (pool)	Lower bank (dry)	Mid bank	Top of bank	Basic	Advanced
<b>Tree</b>	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>	River Red Gum	+	+	+	+	E	E
<b>Small tree</b>	<i>Acacia pycnantha</i>	Golden Wattle				+		O
	<i>Acacia salicina</i>	Willow Wattle		+	+	+	E	E
	<i>Pittosporum angustifolium</i>	Native Apricot				+	O	O
<b>Large Shrub</b>	<i>Acacia ligulata</i>	Umbrella Bush				+	O	O
	<i>Bursaria spinosa</i> ssp. <i>spinosa</i>	Sweet Bursaria				+	O	O
	<i>Dodonaea viscosa</i> ssp. <i>spatulata</i>	Sticky Hop-bush			+	+	O	O
	<i>Duma florulenta</i>	Lignum	+	+	+		E	E
<b>Small Shrub</b>	<i>Cullen australasicum</i>	Tall Scurf-pea			+	+	E	E
	<i>Hardenbergia violacea</i>	Native Lilac				+	O	O
	<i>Maireana brevifolia</i>	Short-leaf Bluebush				+	E	E
	<i>Maireana aphylla</i> (D)	Cottonbush				+	O	O
	<i>Malva preissiana</i>	Australian Hollyhock			+	+	O	E
	<i>Myoporum insulare</i> (D)	Common Boobialla				+		O
	<i>Rhagodia parabolica</i>	Mealy Saltbush				+	O	E
	<i>Senna artemisioides</i> ssp.	Desert Senna				+		O
<b>Ground layer</b>	<i>Aristida behriana</i>	Brush Wire-grass				+		E
	<i>Arthropodium strictum</i>	Nodding Vanilla-lily				+		O
	<i>Atriplex semibaccata</i>	Berry Saltbush				+	O	E
	<i>Atriplex suberecta</i>	Lagoon Saltbush		+	+		O	E
	<i>Austrostipa</i> spp. ( <i>blackii</i> , <i>curticoma</i> , <i>elegantissima</i> , <i>eremophila</i> , <i>nodosa</i> , <i>scabra</i> ssp.)	Spear-grass				+	E	E
	<i>Bolboschoenus caldwellii</i>	Salt Club-rush	+	+	+			E
	<i>Bolboschoenus medianus</i>	Marsh Club-rush	+				O	E
	<i>Carex bichenoviana</i>	Notched Sedge		+	+	+	O	E
	<i>Chloris truncata</i>	Windmill Grass				+	O	E
	<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge		+	+	+	O	E
	<i>Cyperus vaginatus</i>	Stiff Flat-sedge		+	+		O	E

Form	Scientific name	Common name	Zone				Target*	
			Lower bank (pool)	Lower bank (dry)	Mid bank	Top of bank	Basic	Advanced
Ground layer (cont.)	<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily			+	+	O	E
	<i>Dichanthium sericeum</i> ssp. (U)	Silky Blue-grass				+		O
	<i>Einadia nutans</i> ssp.	Climbing Saltbush				+	O	E
	<i>Eleocharis acuta</i>	Common Spike-rush	+					O
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush				+	E	E
	<i>Enneapogon nigricans</i>	Black-head Grass				+	O	O
	<i>Enteropogon acicularis</i>	Umbrella Grass				+	O	E
	<i>Epilobium hirtigerum</i>	Hairy Willow-herb		+	+			O
	<i>Ficinia nodosa</i> (D)	Knobby Club-rush		+	+		O	O
	<i>Juncus subsecundus</i>	Finger Rush			+	+	O	O
	<i>Lotus australis</i>	Austral Trefoil				+		O
	<i>Maireana enchylaenoides</i>	Wingless Fissure-plant				+		O
	<i>Pauridia glabella</i> var. <i>glabella</i>	Tiny Star				+		O
	<i>Phragmites australis</i>	Common Reed	+	+	+		E	E
	<i>Poa labillardieri</i> var. <i>labillardieri</i> (U)	Common Tussock-grass			+			O
	<i>Rytidosperma</i> spp. ( <i>R. caespitosum</i> , <i>R. fulvum</i> , <i>R. setaceum</i> )	Wallaby-grasses				+		E
	<i>Setaria jubiflora</i>	Warrego Summer-grass		+	+	+	O	E
	<i>Sida corrugata</i> var. <i>angustifolia</i>	Grassland Sida				+		O
	<i>Themeda triandra</i> (U)	Kangaroo Grass				+	O	O
	<i>Vittadinia</i> spp. ( <i>australasica</i> var., <i>gracilis</i> , <i>cervicularis</i> )	Sticky New Holland Daisy				+		O
<i>Walwhalleya proluta</i>	Rigid Panic				+	O	O	

+ = species occurs in this zone; \*O = optional species; E = essential species

(U) generally occurring upstream of Angle Vale; (D) generally occurring downstream of Angle Vale

Note regarding species list: the list represents species most likely to occur and able to be established using revegetation

## Other considerations

The river environment is impacted by a range of threats that also need to be addressed. In particular, water pollution and levels of hard rubbish both from catchment run-off and illegal dumping need to be managed.

The siting of land parcel and administrative boundaries across and along the river complicates (and often hinders) river management.

The linear nature of the river and connection from Gawler to the sea presents an opportunity to provide a recreational and passive transport link between towns along the river. As residential land development occurs in Angle Vale and Riverlea, riparian land will transfer into public open space, enabling recreation access along the linear corridor in these areas. Throughout the river system, active and coordinated management between councils, land managers and Kaurna Meyunna is key to achieving sustainable river restoration and public access.

### Special considerations when planning restoration activities in and around the Gawler River main channel

Some activities may require a **Water Affecting Activities Permit** under the *Landscape South Australia Act 2019*, these include, the construction of crossings, stormwater outlets and erosion control works as well as other soil disturbing activities like building structures or destroying vegetation in the watercourse. If you are uncertain if you will need a permit, contact your regional landscape board.

### Cultural heritage

All major ground disturbing works within 500 metres of the river, whether development or conservation based, need Kaurna cultural heritage assessment, because of the very high heritage sensitivity of this zone. Kaurna should be involved in delivering these works wherever possible.

### Levee banks

It's important that levee banks remain accessible for regular inspection and maintenance. To support this, woody weeds and exotic trees should be removed from levees using methods that avoid disturbing the soil. Tree and shrub planting on levees should be avoided.

Depending on the site's topography, slashing or brush-cutting may be the most practical management approach. If revegetation is necessary, it should be limited to native grasses and other low-growing species that won't obstruct access or compromise the structural integrity of the levee.

For more information see Section 2 (Planning).



Work in focus - Almond growers  
Brenton and Andrew SHARPE

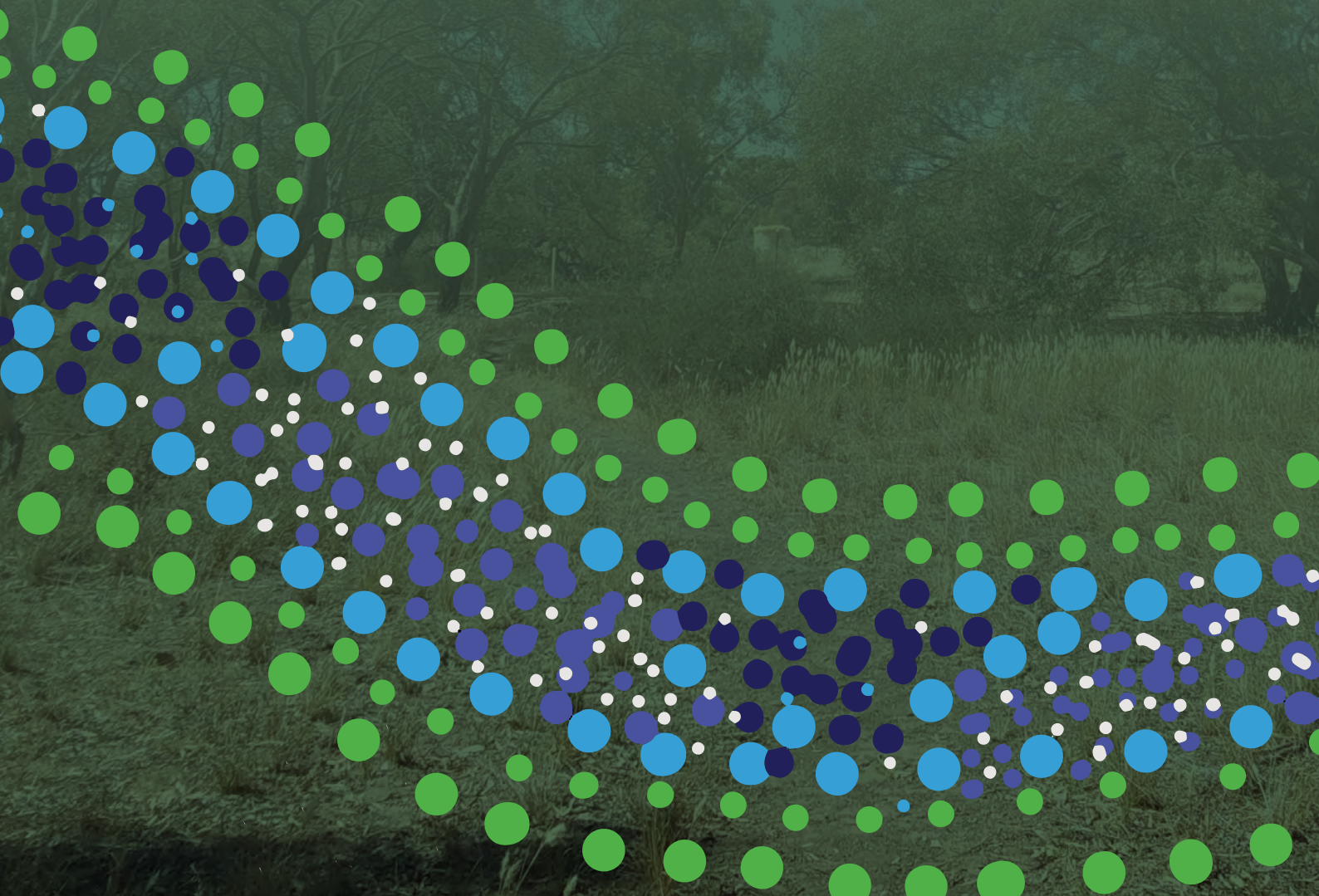
*"River bank weed control and maintenance is a bit of an effort but it has its benefits and is an insurance policy for the business".*

*"Woody weeds block water flow and increase chance of flooding while long grass and weeds can hide rabbit warrens and compromise levee stability."*

*"Less weeds allows water to flow more freely and supports a higher diversity of birdlife, native bees and beneficial insects which helps with pest control and pollination in the orchard"*



## 4.2 Black Box floodplain woodlands



# Description

Black Box floodplain woodlands comprised widely spaced (10 to 15 m apart) Black Box trees in lower lying floodplain areas mingling with Mallee Box on slightly higher ground.

Broughton Willows and Lignum may have occurred in patches, but the mid storey was probably otherwise quite open (Figure 31). The ground layer probably included a mix of semi aquatic species such as Nardoo, rushes and sedges, and water-loving salt bushes (e.g. Cottonbush and Nitrebush). Grasses and other ground layer species would have grown between flood events.

Black Box floodplain woodlands were mostly surrounded by grasslands but at some locations occurred adjacent to the River Red Gum riverine forest. Further north they also graded into Peppermint Box, Native Pine and mallee communities on sandier soils.

The scientific name for Black Box is *Eucalyptus largiflorens* and can also be referred to as River Box.

## Reference Site: Lewiston Wetlands, corner Pederick and Two Wells roads



Figure 31: Lewiston Wetlands, corner Pederick and Gawler roads

- Widely spaced original Black Box and Mallee Box with large hollows, open areas allow sunlight through to the ground and there is no need for additional planting because natural regeneration is occurring
- Many different types of native understorey species including Nardoo, sedges and rushes, saltbush, Lignum and several types of native grasses, with gaps between the grass tussocks where reptiles can bask
- Patchy and widely spaced understorey shrub planting so that the site has a “see through” appearance, this provides space for insects to fly, birds to forage, and light to reach the ground
- Very few woody weeds, exotic trees and other high threat weeds
- Lots of fallen branches and logs as well as leaf litter.

The site has a linear trail through it and can be accessed from Pederick Road just south of the intersection with Two Wells Road.

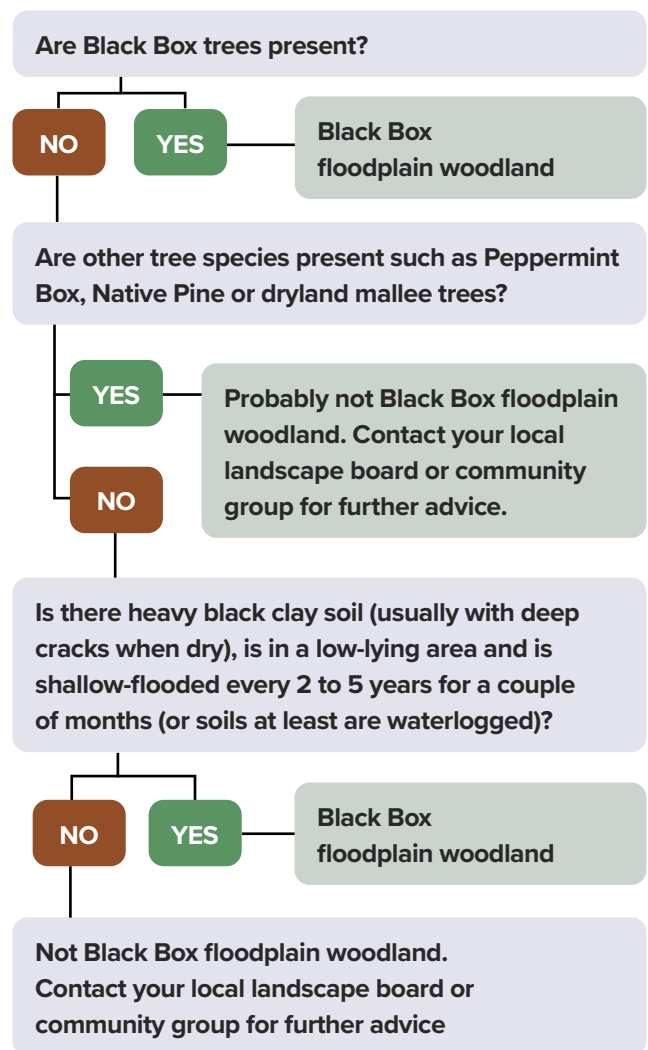
## Distribution

*... clumps of [Black Box] stood in the flood-water lagoons and one-time billabongs...*<sup>5</sup>

Black Box floodplain woodlands occur on the floodplains of the Gawler River on heavy clay soils (usually black cracking clays), in areas that are subject to flooding every 3 to 5 years. Black Box floodplain woodlands do not survive extended dry conditions or excessive flooding. They also occur north of the floodplain in low lying areas that receive local run-off with similar soil type. The Black Box floodplain woodlands have been almost entirely cleared from areas south of the river, and north of the river remnant patches are mostly small and degraded. Therefore, it can be difficult to determine where they would have been before disturbance. Black Box, Mallee Box, and Peppermint Box are similar species that all occur in the region and often nearby. They can be difficult to tell apart, also making it hard to identify Black Box floodplain woodland sites – guidebooks and on-line resources listed in Section 6 or local experts may be able to help. The three Box species tend to occur in the sequence shown in Figure 34.

## How to tell where Black Box floodplain woodlands did occur or should be established

Map 2.1 in section 2 shows the approximate location where Black Box floodplain woodlands would have occurred, however readers will need to look more closely at site features to determine if it is or should be Black Box floodplain woodland – it will be more obvious in some locations than others. A decision tree for determining Black Box locations is:



The presence of flood tolerant understorey species such as Lignum, Nardoo, Rushes and Sedges may also indicate a site may once have been Black Box floodplain woodland if in the area between Gawler to Lewiston, Virginia and Angle Vale, but further out and downstream these species also occur in shrubland communities without trees (see Section 4.4). There

are also areas where young (less than 50 year old) River Red Gums are growing on the floodplain which may have been introduced, these are probably (but not always) growing in Black Box sites.

## Ecological importance

Black Box floodplain woodlands contain a number of important habitat features that provide feeding, shelter and breeding sites for many native fauna, including:

- cracks and hollows in very old trees
- cracking clay soils shelter small lizards such as the Snake-eyed Skink
- native grass tussocks
- fallen timber.

As noted above, the Lewiston Road Wetland is an excellent example of remnant Black Box floodplain woodland. Ecological surveys for this Guide found that it had the highest invertebrate, native plant and reptile diversity and supports a



small population of Australian Zebra Finches.

*Figure 32: Zebra Finches were observed at the Lewiston and Wingate wetlands in Black Box floodplain woodlands and have also been recorded at Buckland Park and Carclew cemetery. They live in flocks of 10 to 100 and mostly feed on the ground on fallen or ripening grass seeds but also eat insects (especially ants and termites). They pair for life and build dome shaped nests. This species has declined in the Adelaide region in the last 30 years.*

*Photo: Eddy Smith, some rights reserved (CC BY-NC)  
<https://inaturalist.ala.org.au/observations/200978667>*

## Cultural and social significance

Black Box trees (and other Box species) often form large hollows near ground level, which attract bees. Kurna people developed skilled techniques to harvest honey from these hives without destroying them, allowing the bees to continue producing. This sustainable practice occurred during post-colonial times with feral European honey-bee hives. This shows Kurna people adopted traditional honey harvesting techniques from areas that have native honey producing bees.

## Current state

Black Box floodplain woodlands have been largely cleared and most remnants are either paddock trees over crops and pastures, or narrow strips along roadsides with an understorey of Lignum and weeds (Figure 33). There are however good remnants in council reserves in the Lewiston area, including Humzy Reserve and the northern end of Lewiston Wetlands adjacent to Pederick Road (Figure 31). Both sites have a very high native species diversity and good cover of native understorey, old trees and limited high threat weeds.

Black Box floodplain woodlands on the Gawler River floodplain are considered vulnerable to climate change as well as changes in flood patterns. Many remnant Black Box sites contain species of native shrubs and other understorey that are more typical of dryland areas. This may be because reduced flooding in these areas is causing a shift towards a more dryland woodland community.

Black Box trees are common in the Murray Darling Basin, but in the Gawler River region the species has a restricted distribution and is considered Vulnerable to extinction from urbanisation and change in water availability.



*Figure 33: Typical example of roadside remnant Black Box woodland, with understorey of Lignum.*

# Restoration requirements

## Priority areas

Site priority considerations for Black Box floodplain woodland conservation and restoration are:

**1<sup>st</sup> Existing remnant woodlands:** Existing remnants in moderate to good condition –manage threats such as weeds, pest animals and grazing to ensure no loss of biodiversity.

**2<sup>nd</sup> Degraded areas with remnant trees/plants:** e.g. trees with little to no native understorey, or remnant understorey without trees. First manage threats to encourage natural regeneration, continue low impact weed control and monitor for a few years and see how the site responds before deciding if and what revegetation is required.

**3<sup>rd</sup> Areas adjacent to remnants:** Manage threats and restore environmental water requirements to encourage natural regeneration around existing remnants such as roadsides, council reserves and paddock trees, continue low impact weed control and monitor for a few years and see what happens before deciding if and what revegetation is required. Note: if on higher ground a different plant community may be appropriate.

**4<sup>th</sup> New sites:** Most cleared sites will need revegetation to restore Black Box floodplain woodland. Site size and proximity to the edge are both factors that impact ecosystem health. Therefore, larger, more compact sites (square or round) are better than long, narrow sites because compact sites have less edge.

## Restoration risks

Black Box floodplain woodlands		
Risk	Consideration	Mitigate
<b>Converting to the wrong vegetation community</b>	Excess planting of a species that can degrade integrity of the vegetation community.	Take care to correctly identify the site's target vegetation community to avoid restoring to recommendations of a different community. Follow guidelines of recommended plants per hectare.
<b>Planting the wrong species or the wrong amount of a species</b>	Planting unsuitable species for the vegetation community may lead to a struggle to survive. For instance, some species cannot tolerate saline environments.	
<b>Planting in an area that doesn't provide water needs for this vegetation community</b>	Black box has environmental water requirements and may not survive long term if these are not met.	Ensure the restoration site is in an area that is normally / or can be flooded every 3-5 years.
<b>Impacting Kaurua culture with inappropriate restoration activities</b>	Planned work could impact culturally significant sites – especially if it includes earthworks within 500 metres from the river.	Seek to learn what may be significant (Section 2, Step 4) at the site and engaging Kaurua to reduce the impact of works.

## Environmental water requirements

Key points:

- Black Box trees benefit from flooding every 3-5 years for optimal health.
- Stormwater systems could help provide environmental flows to Black Box floodplain woodlands, but excessive flooding could harm the trees.

Healthy Black Box trees are essential to the Black Box community and maintaining old trees is critical as it takes many years to produce the large hollows these hold. Core to achieving this is ensuring that the environmental water requirements of these trees are met. This would naturally have occurred through a combination of flooding from the Gawler River and local rainfall run-off.

There has not been a specific assessment of the water sources used by Gawler River Black Box, but on River Murray floodplains, Black Box require flooding every three to five years to maintain their health.

Stormwater systems could be planned and designed to assist in providing environmental flows by directing urban and road run-off to Black Box floodplain woodlands. It is important however that Black Box floodplain woodlands do not receive too much flooding which could kill them.

## Reference sites

**Humzy Reserve:** corner of Bethesda Road and Gawler Road, Lewiston

**Lewiston Wetlands:** (Figure 31), northern end adjacent to Pederick and Gawler Roads, Lewiston

# Vegetation management

Section 2 (Planning) describes the key priorities for planning vegetation management works, including setting the vegetation management target level for restoration and determining what actions are required, such as weed control and revegetation. For the Black Box floodplain woodlands, ongoing weed control and conserving any remnant native vegetation are the priority for most areas. Natural regeneration should be allowed to occur following initial weed control and the cover of native species assessed before revegetation is planned. Where revegetation is required (i.e. where the goal is habitat restoration and natural regeneration is limited), then the priority is to increase the native ground layer diversity.

## Weed control

Most remnants of Black Box floodplain woodlands contain common declared weeds such as feral Olive trees, African boxthorn and Cactus as well as environmental weeds such as Rice Millet and Carpet weed. In the Lewiston to Two Wells area, a type of Pistachio has also become a weed. Most remnant sites however do not have high weed levels and eradication of high threat weeds is achievable,

although on-going follow-up will be critical because of seed sources in surrounding areas. Section 3 provides further information on weed control, but the general priorities for weed control follow:

- Assess whether any native wildlife is dependent on the weeds. If so, weed control will need to progress slowly to allow for new habitat to replace the weeds.
- Start in the least weedy areas, working towards the weediest areas, and don't 'over weed' areas leaving them bare.
- Use minimal disturbance methods that avoid off-target damage to native species and don't disturb the ground.
- Revisit and continue weed control into the future to prevent reinfestation.

## Vegetation zones for assessment and revegetation

Table 3 describes the target plant species diversity and number of plants per hectare depending on what the vegetation target is; these targets represent an end point rather than a revegetation list. Figure 34 illustrates the zones within the Black Box floodplain

woodland where different species would most commonly occur and the basic structure of the community. Species that commonly occur in each zone are provided in Table 4. The tree canopy layer is present in all sites, and planting new trees should only occur where no natural regeneration is occurring.

Table 3: Target diversity (number of different species) and numbers per hectare for different life forms in the Black Box floodplain woodland.

life form	Target: Basic		Target: Advanced		Comments
	Species diversity	Numbers / hectare	Species diversity	Numbers /hectare	
<b>Trees</b>	1 to 2	15 to 30	1 to 2	15 to 30	Generally canopy trees are always present and regenerating trees include 10-30 year old plants
<b>Small trees</b>	0 to 1	0 to 25	0 to 4	0 to 25	Plant in clumps of 5 to 10 plants that are 1 to 3 m apart; leave long gaps between clumps
<b>Large shrubs</b>	1 to 3	10 to 30	1 to 3	10 to 30	The shrub layer should be open, avoid the temptation to achieve native species diversity and coverage by planting high numbers of shrubs.
<b>Small shrubs</b>	2 to 4	50 to 150	5 to 8	50 to 150	
<b>Ground layer</b>	15+	150 to 500	15 to 30	10,000+	Plant clumps of 5 to 10 plants of the same species, at less than 1m between plants; this may mean leaving gaps between clumps of groundcover which can be maintained with slashing. High diversity and numbers of ground layer plant are the most challenging to achieve when undertaking revegetation and it may take many years to realise the "advanced" targets for groundlayer.



Figure 34: Vegetation zones of the Black Box floodplain woodland

# Vegetation zones of the Black Box floodplain woodland



## Slightly elevated areas subject to seasonal waterlogging and infrequent flooding

On slightly higher ground the tree canopy becomes a mix of Black Box and Mallee Box and more grasses and water-loving saltbushes occur resulting in a high diversity of understorey in good sites.

Note: the slope is exaggerated in this diagram



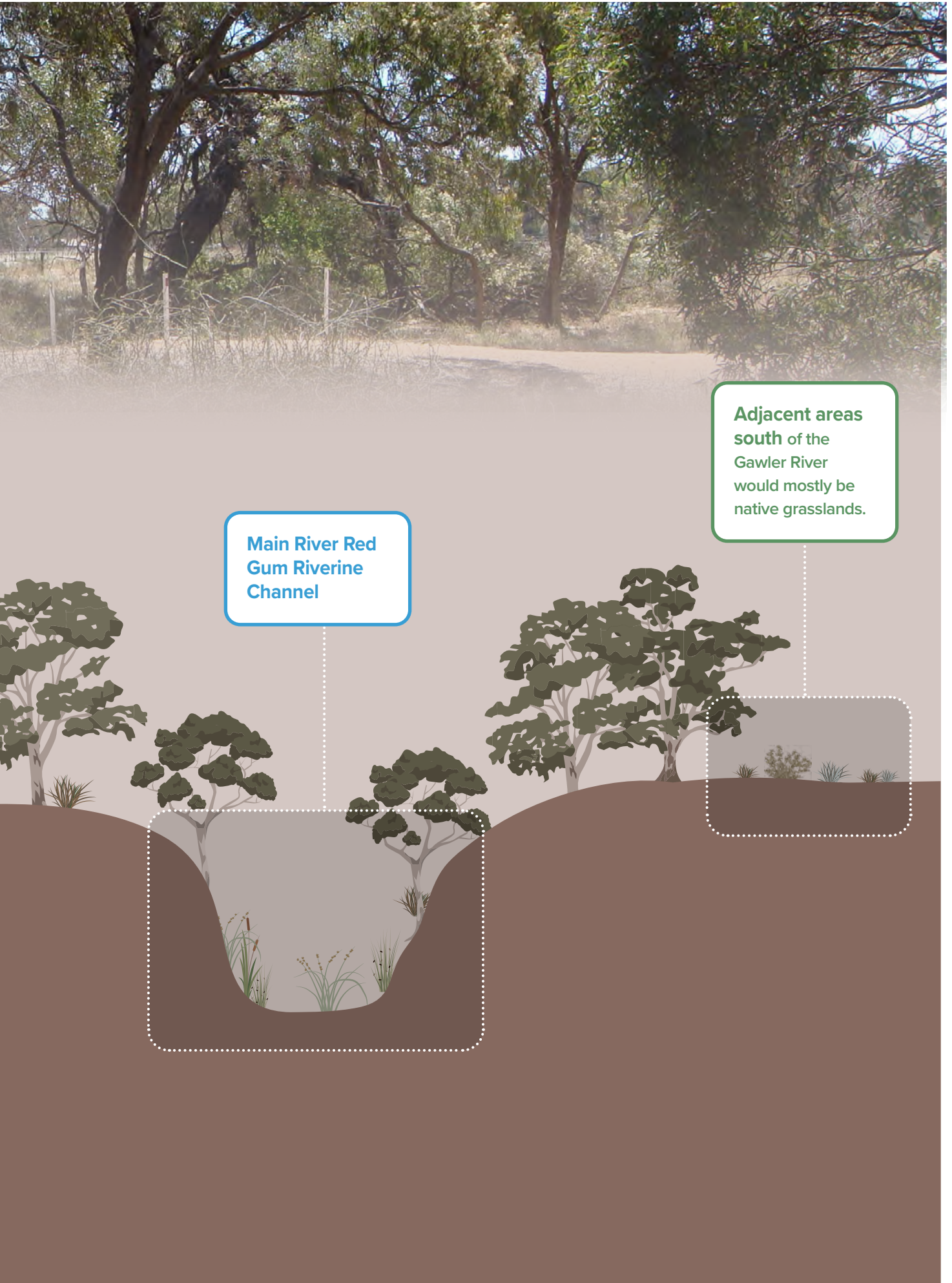
## Adjacent areas north

of the Gawler River would be either grassland on heavier soils or Peppermint Box, Native Pines and dryland mallee on sandier and limestone soils

## Low lying areas, 'billabongs' and flood channels

The very lowest lying areas are flooded on average every 2 to 5 years and would generally hold water after local rain. The vegetation is usually a mix of native Black Box over Lignum, Nardoo, sedges and rushes.

*\*Note: the distance between the Main River Red Gum Channel and Black Box Woodland can vary from meters to kilometers depending on the location along the river*



**Main River Red Gum Riverine Channel**

**Adjacent areas south of the Gawler River would mostly be native grasslands.**



Table 4: Native vegetation species list for Black Box Floodplain Woodlands.

Form	Scientific name	Common name	Zone		Target*	
			Lowest	Elevated	Basic	Advanced
Tree	<i>Eucalyptus largiflorens</i>	Black Box	+	+	E	E
	<i>Eucalyptus porosa</i>	Mallee Box		+	E	E
Small tree	<i>Acacia pycnantha</i>	Golden Wattle		+	E	E
	<i>Acacia salicina</i>	Broughton Willow	+	+	O	O
	<i>Myoporum montanum</i>	Native Myrtle	+	+	O	O
	<i>Pittosporum angustifolium</i>	Native Apricot		+	O	O
Large Shrub	<i>Bursaria spinosa</i> ssp. <i>spinosa</i>	Sweet Bursaria		+	O	O
	<i>Duma florulenta</i>	Lignum	+		E	E
Small Shrub	<i>Cullen australasicum</i>	Tall Scurf-pea	+	+	O	O
	<i>Exocarpos aphyllus</i>	Leafless Cherry		+	O	O
	<i>Maireana aphylla</i>	Cotton-bush	+	+	O	E
	<i>Maireana brevifolia</i>	Short-leaf Bluebush		+	O	E
	<i>Maireana oppositifolia</i>	Salt Bluebush		+	O	O
	<i>Nitraria billardierei</i>	Nitre-bush	+	+	O	O
	<i>Rhagodia parabolica</i>	Mealy Saltbush		+	E	E
	<i>Rhagodia spinescens</i>	Spiny Saltbush		+		O
	<i>Tecticornia indica</i> ssp. <i>leiostachya</i> (U)	Brown-head Samphire	+		O	O

Form	Scientific name	Common name	Zone		Target*	
			Lowest	Elevated	Basic	Advanced
Ground-layer	<i>Aristida behriana</i>	Brush Wire-grass		+	O	E
	<i>Arthropodium strictum</i>	Common Chocolate Lily		+	O	O
	<i>Atriplex semibaccata</i>	Berry Saltbush		+	E	E
	<i>Atriplex suberecta</i>	Lagoon Saltbush	+		O	O
	<i>Austrostipa</i> spp. ( <i>A. curticoma</i> , <i>A. elegantissima</i> , <i>A. eremophila</i> , <i>A. nodosa</i> , <i>A. scabra</i> ssp.)	Spear-grass	+	+	O	E
	<i>Boerhavia dominii</i>	Tar Vine	+	+		O
	<i>Carex bichenoviana</i>	Notched Sedge	+			E
	<i>Chloris truncata</i>	Windmill Grass		+		E
	<i>Cressa australis</i>	Rosinweed	+			O
	<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily		+	O	E
	<i>Dicanthium sericeum</i>	Silky Blue-grass	+	+		O
	<i>Einadia nutans</i> ssp. <i>nutans</i>	Climbing Saltbush		+	O	E
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush		+	O	E
	<i>Enneapogon nigricans</i>	Black-head Grass		+	O	O
	<i>Enteropogon acicularis</i>	Umbrella Grass	+	+	O	E
	<i>Juncus pauciflorus</i>	Loose-flower Rush	+		O	O
	<i>Juncus subsecundus</i>	Finger Rush	+	+	E	E
	<i>Maireana enchylaenoides</i>	Wingless Fissure-plant	+	+		O
	<i>Marsilea drummondii</i>	Nardoo	+			E
	<i>Myoporum parvifolium</i>	Creeping Myoporum			O	O
	<i>Oxalis perennans</i>	Native Oxalis	+	+	O	O
	<i>Panicum effusum</i> var. <i>effusum</i>	Hairy Panic	+	+		O
	<i>Rytidosperma</i> spp. ( <i>R. caespitosum</i> , <i>R. fulvum</i> , <i>R. geniculatum</i> , <i>R. setacum</i> )	Wallaby-grass	+	+	O	E
	<i>Sida corrugata</i> var. <i>corrugata</i> and <i>angustifolia</i>	Grassland Sida		+		O
<i>Themeda triandra</i>	Kangaroo Grass	+	+	O	O	
<i>Vittadinia</i> spp. ( <i>V. cervicalis</i> var. <i>circularis</i> , <i>V. cuneata</i> )	New Holland Daisy		+	O	E	
<i>Walwhalleya prolata</i>	Rigid Panic	+	+	O	E	

+ = species occurs in this zone; \*O = optional species; E = essential species, (U) generally occurring in outer areas of the floodplain.

Note regarding species list: the list represents species most likely to occur and able to be established using revegetation.

# 4.3 River Red Gum floodplain woodlands





Figure 35: Photo of market garden on the banks of the Gawler River, attributed to Buckland Park. Photo: S W Sweet - State Library of South Australia B 72483/6/3

## Description

At the downstream end of the Gawler River, the river channel becomes increasingly shallow and eventually flattens out, where the river would have flooded across the land and massive River Red Gums grew across the floodplain in pre-European conditions. Early European visitors to Buckland Park remarked on the size of the trees, their numerous hollows and width of area covered by them.

The lower lying areas likely contained more water-loving species such as Nardoo, native buttercups, sedges, rushes and possibly Common Reed as well as Lignum. The more elevated areas likely contained more grasses and saltbushes as well as herbs such as Cressa. Broughton Willow, Black Box, Mallee Box (Figure 36) and possibly Native Apricot occurred as occasional sub-canopy. Like other woodlands, the shrub layer was probably sparse with Lignum on lower areas and Native Scurf Pea, Nitrebush and Inland Austral Hollock in higher areas.

In 1839 George Milner Stephen was informed there was fresh water and could see paths worn by Kaurna people going into the woodland. It is likely that the flow of the river across this area maintained a very high groundwater table that supported the forest and swamp vegetation, provided permanent freshwater pools (natural or made) and kept water flowing out to sea.

## Distribution

The historical distribution of this vegetation community is shown in Map 2 and includes areas where River Red Gums still occur as well as productive soil types in the lower floodplain.



Figure 36: A patch of old Mallee Box trees growing amongst floodplain River Red Gums.

## Ecological importance

Ecological surveys for this Guide did not include River Red Gum floodplain woodlands. However, large River Red Gums with substantial hollows are a key habitat feature, supporting a variety of native bird species and other hollow-nesting fauna such as possums and bats. During the 2009 environmental impact assessment (EIS) for Riverlea, a diverse range of hollow-dependent fauna was recorded, including seven bat species and two possum species. These mature trees also serve as important perching and nesting sites for raptors, including the White-bellied Sea Eagle and Wedge-tailed Eagle—15 raptor species were documented in the Riverlea EIS. Additionally, areas with a well-developed canopy tend to have abundant fallen timber, which likely provides valuable habitat for reptiles.



Figure 37: White-bellied Sea Eagle using a tree to perch with its prey. Photo: Martin Stokes.

## Cultural and social significance

The Gawler River Kadlitpari and its fringing River Red Gums have very high cultural significance and the River Red Gums themselves also have their own Dreaming Story. Consequently, old growth River Red Gums along the river banks and on the adjacent flood plains are culturally significant in general (as are Black Box trees). Many of these trees have modifications which identify and commemorate their previous cultural usage. The culturally modified trees are significant Aboriginal sites in terms of the SA Aboriginal Heritage Act (1988).

In his travels in this area in 1939, AF Lindsay (surveyor) recorded abundant fresh water, a “native well” and burial mound. Many other records of Kurna occupation of this area have been written since, and an abundance of cultural heritage documented.

Many of the plants that probably grew in the River Red Gum floodplain (some of which still occur), are known food plants in other regions (e.g. Common Reed and Nardoo). Flat-sedges, which still occur on the banks, are commonly used for making baskets and mats and Common Reeds were used to make spears.



Figure 38: Remnant River Red Gum floodplain woodland with a mixture of old and young trees.



Figure 39: Large dead Red Gums along a flow path on the lower Gawler River floodplain (note younger living trees in the background on higher ground).

## Current state

Buckland Park Estate (formerly Port Gawler Estate) was one of the first pastoral stations in South Australia, with many buildings constructed from 1840. The land included most of the River Red Gum woodland as well as chenopod shrublands and grasslands towards the coast. It was a popular destination for hunting and bird watching, and one of the early land managers constructed the weirs that formed Buckland Park lake. The land has since been divided and sold off in smaller allotments.

Remnants of the River Red Gum and other canopy occur in paddocks downstream of Old Port Wakefield Road. Some areas have been completely logged and others selectively logged, but there are areas on the north side of the Gawler River where an extensive canopy of old and young trees remains over an exotic pasture containing scattered native grasses, herbs and occasional patches of Spiny Flat-sedge (e.g. Figure 38). The new Riverlea township is partly sited on what would have been River Red Gum floodplain woodland, leading to a complete transformation to urban area in parts, however the development includes areas of River Red Gums with Black Box in Open Space zones close to the river.

Downstream of Port Wakefield Highway site north of the river at Windamere Park there are patches of old River Red Gums that have either died or are in very poor health, mostly occurring along the edges of flow paths (Figure 39). The position of this community at the downstream extent of river flooding makes it vulnerable to reductions in surface water flows. While the proximity of this vegetation association to the coast along with low elevation also makes this community vulnerable to the impacts of sea level rise.

Many birds have previously been recorded in Buckland Park River Red Gum woodlands but are now considered rare or locally extinct including: White-bellied Cuckoo Shrike, Swift Parrot, Black Falcon (requires grassland adjacent to trees). Bush Stone Curlews were reported until the 1940s, Flame Robin until 1981, and Plains Wanderer and a pair of Yellow-tailed Black Cockatoos were observed in the 1970s.

# Restoration requirements

## Priority areas

Site priority considerations for River Red Gum floodplain woodland conservation and restoration are:

**1<sup>st</sup> Existing remnant woodlands:** Areas of remnant trees with some native ground-layer – manage threats such as weeds, pest animals, grazing and barriers to flow (if possible).

**2<sup>nd</sup> Remnant trees over exotic pasture:** first manage threats to encourage natural regeneration and maintain or improve tree health, monitor for a few years and see how the site responds before deciding if and what revegetation or other action is required.

**3<sup>rd</sup> Areas adjacent to remnants:** manage threats and monitor for a few years and see what happens before deciding if and what revegetation is required. Note: some adjacent areas may be grassland or shrubland communities and do not require the addition of trees.

## Restoration risks

River Red Gum floodplain woodlands		
Risk	Consideration	Mitigate
<b>Converting to the wrong vegetation community</b>	Excess planting of a species that can degrade integrity of the vegetation community.	Take care to correctly identify the site’s target vegetation community to avoid restoring to recommendations of a different community. Follow guidelines of recommended plants per hectare.
<b>Planting the wrong species or the wrong amount of a species</b>	Planting unsuitable species for the vegetation community may lead to a struggle to survive. For instance, some species cannot tolerate saline environments.	
<b>Planting in an area that doesn’t provide water needs for this vegetation community</b>	Young trees (10–30 years old) are often not recognised as such. This can lead to a belief that more trees need to be planted, resulting in overly dense tree cover that may reduce habitat quality and affect tree health.	After assessment, thinning may be appropriate. Native Vegetation Clearance guidelines will need to be consulted
<b>Impacting Kurna culture with inappropriate restoration activities</b>	Planned work could impact culturally significant sites – especially if it includes earthworks within 500 metres from the river.	Seek to learn what may be significant at the site and engaging Kurna to reduce the impact of works.

## Environmental water requirements

Key points:

- River Red Gums need flooding every 1-3 years unless they access fresh groundwater.
- Changes in flood frequency, groundwater levels, and salinity may cause shifts to more drought- or salt-tolerant vegetation.
- Carefully designed stormwater systems could help provide environmental flows, but excessive flooding or high salinity could harm the River Red Gum woodlands.

Reinstating the environmental water requirements of the trees will be required at some locations to maintain large old remnant trees. River Red Gums require flooding on average every one to three years to maintain healthy growth in the River Murray floodplain. It is likely that trees in the Gawler River catchment have similar flooding requirements unless they have access to fresh groundwater within their root zone. There has not, however, been a specific assessment of water sources used by Gawler River Red Gums. Historical surveys indicate fresh groundwater was found within 6 to 10 metres of the ground surface in some areas which would have been close enough for deep rooted perennial vegetation (e.g. trees, small trees and possibly

some shrubs). Shallower rooting species however such as Spiny Flat-sedge and Nardoo prefer annual flooding and cannot reach groundwater but may survive where local rainfall causes puddles or waterlogging and can persist without water for a few years.

This River Red Gum community is susceptible to reductions in flood frequency and changes in groundwater conditions (level and salinity) and it is likely that some areas have already shifted towards more drought and/or salt tolerant vegetation. Where environmental water requirements cannot be re-instated, an option may be to incorporate plant species from a vegetation community that is better suited to the likely future conditions.

Carefully planned and designed stormwater systems may assist in providing environmental flows by directing urban and road run-off to River Red Gum woodlands. It is important however that River Red Gum woodlands do not receive too much flooding or water with high salinity levels, both of which could kill them.

## Reference sites

The wooded plains downstream of Old Port Wakefield Road, including the area to be converted to the new Riverlea township, contain good examples River Red Gum floodplain woodland

# Vegetation management

Section 2 (planning) describes the key priorities and steps for planning vegetation management works, including setting the vegetation management target level for restoration and determining what actions are required, such as weed control and revegetation. For the River Red Gum floodplain woodlands, maintaining the health of and conserving old mature trees is critical to maintaining the ecology of the area which requires that their environmental water requirements are met.

## Weed control

Introduced pasture grasses weeds make up most of the ground layer in River Red Gum woodland sites. Total stock exclusion from grazed sites may result in excessive pasture growth while broadscale spraying often results in other weeds colonising the bare ground. Strategic grazing or slashing is therefore recommended for these sites and can promote natural regeneration of some native species.

Common declared weeds of River Red Gum woodlands include feral Olive trees and African boxthorn as well as environmental weeds such as Carpetweed and Artichoke Thistle. Section 3 provides further information on weed control, but the general priorities for weed control are:

- Assess whether any native fauna is dependent on the weeds (e.g. nectar). If so, progress slowly to allow time for new habitat to replace the weeds.
- Start in the least weedy areas, working towards the weediest areas, and don't 'over weed' areas leaving them bare
- Use minimal disturbance methods that avoid off-target damage to native species and don't disturb the ground.

## Vegetation zones for assessment and revegetation

Natural regeneration should be allowed to occur following weed control and then an assessment made of the cover of native species before any revegetation is planned. Where revegetation is required (i.e. where the goal is habitat restoration and natural regeneration is limited), then the priority is to increase the native ground layer diversity.

Table 5 describes the target plant species diversity and number of plants per hectare of a River Red Gum floodplain woodland depending on what the vegetation target is. These targets represent an end point rather than a revegetation order list.

Figure 40 illustrates a simplified River Red Gum floodplain woodland showing the open mid storey and widely spaced trees where different species would most commonly occur and the basic structure of the community.

Species that are expected to occur in this community are provided in Table 6, the species list assumes that the current flood and groundwater conditions continue which are likely to be drier than historic conditions. No zones within the community are provided, however sites with obvious elevation changes may require refined placement of different species if revegetation is required.

Table 5: Target diversity (number of different species) and numbers per hectare for different life forms in the River Red Gum floodplain woodland.

Life form	Target: Basic		Target: Advanced		Comments
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare	
<b>Trees</b>	1 to 3	5 to 10	1 to 3	5 to 10	Natural regeneration may occur at high densities, with regeneration rate of 1 to 2 trees per hectare is considered sufficient. It is important to understand that a tree which is 20-30 years old is still considered a regenerating tree (as the species is far longer lived). There may be a need to control an overabundance of natural seedling regeneration, however the Native Vegetation Clearance guidelines will need to be consulted.
<b>Small trees</b>	1 to 2	0 to 50	1 to 2	0 to 50	Plant in clumps of 3 to 5 plants that are 1 to 3 metres apart; leave long gaps between clumps.
<b>Large shrubs</b>	1 to 3	10 to 30	1 to 3	10 to 30	The shrub layer should be open, avoid the temptation to achieve native species diversity and coverage by planting high numbers of shrubs.
<b>Small shrubs</b>	1 to 4	50 to 150	5 to 8	100 to 300	
<b>Ground layer</b>	10+	100 to 500	15 to 30	10,000+	Plant clumps of 5 to 10 plants of the same species, at less than 1m between plants; this may mean leaving gaps between clumps of groundcover which can be maintained with slashing. High diversity and numbers of ground layer plant are the most challenging to achieve when undertaking revegetation and it may take many years to achieve the "advanced" targets for groundlayer.

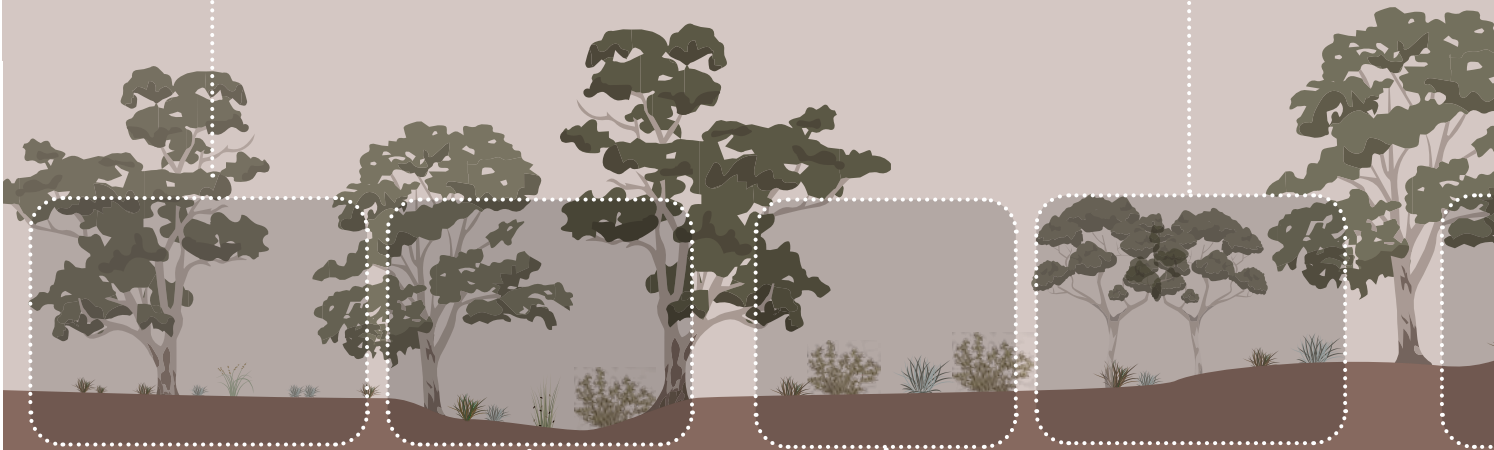


Figure 40: Vegetation zones of the River Red Gum floodplain woodland.

# Vegetation zones of the River Red Gum floodplain woodland

**Most of the floodplain was widely spaced Red Gums with broad canopies that didn't overlap**

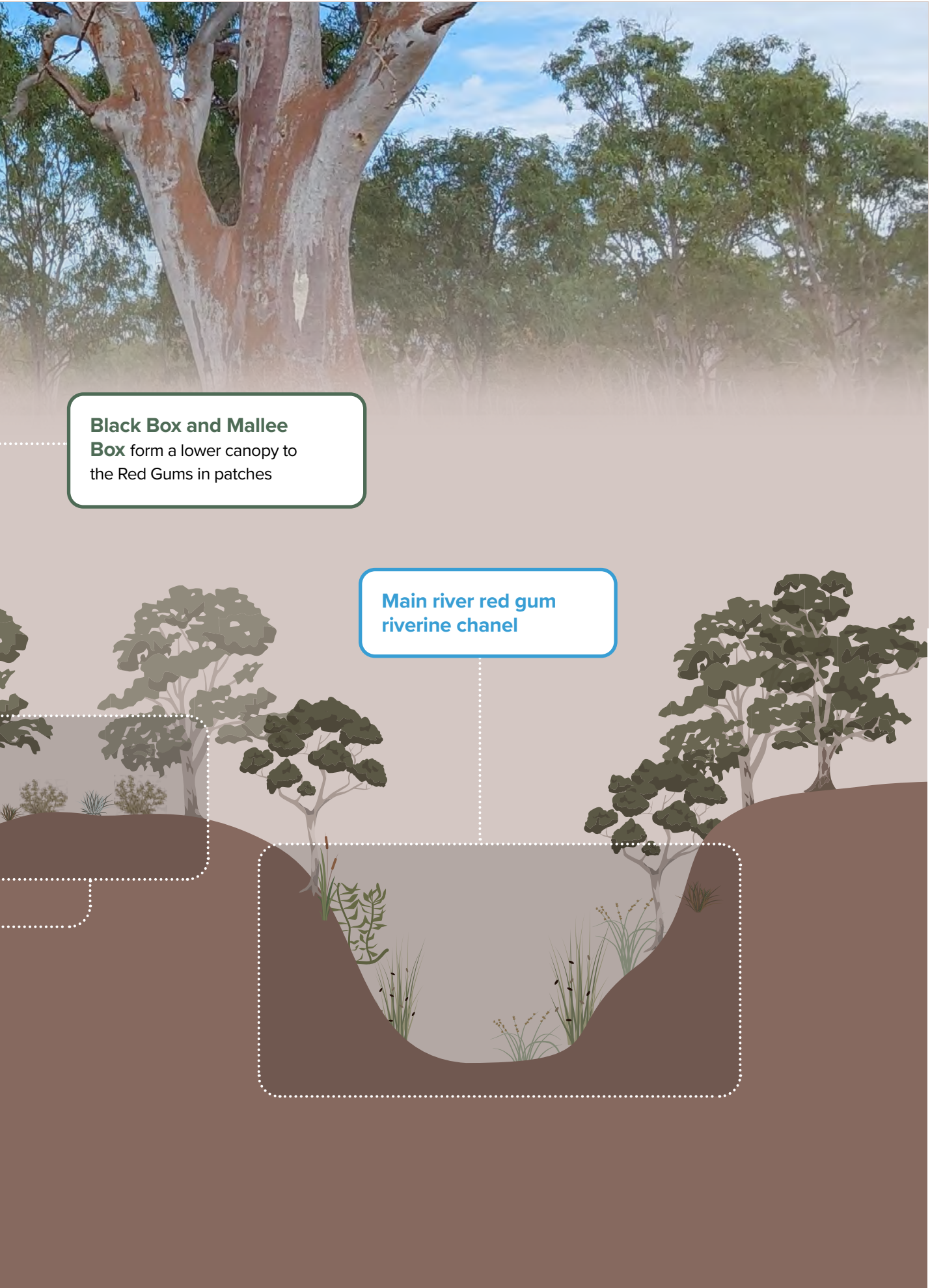
Broughton Willows probably occurred sparsely and the site would have had an open midstorey but dense lush understorey of lush, tall sedges, rushes and grasses



**Low lying areas and 'flood channels'**

On lower lying areas subject to more regular floods a canopy of large and widely spaced Red Gums over species that require regular flooding such as Lignum, Nardoo, Chaffy Cutting-grass, Spiny Flat-sedge and Knotched Sedge with flood tolerant grasses.

**Grasslands with saltbush and occasional sedges are likely to have occurred in elevated areas where there are large gaps in the canopy.**



**Black Box and Mallee**  
**Box** form a lower canopy to the Red Gums in patches

**Main river red gum riverine channel**



Table 6: Native vegetation species list for River Red Gum floodplain woodland.

Form	Scientific name	Common name	Target*	
			Basic	Advanced
<b>Tree</b>	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>	(River) Red Gum	E	E
	<i>Eucalyptus largiflorens</i>	Black Box	O	O
	<i>Eucalyptus porosa</i>	Mallee Box	O	O
<b>Small tree</b>	<i>Acacia salicina</i>	Broughton Willow	O	E
	<i>Myoporum montanum</i>	Native Myrtle	O	O
	<i>Pittosporum angustifolium</i>	Native Apricot	O	O
<b>Shrub</b>	<i>Cullen australasicum</i>	Tall Scurf-pea	O	O
	<i>Duma florulenta</i>	Lignum	O	E
	<i>Maireana aphylla</i>	Cotton-bush	O	E
	<i>Maireana brevifolia</i>	Short-leaf Bluebush	O	E
	<i>Maireana oppositifolia</i>	Salt Bluebush	O	O
	<i>Malva weinmanniana</i>	Inland Austral Hollyhock	O	O
	<i>Nitraria billardierei</i>	Nitre-bush	O	E
	<i>Rhagodia parabolica</i>	Mealy Saltbush	O	O

Form	Scientific name	Common name	Target*	
			Basic	Advanced
Ground-layer	<i>Arthropodium strictum</i>	Common Chocolate Lily	O	O
	<i>Atriplex semibaccata</i>	Berry Saltbush	E	E
	<i>Atriplex suberecta</i>	Lagoon Saltbush	O	E
	<i>Austrostipa</i> spp. ( <i>A. curticola</i> , <i>A. elegantissima</i> , <i>A. eremophila</i> , <i>A. scabra</i> ssp.)	Spear-grass	O	E
	<i>Boerhavia dominii</i>	Tar Vine	O	O
	<i>Carex bichenoviana</i>	Notched Sedge	O	E
	<i>Chloris truncata</i>	Windmill Grass	O	O
	<i>Cressa australis</i>	Rosinweed	O	O
	<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge	E	E
	<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily	O	O
	<i>Einadia nutans</i> ssp. <i>nutans</i>	Climbing Saltbush	O	O
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush	E	E
	<i>Enneapogon nigricans</i>	Black-head Grass	O	O
	<i>Enteropogon acicularis</i>	Umbrella Grass	O	E
	<i>Juncus subsecundus</i>	Finger Rush	O	E
	<i>Lomandra effusa</i>	Scented Mat-rush	O	O
	<i>Maireana enchylaenoides</i>	Wingless Fissure-plant	O	O
	<i>Marsilea drummondii</i>	Nardoo	O	E
	<i>Myoporum parvifolium</i>	Creeping Myoporum	O	O
	<i>Oxalis perennans</i>	Native Oxalis	O	O
<i>Pauridia glabella</i> var. <i>glabella</i>	Tiny Yellow-star	O	O	
<i>Rytidosperma</i> spp. ( <i>R. caespitosum</i> , <i>R. fulvum</i> , <i>R. geniculatum</i> , <i>R. setacum</i> )	Wallaby-grass	E	E	
<i>Setaria jubiflora</i>	Warrego Summer-grass	E	E	
<i>Sida corrugata</i> var. <i>corrugata</i> and <i>angustifolia</i>	Grassland Sida	O	O	
<i>Themeda triandra</i>	Kangaroo Grass	O	O	
<i>Vittadinia</i> spp. ( <i>V. gracilis</i> , <i>V. cervicalis</i> var. <i>circularis</i> )	New Holland Daisy	O	E	

\*O = optional species; E = essential species,

Note regarding species list: the list represents species most likely to occur and able to be established using revegetation and restoration techniques.

# 4.4 Floodplain shrublands



# Description

Open plain and low shrublands between the riverine woodlands and the coastal mangroves at the end of the Gawler River system are well documented in the first surveys but there are few formal descriptions of these shrublands. It is likely that there would have been three distinct communities:

1. **Lignum shrublands:** with occasional Nitrebush and Australian Boxthorn over Spiny Flatsedge and other sedges and rushes on the edge of the River Red Gum woodlands in low lying areas on the outer edge of floodplains. These shrublands may not have covered large areas, with Lignum (Figure 41) more commonly occurring as an understorey to River Red Gum and Black Box.
2. **Mixed chenopod shrublands:** might include Leafless Bluebush lined channels extending out from the floodplain towards the coast or scattered shrubs throughout the flats. Chenopod shrubs also inhabit depressions where freshwater from local rainfall and floodwaters would persist in shallow pools; Nardoo, Cressa and Spiny Flat-sedge and other sedges and rushes would have regenerated from underground roots after floods, and scattered Nitrebush and Australian Boxthorn would have been the tallest vegetation and occurred sparsely.
3. **Open chenopod shrublands:** would occur on the higher loamy or sandy flats and include sparsely scattered drought resilient plants like saltbushes and bluebushes with a diverse groundcover of native grasses and forbs.



*Figure 41: Lignum flowers are a source of nectar for many insects.*

A key feature of this landscape was the absence of trees, with historic records describing an extensive plain and being able to see for miles from the woodlands to the coast. This unique environment supported its own unique fauna that were adapted to or preferred the treeless vegetation communities; White-wing Fairywren and insects such as the Yellowish Sedge Skipper Butterfly (now locally extinct) and Mottled Grass Skipper Butterfly.

## Distribution

The shrubland plant communities are found in the ephemeral channels and flood out zones of the system. They are typically located north of the river in inundation areas and the lower reaches of the southern side of the river, to the west. The pre-European vegetation map (Map 2) in Section 4 shows where different shrublands would likely have occurred. It will be more obvious where remnant overstorey still remains but due to changes in local surface and groundwater conditions some sites may have a mixture of understorey species from the three shrubland communities.

Although three shrubland communities have been defined in this section, there are other distinct floristic communities that fall within these categories that are not widespread or common. For example, Chaffy Saw-sedge swamplands (Figure 42) occur in coastal saltmarsh communities, but pockets will also occur in the described Lignum shrublands and mixed chenopod shrublands in wetter clay-heavy depressions.

Understanding the soil and hydrology of sites in these vegetation communities is key to selecting the right plants and successfully restoring the site (Figure 43).



Figure 42: Chaffy Saw-Sedge (*Gahnia filum*) swamplands.

Figure 43: Description of shrubland community characteristics.

Indicator	Lignum shrublands	Mixed chenopod shrublands	Open chenopod shrublands
<b>Dominant overstorey</b>	Lignum	Leafless Bluebush	Spear-grass, Wallaby Grass, Marsh Saltbush, Short-leaf Bluebush
<b>Other common overstorey</b>	Nitrebush, Australian Boxthorn	Short-leaf Bluebush, Chaffy Saw-sedge, Nitrebush, Australian Boxthorn, Marsh Saltbush, various samphires	Ruby Saltbush, Scented Mat-rush, Nitrebush, Australian Boxthorn
<b>Common understorey</b>	Spiny Flat-sedge, Round-leaf Pigface, various samphires,	Nardoo, Cressa, Berry Saltbush, Mulka, Umbrella Grass	Windmill Grass, Cressa, Round-leaf Pigface, Mulka
<b>Soils</b>	Black cracking clays	Red-brown to grey clays, often cracking, may be mildly saline	Loams and sands overlying clays or clayey loams and sands
<b>Inundation frequency</b>	Flooded every 3 to 10 years for at least a month and up to 6 months.	Not documented but probably less frequently and/or for shorter periods than Lignum shrublands. Bluebush is both drought tolerant and flood tolerant.	Flooded for short periods (i.e. a few days or less) every 10 to 20 years during large-scale flood events



Figure 44: White-wing Fairywren on Leafless bluebush at Thompson Creek

This species requires dense shrubs such as Leafless Bluebush, Lignum and Nitrebush to shelter and nest in areas free from trees where predators may perch. They occur in groups of 10 to 20 that range over a few hectares. In degraded areas they will also use weedy African Boxthorns and occupy roadside shrublands adjacent to paddocks containing scattered saltbush and other shrubs.



Figure 45: *Myopsalta bisonabilis*, a newly described species of Cicada . Photo: Matt Endacott

This species was first collected from artificial wetlands in the lower Gawler River floodplain, they have since been collected from other grassland sites.

The species is dependent on grasslands and seasonally swampy sedgeland. Adults were found on native and exotic species including Wild Oats, Chaffey Saw-sedge and planted shrubs.



Figure 46: Three-toed Earless Skink (*Hemiergis decresiensis*). Photo: Martin Stokes.

This species is not usually found on the Adelaide Plains suggesting the Gawler River provides a corridor for this and other cooler climate species to push into these drier environments. The flood plain shrublands and wetlands along the western extent of the river allows the Three-toed Skinks in particular to live away from the river's edge.

## Ecological importance

The floodplain shrublands of the Gawler River are ecologically important communities that support a range of unique flora and fauna. Lignum shrublands provide shelter for small birds such as White-wing Fairywrens (Figure 44) and when flooded become roosting and nesting sites for waterbirds while the water itself provides breeding opportunities for Dragonflies and Damselflies. Healthy Lignum plants produce masses of tiny flowers that are a source of nectar for insects.

Ecological surveys for this Guide identified some unique fauna occurring in shrublands, some of which are profiled below. Many of the fauna that persist in the area are reliant on weeds for critical habitat or food resources due to loss of native habitat. For example, nectar from mustard weeds substitute native flowering species and African Boxthorns provide shelter for White-wing Fairywrens. Artificial seasonal wetlands created with water impoundments and horticultural drainages are used by waterbirds that feed in the shallow muddy edges.

## Cultural significance

Archaeological sites, including traditional burial sites may occur in any slightly elevated, well-drained sandy areas. Due to the high cultural significance of the area to Kurna, conservation and restoration activities should be conducted with Kurna participation wherever possible.

## Current state

The Buckland Park area, containing land described in early years of South Australia as the ‘Milner Estate’ and ‘Port Gawler Estate’, has changed a lot over time. It was originally used for grazing animals, but later parts were turned into farms, salt fields, market gardens, glasshouses, and currently housing developments.

These changes have affected how water flows through the land. Some areas that used to get regular water now stay dry, which has caused changes in the types of plants that grow there. For example, Lignum shrublands near Buckland Park Lake still get enough water, but other areas are drying out and now mostly have salt-tolerant plants instead of the original mix of shrubs and sedges (Figure 47).

The Leafless Bluebush is still common but the original mixed shrublands are now rare and often full of weeds (Figure 48). Some areas, like a reserve near Thompson Creek, still show what the natural vegetation used to look like (Figure 49).

Water channels have also been changed—some no longer get water naturally, while others get extra water from glasshouses and stormwater. This has led to more changes in plant life. In addition, people have planted both local and non-local trees, which affects the types of animals that can live there.

Finally, large open shrublands west of Old Port Wakefield Road show different plant mixes depending on how the land is managed. Many of these areas now have lots of introduced grasses and weeds.



Figure 47: Remnant lignum shrubland in poor health with samphires.



Figure 48: Remnant mixed chenopod shrubland in Thompson Creek (not accessible to public).



Figure 49: Remnant open chenopod shrubland adjacent to Thompson Creek (not accessible to public).

# Restoration requirements

## Priority areas

Site priority considerations for Black Box floodplain woodland conservation and restoration are:

**1<sup>st</sup> Existing remnant woodlands:** Manage threats such as weeds, changed hydrology, pest animals and grazing without reducing habitat for threatened and declining native fauna.

**2<sup>nd</sup> Degraded areas with remnant trees/plants:** e.g. sites with less than 10% native groundcover. First manage threats to encourage natural regeneration, continue low impact weed control and monitor for a few years and see how the site responds before deciding if and what revegetation is required.

**3<sup>rd</sup> Areas adjacent to remnants:** and see how the site responds before deciding if and what revegetation is required.

## Restoration risks

Floodplain shrublands		
Risk	Consideration	Mitigate
<b>Shrublands are under recognised as native vegetation and can be degraded or destroyed</b>	Several wildlife species rely on tree-less shrublands and grasslands.	Understanding the care requirements of the site.  Enabling sufficient water resource for the vegetation community requirements
<b>Lignum flats water requirements receive insufficient water to function</b>	Plant species within the shrublands have water requirements that need to be met.	
<b>Converting to the wrong vegetation community</b>	Excess planting of a species that can degrade integrity of the vegetation community.	Take care to correctly identify the site's target vegetation community to avoid restoring to recommendations of a different community. Follow guidelines of recommended plants per hectare.
<b>Over planting of trees within shrubland communities.  Planting the wrong species or the wrong amount of a species</b>	Planting unsuitable species for the vegetation community may lead to a struggle to survive.	
<b>Impacting Kaurua culture with inappropriate restoration activities</b>	Planned work could impact culturally significant sites – especially if it includes earthworks within 500 metres from the river.	Seek to learn what may be significant at the site and engaging Kaurua to reduce the impact of works.

## Environmental water requirements

Key points:

- Changes to natural water flows have altered floodplain shrubland conditions, impacting vegetation composition.
- Lignum requires a few months of flooding every 3–10 years; other species like Spiny Flat-sedge can tolerate dry periods up to two years.
- Stormwater systems could help provide suitable environmental flows but must be carefully managed to avoid over-flooding.

Most plants in floodplain shrublands haven't been well studied when it comes to how much water they need—except for Lignum. On the River Murray floodplains, Lignum needs to be flooded for a few months every 3 to 10 years, but every 3 years is best – similar requirements are expected in the Gawler River region. Spiny Flat-sedge grows in mixed chenopod shrubland and can survive dry periods for up to 2 years.

Since European colonisation, water flows to these shrublands have changed. Some areas don't flood

as often or as long because floodwaters are diverted or blocked. Other areas get extra water from urban runoff, industries, and farms. These changes affect which plants grow and how the vegetation looks.

To bring back the original plant communities, we'd need to restore the old water flow patterns. This might be possible in some places, but not everywhere. When planning to restore shrublands, the first step is deciding whether to try to bring back natural water flows or work with the current ones.

Stormwater systems of developing urban areas could be designed to send rainwater from roads and towns to the shrublands. But it's important not to flood them too much, because that could harm the plants.

## Reference sites

No excellent reference sites for complete Floodplain shrublands remain in the area. Examples showing elements of Floodplain shrublands are described earlier under *Current state* and are found across Buckland Park and Windamere Park at Thompson Creek, and surrounding Old Port Wakefield Road.

# Vegetation management

Section 2 (Planning) describes the key priorities for planning vegetation management works, including setting the vegetation management target level for restoration and determining what actions are required, such as weed control and revegetation.

Most shrubland and grassland sites with remnant vegetation require only minimal intervention. Key native species in these areas have strong potential for natural regeneration, provided that threats such as overgrazing, cultivation, low slashing, and pest animals are effectively managed. Implementing high slashing (e.g. at 10 cm) before annual grasses set seed, combined with stock exclusion or strategic grazing, can promote natural regeneration across many sites. In addition, targeted weed control and revegetation of missing species may be necessary to support ecosystem recovery.

Accurate identification of remnants before management decisions are made is critical to ensure they are properly conserved.

## Weed control

Most remnants of floodplain shrublands contain declared weeds such as African Boxthorn, Silver-leaf Nightshade and Artichoke Thistle as well as environmental weeds such as Carpet Weed and Ice Plant. Annual grasses and herbaceous weeds are also common. As noted earlier, some weeds may provide habitat and or food for rare and declining native fauna, therefore weed control may need to be staged to allow time for native habitat to establish before weeds are removed. Many weeds are also better than native species at growing after disturbance such as mechanical removal of weeds or spraying out, so over-weeding can result in proliferation of new weeds. The goal for these areas should be conserving and improving the health, diversity and ground cover of native species rather than complete eradication of weeds.

Section 5 provides further information on weed control, but the general priorities for weed control are as follows:

- Assess whether any native fauna are dependent on the weeds in which case weed control will need to progress at a pace that allows for new habitat to replace the weeds.
- For declared and high threat environmental weeds, start in the least weedy areas, working towards the weediest areas, and don't 'over weed' areas leaving them bare.
- Use minimal disturbance methods that avoid off-target damage to native species and don't disturb the ground.

## Vegetation zones for assessment and revegetation

Figure 51 describes the target plant species diversity and number of plants per hectare depending on the vegetation target; these targets represent an end point as stems per hectare, not a seedling planting quantity. Figure 52 illustrates the zones within the floodplain shrublands where different species most commonly occur and the basic structure of the community.

Many areas of the lower Gawler floodplain contain remnants of these communities and may be best restored through improved grazing management (e.g. rotational grazing rather than set-stocking), cultural burning, or weed control to encourage natural regeneration rather than traditional revegetation approaches.

Species that commonly occur in each zone are provided in Table 7. Note that, due to the high numbers of ground layer species expected in these communities, specialist revegetation techniques may be required.

### Thompson Creek



*Figure 50: This site is an excellent example of remnant Leafless Bluebush (Maireana aphylla) shrubland within a mixed chenopod shrubland. It has a very high diversity and cover of native species including herbs, sedges, saltbushes and native grasses however it also has abundant weeds in some areas. The site is not grazed or slashed. The abundance of Wallaby Grass in parts of the channel may be the result of drier conditions than historically occurred, or just part of a cycle of vegetation changes between flows. The site is not accessible to the public.*

Figure 51: Target diversity (number of different species) and numbers per hectare for different life forms in three types of Floodplain shrublands.

Lignum shrubland				
Life form	Target: Basic		Target: Advanced	
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare
Trees	0	0	0	0
Tall shrubs	1	300 to 400	2	500 to 700
Small Shrubs	2	200	2 to 5	400
Sedge/tussock	1 to 2	400	2 to 3	2000
Ground-layer	1 to 2	100	2 to 4	600

Mixed chenopod shrubland				
Life form	Target: Basic		Target: Advanced	
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare
Trees	0	0	0	0
Tall shrubs	1	30	1 to 2	30
Small Shrubs	2 to 3	400	3 to 5	2500
Sedge/ tussock	1 to 2	200	2 to 4	2500
Ground-layer	1 to 3	400	3 to 6	5000

Open chenopod shrubland				
Life form	Target: Basic		Target: Advanced	
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare
Trees	0	0	0	0
Tall shrubs	1	10 to 30	1 to 3	10 to 30
Small Shrubs	2	100	2 to 4	200
Sedge/ tussock	1	100	1 to 2	100
Ground-layer	5 to 10	10,000	10 to 15	25,000



Figure 52: Sequence of vegetation communities in flood outs from floodplain woodlands to lignum shrubland, then mixed chenopod shrubland, then open chenopod shrubland.

## Vegetation zones of the Floodplain shrublands



Red Gum woodlands (section 4.3) between the Lignum shrublands and the Gawler River are often adjacent to floodplain shrublands



### Most frequently flooded areas

The very lowest lying areas are flooded on average every 3 to 10 years for several months. The vegetation is dominated by large Lignum bushes that can form dense thickets with regular flooding. More regularly flooded areas would have had Spiny Flat-sedge and Nardoo, while drier areas or after long periods without water, more dryland species would grow.

[as drafted]

## Decreasing flood frequency and duration

### Slightly higher areas that are only flooded for short periods during major floods

A range of native grasses with occasional Shortleaf Bluebush, Marsh Saltbush and other Saltbushes, as well as native herbs and Scented Irongrass.

### Channels and low areas that hold water for weeks to months following local rainfall run-off and river floods

Mixed chenopod shrubland of Leafless Bluebush and other saltbushes with scattered taller shrubs such as Nitrebush. Sedges, rushes, Nardoo and Cressa and low growing grasses such as Mulka dominate the groundlayer. Chaffy Sword-sedge may occur on the edges of this community.

Table 7: Native vegetation species list for Floodplain Shrublands.

Form	Scientific name	Common name	Zone			Target*	
			Lignum shrubland	Mixed chenopod shrubland	Open chenopod shrubland	Basic	Advanced
Tall shrub	<i>Duma florulenta</i>	Lignum	+			E	E
	<i>Lycium australe</i>	Australian boxthorn	+	+	+	O	O
	<i>Rhagodia candolleana</i> ssp. <i>candolleana</i>	Sea-berry Saltbush			+	O	O
Small shrub	<i>Atriplex paludosa</i> ssp. <i>cordata</i>	Marsh Saltbush	+	+	+	E	E
	<i>Atriplex suberecta</i>	Lagoon Saltbush	+			O	E
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush	+	+	+	E	E
	<i>Maireana aphylla</i>	Cottonbush	+	+	+	E	E
	<i>Maireana brevifolia</i>	Short-leaf Bluebush		+	+	E	E
	<i>Maireana oppositifolia</i>	Salt Bluebush		+	+	O	O
	<i>Rhagodia spinescens</i>	Spiny Saltbush	+			O	O
	<i>Salicornia quinqueflora</i> ssp. <i>quinqueflora</i>	Beaded Samphire	+			O	O
	<i>Salsola australis</i>	Buckbush		+	+	O	O
	<i>Tecticornia arbuscula</i>	Shrubby Samphire	+			O	O
	<i>Tecticornia indica</i> ssp. <i>leiostachya/bidens</i>	Brown-head Samphire		+	+	O	O
	<i>Tecticornia pergranulata</i> ssp.	Black-seed Samphire	+	+		O	E
<i>Threlkeldia diffusa</i>	Coast Bonefruit		+		O	O	
Sedge/tussock	<i>Bolboschoenus caldwellii</i> (W)	Salt Club-rush	+			O	O
	<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge	+	+		E	E
	<i>Dianella brevicaulis</i>	Short-stem Flax-lily			+	O	O
	<i>Ficinia nodosa</i>	Knobby Club-rush	+	+		O	O
	<i>Gahnia filum</i>	Chaffy Saw-sedge	+	+		O	E
	<i>Juncus kraussii</i>	Sea Rush	+			O	O
	<i>Lomandra effusa</i>	Scented Mat-rush			+	O	E

+ = species occurs in this zone; \*O = optional species; E = essential species, (W) very wet areas only

Note regarding species list: the list represents species most likely to occur and able to be established using revegetation.

Form	Scientific name	Common name	Zone			Target*	
			Lignum shrubland	Mixed chenopod shrubland	Open chenopod shrubland	Basic	Advanced
Ground-layer	<i>Atriplex semibaccata</i>	Berry Saltbush	+	+	+	O	E
	<i>Austrostipa</i> spp. ( <i>A. scabra</i> ssp., <i>A. nitida</i> , <i>A. elegantissima</i> , <i>A. drummondii</i> )	Spear-grasses			+	E	E
	<i>Brachyscome paludicola</i>	Swamp Daisy	+			O	O
	<i>Chloris truncata</i>	Windmill Grass			+	O	E
	<i>Cressa australis</i>	Rosinweed		+	+	O	E
	<i>Disphyma crassifolium</i> ssp. <i>clavellatum</i>	Round-leaf Pigface	+		+	O	O
	<i>Distichlis distichophylla</i>	Emu-grass	+	+		O	O
	<i>Einadia nutans</i> ssp. <i>nutans</i>	Climbing Saltbush	+	+		O	E
	<i>Enneopogon nigricans</i>	Blackhead grass			+	O	E
	<i>Enteropogon aciliaris</i>	Umbrella Grass		+	+	O	O
	<i>Eragrostis dielsii</i>	Mulka	+	+	+	O	O
	<i>Frankenia pauciflora</i> var. <i>fruticulosa</i>	Southern Sea-heath	+			O	O
	<i>Lythrum hyssopifolia</i>	Lesser Loosestrife		+		O	O
	<i>Marsilea drummondii</i>	Nardoo	+	+		O	E
	<i>Oxalis perennans</i>	Native Sorrel			+	O	O
	<i>Panicum effusum</i>	Hairy Panic		+	+	O	O
	<i>Pauridia glabella</i> var. <i>glabella</i>	Tiny Yellow-star	+			O	O
	<i>Rytidosperma</i> sp. ( <i>R. caespitosum</i> , <i>R. fulvum</i> )	Wallaby-grass		+	+	O	E
	<i>Samolus repens</i>	Creeping Brookweed	+			O	O
	<i>Senecio pinnatifolius</i> var. <i>maritimus</i>	Variable Groundsel			+	O	O
	<i>Setaria jubiflora</i>	Warrego Summer-grass			+	O	O
	<i>Sporobolus mitchellii</i>	Rat-tail Couch	+	+		O	O
	<i>Suaeda australis</i>	Austral Seablite	+			O	O
<i>Teucrium racemosum</i>	Grey Germander		+	+	O	O	
<i>Vittadinia</i> spp. ( <i>cervicularis</i> , <i>cuneata</i> , <i>gracilis</i> )	Woolly New Holland Daisy		+	+	O	O	
<i>Wilsonia rotundifolia</i>	Round-leaf Wilsonia		+	+	O	O	

# 4.5 Grasslands





Figure 53: High value remnant grasslands in a field with a diversity ground-level native vegetation (shown left of vehicle track).

## Description

Grasslands and Grasslands with Saltbush are open ecosystems dominated by low-growing plants—mainly native grasses, herbs, and in some areas, small chenopod shrubs such as saltbush and bluebush. A key feature of both community types is the absence of trees and very few large shrubs (only in Grasslands with Saltbush), allowing full sunlight to reach the ground. This open structure is essential for many specialised plants and animals.

Historically, the Adelaide Plains supported extensive, highly diverse grasslands. Different areas were dominated by different grasses, such as Wallaby Grasses (*Rytidosperma* spp.), Kangaroo Grass (*Themeda triandra*), Spear Grasses (*Austrostipa* spp.), Brush Wire-grass (*Aristida behriana*), and Windmill Grasses (*Enteropogon* or *Chloris*). These variations were strongly influenced by soil type and landscape position.

As conditions became heavier, more saline, or more waterlogged, grasslands would transition into Grasslands with Saltbush, where species like Sea-Berry Saltbush, Salt Bluebush, Cottonbush, Buckbush, and in the most saline spots, samphire species, formed part of the ground-layer along with grasses and herbs. These chenopod-rich grasslands were once widespread across the North Adelaide Plains.

Because there are no well-preserved examples of original grasslands left, our understanding comes from historical records, early surveys, and the few degraded remnants still visible today. Most remaining patches are very small (often less than half a hectare) and usually found along roadsides.

The lack of trees and shrubs creates an important high-light environment that boosts productivity—much like cropping land—and is crucial for animals that rely on open visibility for feeding or avoiding predators.

To keep these ecosystems healthy, it is important to maintain spaces between grass clumps and saltbush plants. These gaps help native seeds germinate and provide habitat for reptiles, insects, and other ground-dwelling fauna. Without management, these open systems quickly become overgrown with weeds or woody vegetation. Effective management may include grazing, slashing, or Kurna fire management, depending on site conditions.

## Distribution

Evidence shows that both Grasslands and Grasslands with Saltbush once covered much larger areas of the Adelaide Plains than shown in modern mapping.

In the Gawler River catchment, up to 70% of the landscape may have supported these open plant communities, often with very few or no trees or large shrubs. The boundary between the type sub-types is roughly between Lewiston and Virginia; with Grasslands found to the east and Grasslands with Saltbush found to the west (Map 2).

Today, almost all of this vegetation has been lost. What remains is highly fragmented, low in native diversity, and restricted to locations that escaped cultivation or heavy grazing.

## Ecological importance

Many grassland fauna species depend on the absence of trees and shrubs to survive. Trees and shrubs can give predators places to perch or hide, making it harder for grassland species to persist. However, grasslands located near other vegetation types—as is common in this landscape—are also important. For example, parrots may nest in tree hollows in woodlands or along rivers but rely on nearby grasslands for food.

Grasslands are often highly diverse in plant species and support a wide range of animals. Historically, they would have provided habitat for birds such as the Plains-wanderer, Painted Buttonquail, Australian Bustard and Brown Quail. Reptiles may have included the Pygmy Bluetongue Lizard, Flinders Ranges Worm-lizard, and Peter’s Earless Dragon—many of which are now threatened.

Invertebrates in grasslands often depend on the variety of plant species present. These habitats support rare or uncommon species like the Mottled Grass Skipper Butterfly, which relies on both native and introduced grasses as host plants during its larval stage. Remnant populations of Pale Sun Moth (*Synemon selene*) that were recorded near Two Wells in 1937 and 1848 seem to have disappeared but populations have recently been located in native grasslands between Kapunda and Peterborough.

To support local reptiles, grass tussocks must be carefully managed. Preventing them from becoming too dense (or “thatched”) helps maintain open areas for hunting and basking, which are essential for their survival.

## Cultural and social significance

Cultural land management practices are likely to have played a major role in the extent, health, and diversity of grassland communities across the region. For the Kurna people, land management was deeply embedded in cultural knowledge systems and seasonal cycles. Practices such as fire-stick farming (cultural burning), selective harvesting, and spiritual custodianship helped maintain open grassland structure, promote biodiversity, and support the regeneration of native species. These methods were not only ecological but also social, reinforcing kinship ties and responsibilities to Country.

Grassland protection is often insufficient to conserve the full diversity of these ecosystems. Many species

depend on subtle differences in vegetation structure, which can be easily lost without careful management. For example, when grasses become overly dense or “thatched,” it can lead to a decline in plant diversity, affecting the entire community. In many cases where grasslands appear to be in good condition, it is often suggested that a precautionary approach to changing management is warranted to not unintentionally degrade values of the area. Integrating Kurna knowledge and practices including Cultural Burning into contemporary management offers a pathway to more holistic and resilient stewardship of these landscapes.

## Current state

The grasslands that characterised the “great plain” were recognised by the early Europeans as being highly productive and were readily converted to European agricultural practices and consequently were mostly degraded and replaced. It is estimated that only 0.05% of native grasslands remain in the region. Some native grasslands still exist on roadsides and as small patches, though often in a degraded state.

### Clydesdale Reserve, Two Wells



*Figure 54: High diversity grassland site at Clydesdale Reserve, Two Wells*

This site is an example of a high diversity of native grasses, as well as Nardoo, Cressa, several saltbushes and scattered Lignum in the lower wetter area. It appears to be high slashed with care taken to avoid larger native plants. A stormwater drain has been put down one side and planted with eucalypts that would not occur naturally in these communities.

The site is publicly accessible.

# Restoration requirements

## Priority areas

In determining the quality and health of the grassland, it is important to survey grassland areas in spring as diversity may be more apparent when the annual plants emerge, and it can be easier to identify grasses when they seed in spring/summer. Below is a summary of site priority:

**1<sup>st</sup> Existing remnants in moderate to good condition:** manage threats such as planted or encroaching trees and shrubs, weeds, cultivation of soil, pest animals and over- or under-grazing without reducing habitat for threatened and declining native fauna.

**2<sup>nd</sup> Degraded remnants:** sites with less than 10% native groundcover. First manage threats to encourage natural regeneration, continue low impact weed control and monitor for a few years and see how the site responds before deciding if and what revegetation is required.

**3<sup>rd</sup> Areas adjacent to remnants:** manage threats to encourage natural regeneration around existing remnants such as roadsides, council reserves, and drains. Continue low impact weed control and monitor for a few years to see how native or weedy species re-establish before deciding if and what revegetation is required.

## Restoration risks

Grasslands and Grasslands with Saltbush		
Risk	Consideration	Mitigate
Grasslands are under recognised as native vegetation and can be degraded or destroyed	Several wildlife species rely on tree-less grasslands.	Understanding the care requirements of the site.  Enabling sufficient water resource for the vegetation community requirements
Converting to the wrong vegetation community	Excess planting of a species that can degrade integrity of the vegetation community.	Take care to correctly identify the site's target vegetation community to avoid restoring to recommendations of a different community. Follow guidelines of recommended plants per hectare.
Planting trees within grassland communities.  Planting the wrong species or the wrong amount of a species	Planting unsuitable species for the vegetation community may lead to a struggle to survive for the existing plants and wildlife.	
Impacting Kaurua culture with inappropriate restoration activities	Planned work could impact culturally significant sites – especially if it includes earthworks within 500 metres from the river.	Seek to learn what may be significant at the site and engaging Kaurua to reduce the impact of works.

## Reference sites

Clydesdale Reserve, Two Wells

# Vegetation management

It's important not to plant trees or shrubs in native grassland ecosystems, as doing so can disrupt the natural balance and reduce habitat quality. Grasslands should be protected from degradation, including well-meaning revegetation efforts that introduce woody plants.

When managing weeds or removing larger plants, it's essential to seek expert advice, as some species—like African Boxthorn—may provide habitat for birds and reptiles. In such cases, a staged removal approach is recommended to avoid negatively impacting existing fauna.

Healthy grasslands require periodic disturbance, to prevent the build-up of grassy thatch, which can fill open spaces. A variety of management techniques may be used to achieve this such as fire and flail-mowing (refer to grassland management document here). Without regular management, dense thatch can create a continuous, impenetrable cover, reducing the availability of open areas that are vital for species like lizards. These reptiles rely on open spaces between thatches for basking, hunting, and sheltering. With moderate to good quality grasslands, it may be important to maintain current management regimes to support existing species diversity.

Section 3 (planning) describes the key priorities for planning vegetation management works, including setting the vegetation management target level for restoration and determining what actions are required, such as weed control and revegetation.



*Figure 55: Open ground (with short-lived annual grasses) between grass clumps with very few trees scattered across the community.*

## Weed control

Minimise physical soil disturbance to patches of remnant grassland to avoid colonisation by more vigorous weedy species.

Weed control in grasslands can be achieved through various methods, including slashing, grazing, hand removal (on smaller scales), and/or the use of herbicide. There may be opportunity to apply a broadleaf spray at certain times of year when native herbs are dormant or in areas that don't contain susceptible (most plants other than grasses) native species.

Other considerations include:

- **Timing of mowing/slashing:** Slashing in spring can help reduce seed production of weedy annual grasses like wild oats, while still allowing native perennial grasses to set seed later in summer. If there are areas dominated by native grasses, consider leaving these as un-slashed 'islands' to ensure seed dispersal.
- **Use of tools and machinery:** Avoid using heavy machinery in grasslands where possible, as it can compact the soil and hinder the natural regeneration of native plants.
- **Avoid smothering:** Do not leave piles of cut vegetation (e.g. windrows from mowing), as this can lead to thatching, which may reduce habitat quality for fauna and limit opportunities for native seeds to germinate.
- **Prevent contamination:** Make sure all equipment (e.g. mowers, brushcutters) is clean before use to avoid unintentionally spreading weed seeds into the area.
- **Restoration strategy:** Begin restoration work in the least degraded areas first, and gradually move toward the more degraded sections. This helps protect existing native species and improves overall outcomes.

## Vegetation zones for assessment and revegetation

Table 8 describes the target plant species diversity and number of plants per hectare depending on what the vegetation target is; these targets represent an end point as plants per hectare, not a seedling planting quantity. Figure 56 illustrates the zones within grasslands

where different species would most commonly occur and the basic structure of the community.

Species that commonly occur in each zone are provided in Table 9. Note that, due to the high numbers of ground layer species expected in these communities, specialist revegetation techniques may be required.

Table 8: Target diversity (number of different species) and numbers per hectare for different life forms in Grassland and Grassland with Saltbush communities.

Life form	Target: Basic		Target: Advanced		Comments
	Species diversity	Numbers / hectare	Species diversity	Numbers / hectare	
Large/ medium shrubs	0 to 1	0 to 2	0 to 2	0 to 2	Extremely low densities of <i>Eremophila longifolia</i> and <i>Acacia victoriae</i> , planted in a clump are suitable.  These species will regenerate from seed and/or sucker and dominate the structure – need to be aware of this to maintain as a grassland.
Low shrubs	0 to 3	0 to 10	0 to 5	0 to 10	Can plant in clumps.
Grasses	2 to 3	1000 to 5000	3 to 10	5000 to 10000	Plant clumps of 5 to 10 plants of the same species, at less than 1m between plants; this may mean leaving gaps between clumps of groundcover which can be maintained with slashing. High diversity and numbers of grasses and ground layer plants are the most challenging to achieve when undertaking revegetation and it may take many years to achieve the "advanced" targets for ground layer.
Ground layer	2 to 5	100 to 200	5 to 30	200 to 1000	Plant clumps of 5 to 10 plants of the same species, at less than 1m between plants; this may mean leaving gaps between clumps of groundcover which can be maintained with slashing. High diversity and numbers of grasses and ground layer plants are the most challenging to achieve when undertaking revegetation and it may take many years to achieve the enhanced targets for ground layer.

Local not for profit organisation, Seeding Natives are able to offer specialist advice on restoring this rare and important ecosystem: <https://seedingnatives.org.au/>

Greening Australia have prepared a guide for restoring grasslands: <https://www.greeningaustralia.org.au/publications/revegetation-guide-temperate-grasslands/>

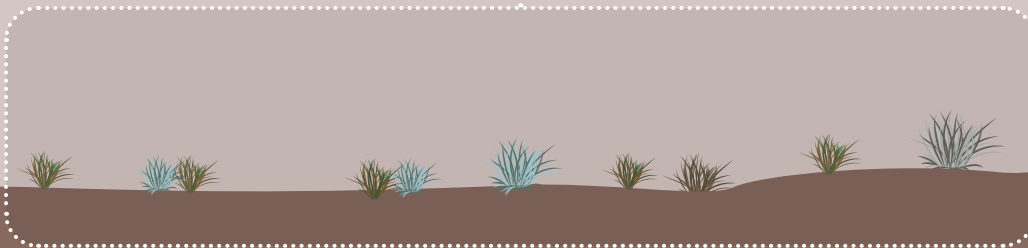
Figure 56: Vegetation zones of grasslands:

## Vegetation zones of grasslands ± saltbush

### Grasslands and low shrubs and ground covers

extended for kilometers adjacent the main River Red Gum channel.

Note lack of trees and shrubs beyond main channel.



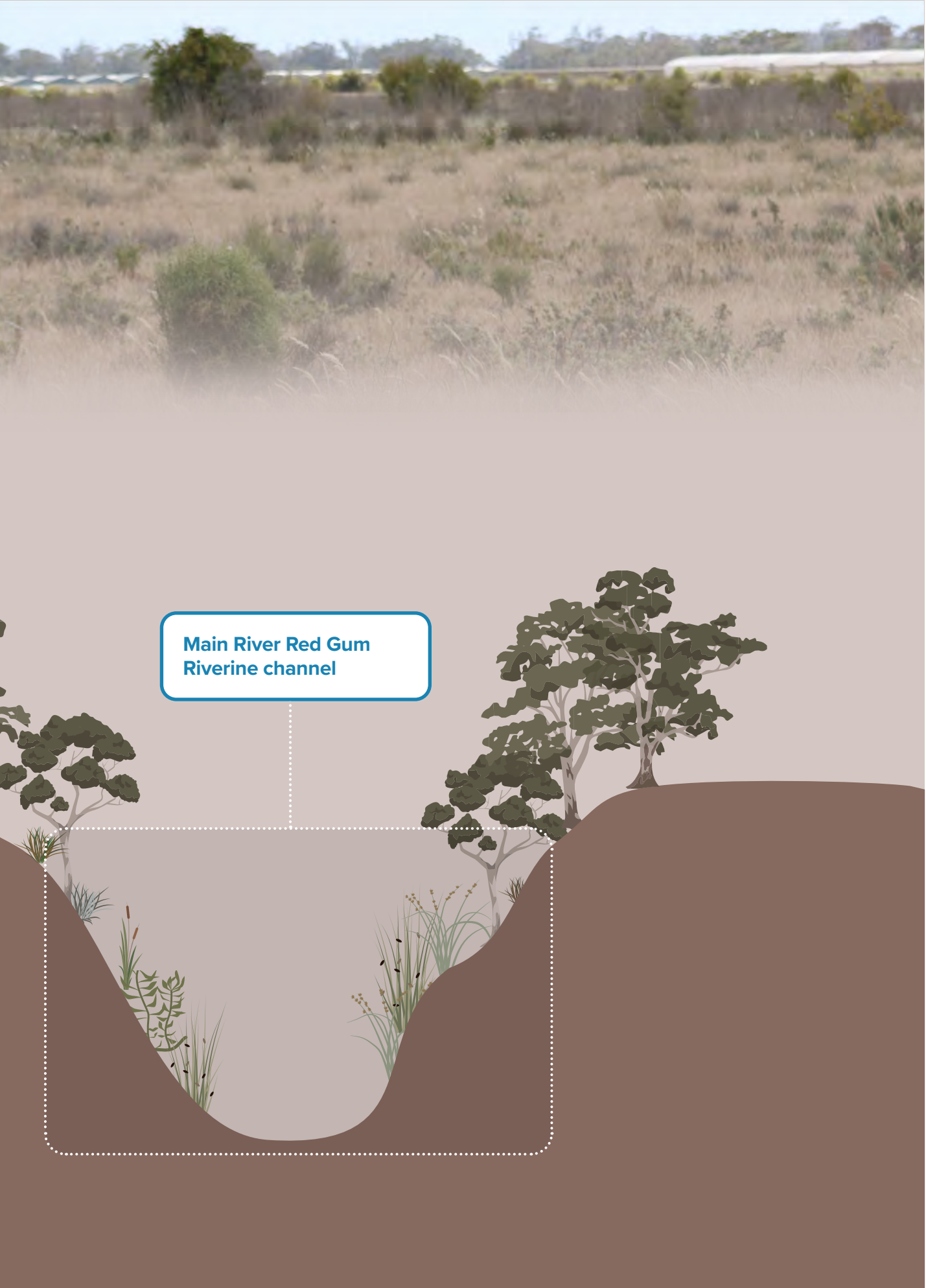


Table 9: Native vegetation species list for Grasslands and Grasslands with Saltbush.

Form	Scientific name	Common name	Zone			Target*		
			Grassland	Basic	Advanced	Grassland with saltbush	Basic	Advanced
Tall shrub	<i>Lycium australe</i>	Australian boxthorn				+	O	O
	<i>Rhagodia candolleana</i> ssp. <i>candolleana</i>	Sea-berry Saltbush				+	O	O
Small shrub	<i>Vittadinia</i> spp. ( <i>cervicularis</i> , <i>cuneata</i> , <i>gracilis</i> )	Annual/Fuzzy/Woolly New Holland Daisy	+	O	O	+	O	O
	<i>Tecticornia indica</i> ssp. <i>leiostachya/bidens</i>	Brown-head Samphire				+	O	O
	<i>Salsola australis</i>	Buckbush				+	O	O
	<i>Maireana aphylla</i>	Cottonbush				+	E	E
	<i>Einadia nutans</i> ssp. <i>nutans</i>	Climbing Saltbush	+	O	O			
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush	+	E	E	+	E	E
	<i>Maireana oppositifolia</i>	Salt Bluebush				+	O	O
	<i>Maireana brevifolia</i>	Small-leaf Bluebush	+	O	E	+	E	E
	<i>Vittadinia australasica</i> var. <i>australasica</i>	New Holland Daisy	+	O	O			
	<i>Frankenia pauciflora</i> var. <i>fruticulosa</i>	Southern Sea-heath	+	O	O			
	<i>Dissocarpus biflorus</i>	Two-Horn Saltbush	+	O	O			
	<i>Brachyscome ciliaris</i> var. <i>ciliaris</i>	Variable Daisy	+	O	O			
	<i>Maireana enchylaenoides</i>	Wingless Fissure-plant	+	O	O			

Form	Scientific name	Common name	Zone	Target*		Zone	Target*	
			Grassland	Basic	Advanced	Grassland with saltbush	Basic	Advanced
Sedge/ Tussock	<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily	+	O	O			
	<i>Juncus subsecundus</i>	Finger Rush	+	O	O			
	<i>Lomandra multiflora</i> ssp. <i>dura</i>	Hard Mat-rush	+	O	O			
	<i>Themeda triandra</i>	Kangaroo Grass	+	O	O			
	<i>Lomandra effusa</i>	Scented Mat-rush	+	O	O	+	O	E
	<i>Dianella brevicaulis</i>	Short-stem Flax-lily				+	O	O
	<i>Austrostipa</i> spp. ( <i>A. curticoma</i> , <i>A. elegantissima</i> , <i>A. eremo</i> )	Spear-grass	+	E	E	+	E	E
	<i>Carex bichenoviana</i>	Notched Sedge	+	O	O			
	<i>Enteropogon acicularis</i>	Umbrella Grass	+	O	O	+	O	O
	<i>Rytidosperma</i> spp. ( <i>R. caespitosum</i> , <i>R. fulvum</i> , <i>R. genicula</i> )	Wallaby-grass	+	E	E	+	O	E
	<i>Setaria jubiflora</i>	Warrego Summer-grass	+	E	E	+	O	O
	<i>Chloris truncata</i>	Windmill Grass	+	O	O	+	O	E
	<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge	+	O	O			
Ground-layer	<i>Suaeda australis</i>	Austral Seablite	+	O	O			
	<i>Erodium crinitum</i>	Blue Heron's-Bill	+	O	O			
	<i>Arthropodium strictum</i>	Common Chocolate Lily	+	O	O			
	<i>Myoporum parvifolium</i>	Creeping Myoporum	+	O	O			
	<i>Distichlis distichophylla</i>	Emu-grass	+	O	O			
	<i>Sida corrugata</i> var. <i>corrugata</i> and <i>angustifolia</i>	Grassland Sid	+	O	O			
	<i>Atriplex suberecta</i>	Lagoon Saltbush	+	O	E			
	<i>Lythrum hyssopifolia</i>	Lesser Loosestrife	+	O	O			
	<i>Euphorbia dallachyana</i>	Mat Spurge	+	O	O			
	<i>Marsilea drummondii</i>	Nardoo	+	O	O			
	<i>Sporobolus mitchellii</i>	Rat-tail Couch	+	O	O			

+ = species occurs in this zone; \*O = optional species; E = essential species.

Note regarding species list: the list represents species most likely to occur and able to be established using revegetation.

# 5. Understanding the Gawler River system

## In this section

- A historic look at the system with Kaurna and colonial perspectives.
- Different ways water interacts and impacts the area.
- Fauna: then and now.
- Future developments.
- Administrative boundaries.



## Kadlitpari: The Wild Dog River

The Gawler and South Para Rivers form part of *Kadlitpari*—the Wild Dog or Dingo River—a place of deep cultural and spiritual significance for the Kurna people. This name is also linked to *Kadlitpinna* (“father of the wild dog”), also known as Captain Jack, a senior Kurna leader from the 1840s and a close associate of *Mullawirraburka* (“King John”).

Kadlitpari is part of a broader cultural landscape that has long been used for ceremony, camping, hunting, and gathering. The broader area is traditionally associated with both men’s and women’s ceremonial business (at different sites), involving both Kurna men and visitors from neighbouring nations. In the warmer months, Kurna people gathered along the coast for fishing, trading, and celebrating the journeys of Dreaming Ancestors. In winter, they moved inland to more sheltered areas along rivers and foothills, including the Gawler and Para Rivers.

Many culturally significant places are found throughout this region, especially along watercourses and the coastline. These include sites linked to ancestral stories such as *Tjilbruke*, as well as archaeological campsites and burial grounds that reflect long-standing Kurna occupation and connections with other groups.

Archaeological mound sites on the northern Adelaide Plains are the physical remains of traditional Kurna camps and burial places. When colonisation began in 1836, Kurna settlements near coastal streams and wetlands featured large, semi-permanent habitation sites.

The River Red Gum, which lines the riverbanks and floodplains, has its own Creation Dreaming (see Section 4.1). In this story, the Ancestor made a pact with the River Red Gums: they would provide shelter, bark, timber, and firewood, and in return, people would care for them through respectful harvesting, fire use, and other land management practices. These trees—and Black Box trees—are culturally significant. Many show signs of past use and are recognised as *culturally modified trees*, protected under the *South Australian Aboriginal Heritage Act 1988*.

Surveys in the Gawler River area have confirmed the presence of significant cultural heritage across the landscape. However, Kurna heritage—including burial sites, modified trees, and archaeological places—is being progressively damaged or lost. To protect this heritage, it is essential to involve Kurna people early in planning and to carry out cultural heritage assessments before any major works take place.



## Records from early Europeans

Early European records, maps, and artworks provide a vivid picture of the Gawler River at the time of European colonisation (as below). In 1839, George Milner Stephen described the river as having a deep channel, lined with tall River Red Gums, meandering across a vast plain. The river did not have a single outlet to the sea but would flood across a wide area at Buckland Park, eventually draining into the sea via multiple tidal channels through mangroves. As he wrote:

*“We travelled along the Gawler, which has a very broad channel and banks from thirty to sixty feet high... for three miles... [then] we again came upon water in a continual chain of extensive ponds.”*

He continued, describing the river’s end at Buckland Park:

*“The Gawler ended in an extensive flat of many hundreds of acres, studded with immense trees, and in which also we have been informed there is water; and to which, indeed, we saw a path made by the Aborigines.”*

Bird watchers noted at Buckland Park that “open River Red Gum forest extends along each bank of the Gawler River, varying from a quarter to a mile wide, with trees often nearly 100 feet high and bearing a plentiful supply of nesting hollows.” The surrounding land was a “great plain,” a treeless grassland, covered in kangaroo grass, with Black Box trees in low-lying areas (Condon and Rix, 1936).

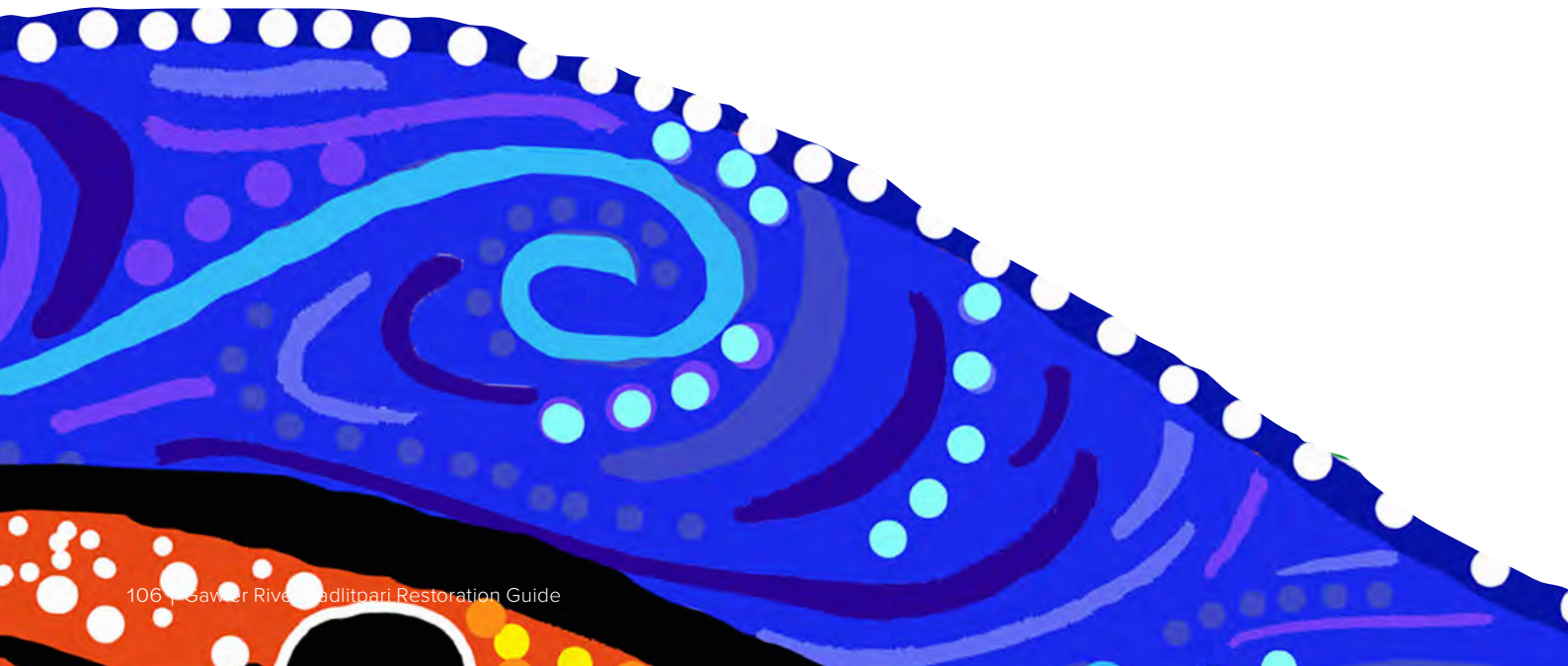
The abundant wildlife of the time in the area was also recorded (Reddin, 1985):

*“There were euros, dingoes, possums, goannas; stumpy tailed, frilled neck and blue-tongued lizards; together with brown, and death adder snakes... Ducks, ibises and water fowls of other description delighted in the wet, flooded countryside when the river overflowed its steep banks ‘every four or five years.’”*

This snapshot of the Gawler River’s ecosystem highlights the richness and diversity of life that once thrived along its banks.



Figure 57: River Red Gum floodplain at Buckland Park with grazing cattle, approximately 1885. Photo credit: S W Sweet - State Library of South Australia B 72483/6/7



# Flows, floods and groundwater

The Gawler River catchment including North Para and South Para rivers is approximately 105,000 hectares that drains into a deep, meandering channel across a flat plain before transitioning into a shallower watercourse as it approaches the coast. Near Buckland Park, the river would historically have flooded out across a wide swamp studded with magnificent River Red Gums, and then re-formed into multiple salty tidal creeks that flowed through mangroves to the sea.

## Flows

The river mainly receives water from rainfall in the North Para and South Para catchments. Between Gawler and Angle Vale, it often dries up between rainfall events, but downstream of Angle Vale, permanent waterholes remain full year-round, providing a reliable water source even when the river isn't flowing.

Every few years, the river overflows onto the floodplain. In larger floods, water spreads further—north to Lewiston and Two Wells, connecting with Salt Creek, and south toward Virginia, joining Thompson Creek.

Floodwaters soak into the riverbanks, supporting River Red Gums and other long-lived vegetation, and contributing to local groundwater. Rainfall in the hills east of Gawler also helps recharge groundwater across the Gawler Plains. When river levels drop, groundwater flows back into the channel, helping to keep waterholes full. On the floodplain, water settles in low-lying clay areas, supporting Black Box woodlands.

At Buckland Park, floodwaters soak into the soil, keeping groundwater fresh and close to the surface. This shallow groundwater moves toward the coast, helping prevent seawater intrusion and supporting the River Red Gum swamp and nearby waterholes and wells.

The river's natural outflow to the coast was altered in 1910 with the construction of weirs forming Buckland Park Lake. These weirs block moderate flows from reaching the estuary, though floodwaters can overtop them. Flow monitoring at Virginia shows water levels rising most years during winter and spring since 2010, but anecdotal evidence suggests flows now reach Buckland Park less often and later than they once did.

**Flow monitoring:** <https://water.data.sa.gov.au/Data/Map>

## The river ecosystem depends on a variety of flow types to remain healthy:

- **Large flood flows:**
  - Recharge groundwater.
  - Support water-dependent floodplain vegetation communities.
  - Flush sediment build-up from river pools.
- **Regular instream flows:**
  - Freshen and top up permanent and temporary pools.
  - Enable aquatic species to migrate upstream and downstream.
- **Baseflows from groundwater:**
  - Maintain permanent pools during dry periods between flow events.
- **Periods of no flow:**
  - Allow riparian (riverbank) plants to grow.
  - Create favourable habitats for a range of native species.
- **Unrestricted flows:**
  - Ensure fish and other aquatic organisms can move freely.
  - Avoid barriers caused by instream weirs and culverts.

The quality of water is particularly important for aquatic plants and fauna.

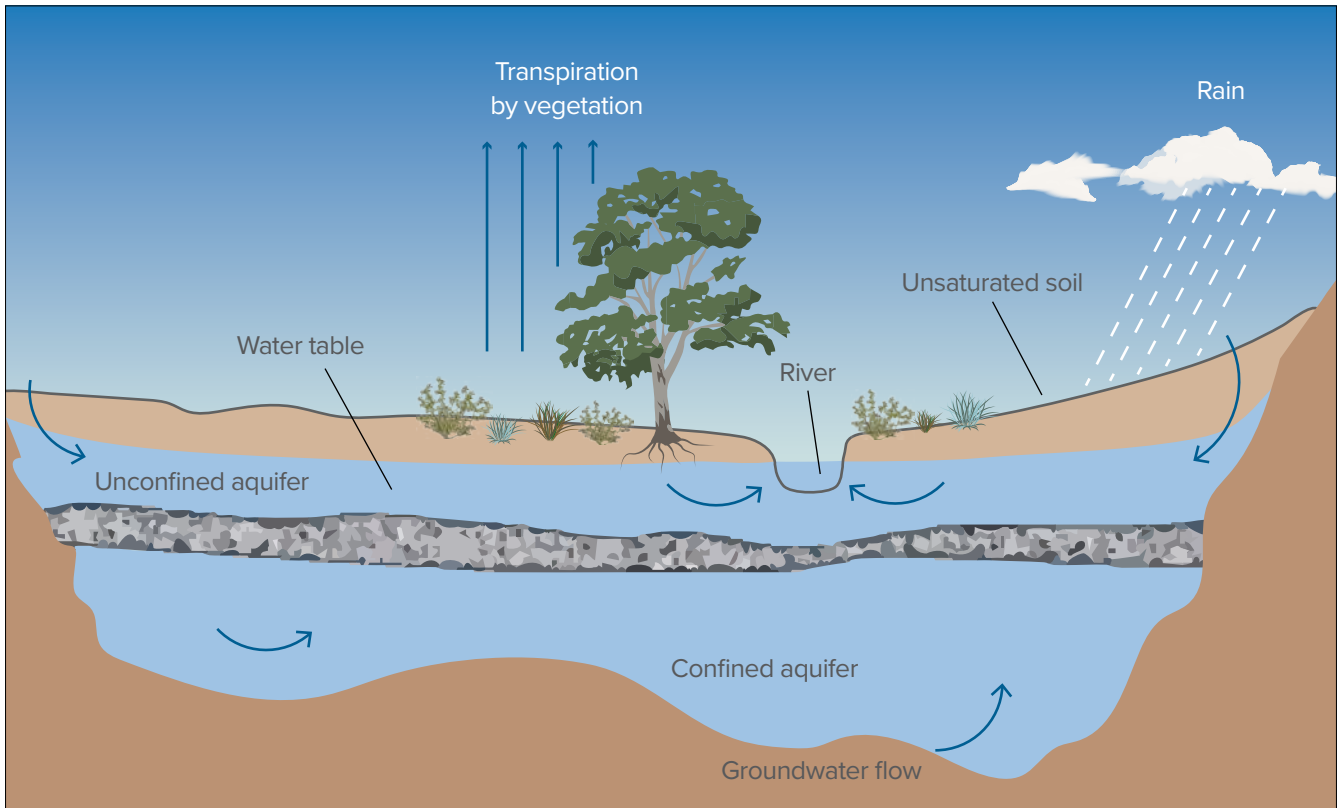


Figure 58: Groundwater flow and connection to underground aquifer.

## Groundwater

A large portion of groundwater in the region is used for horticulture, mainly sourced from confined (deep) aquifers that have little connection to the river system (Figure 58). In contrast, the unconfined (shallow) aquifer plays a crucial role in maintaining river health by allowing groundwater to flow between the river and floodplain, supporting deep-rooted vegetation.

Some water is extracted from the shallow aquifer, mostly for stock and domestic use. Pools in the lower reaches of the river, near the coast, are fed by both local groundwater and seasonal rainfall runoff, which helps top up the pools and improve water quality. High river flows are important for flushing sediment from these pools and recharging the shallow aquifer.

There are anecdotal reports of wells drying up, suggesting groundwater levels may have declined in some areas since the early 1900s. Monitoring shows that groundwater levels in the shallow aquifer have dropped since the 1970s, but are currently considered stable, fluctuating mainly with rainfall.

Reduced groundwater levels and lower surface flows may cause seasonal pools to take longer to fill and dry up earlier, and may even turn once-permanent pools into temporary ones. Although groundwater in the lower reaches near the coast is not actively monitored, it is believed to remain close to the surface and flow toward the sea, helping to prevent seawater intrusion.



## Flooding

On average, the Gawler River floods every ten years, playing a vital role in maintaining riverine and floodplain ecosystems but also posing risks to infrastructure, homes, and businesses.

The Gawler River Flood Management Authority (GRFMA) co-ordinates the construction, operation and maintenance of flood mitigation infrastructure for the Gawler River. Current flood mitigation measures include levee banks along sections of the river and the Bruce Eastick Dam on the North Para River, built in 2008.

Levee banks are an important part of flood management in the Gawler River. The Department for Environment and Water (DEW) are working on improving levee bank management in South Australia and the Gawler River is one of the priority catchments. Levee bank management resources are currently being developed. Further investigations to manage flooding are underway.

Incorporating natural floodplain wetting into town planning and urban design supports both flood management and ecosystem health. Allowing space for periodic inundation helps sustain native habitats and ecological processes, while reducing pressure on built infrastructure. This approach complements levee systems and enhances long-term resilience for communities and the environment.



Figure 59: Pink Cockatoos were once common. John Gould visited Gawler in 1839 and later recorded “as I ascertained, it annually breeds at Gawler in South Australia.” Gould, John *Birds of Australia Volume V 1848 Plate 2 with description* Photo: sandy\_horne CC-BY-NC <https://inaturalist.ala.org.au/observations/59953389>



Figure 60: Malleefowl – one was observed near Port Gawler and they were also seen in the Gawler area . Photo: davidsando cc-by-nc <https://inaturalist.Ala.Org.Au/observations/184477260>

## Pre-European fauna

The Gawler River supported a rich and varied array of fauna, shaped by the diverse habitats that occurred. Over time, our understanding of what is “normal” has shifted, shaped by the concept of shifting baselines—the tendency to perceive the current state of the environment as typical, based on the changes we’ve witnessed in our own lifetimes. As a result, species that were once common are now absent or rare, and the diversity of life the river supported in the past is often underestimated. Historical bird records and surveys (see Appendix 1) provide a glimpse into this lost biodiversity.

### Kurna people and fauna

The Kurna people thrived by hunting a variety of fauna, including mammals, as well as turtles and fish. Their traditional knowledge of the land and its cycles helped sustain a balanced and thriving environment, offering valuable lessons that we can all learn from today.

### Birds

The Gawler River and its surrounding landscapes once hosted an impressive diversity of bird species, drawn to the variety of habitats including wetlands, woodlands, and grasslands. Species such as the Yellow Throated Miner, which typically inhabits more arid regions, were found in the area due to the river’s diverse environments. Early European colonisers recorded a range of birds that are no longer seen today, including breeding sea eagles at Buckland Park.

Early Europeans recorded species that are no longer seen (Figure 59, Figure 60, Figure 61).



Figure 61: Plains Wanderers require extensive grasslands, they were collected from the Gawler Plains in 1840s, and were observed at Buckland Park in the 1970s. Photo: owenlishmund CC-BY-NC <https://inaturalist.ala.org.au/observations/181177421>



Figure 62: Eastern Banjo Frog (*Limnodynastes dumerilii*) (Photo: Martin Stokes)

## Fish and other aquatic fauna

The Gawler River catchment once supported at least seven native fish species, with some found only in the upstream areas of the North and South Para rivers, while others, such as Congolli and Common Galaxias, migrated up and down the river. Unfortunately, two species that used to be found in these waterways – Pouched Lamprey and Western Bluespot Goby – have not been recorded in recent years.

A total of 26 reptile species have been recorded in the region, including skinks, snakes, dragons, lizards and geckos. Additionally, five frog species are recorded, including the Painted Burrowing Frog, SA Tree Frog, Perons Tree Frog, Spotted Marsh Frog, and Common (Brown) Froglet.

See Appendix 2: Fauna surveys summary

The river also provides habitat for Rakali (native water rats) and Long-necked Tortoises, further contributing to its diverse aquatic fauna.

## Mammals

The surrounding forests and woodlands offered critical nesting sites for bats, with at least seven species still present today. The large tree hollows in these areas are ideal homes for Brushtail and Ringtail Possums. Species such as Dingoes, Red Kangaroos, Echidnas, the Greater Bilby and Western Quoll were once common, with only Echidnas still seen.



Figure 63: Recreating on the Gawler River, Virginia (no date, source: Playfords Past, library reference PH08731, CC BY 3.0).

## Major changes – 1836 to 2025

There are many differences between the Gawler River and surrounds today compared with before European colonisation (Figure 63). Ten key changes that have impacted water flows, flood frequency, flora and fauna, in the years since colonisation are listed below:

- 1. Dispossession of Kurna Peoples:** Kurna people were forcibly removed from their ancestral lands, disrupting their cultural practices and traditional care for Country.
- 2. Vegetation clearance:** Native grasslands and woodlands on floodplains were cleared for agriculture and development. Logging occurred along the river channel, altering habitat and ecosystem structure.
- 3. Introduction of pests and loss of native fauna:** European settlement brought invasive plants and animals. Native species, including Kadli (Dingoes), declined or disappeared due to habitat loss and competition.
- 4. Conversion to European agriculture:** Land was repurposed for grazing, cropping, orchards, and intensive horticulture, changing soil health and water use patterns.
- 5. Urbanisation and stormwater impacts:** Towns developed across the catchment, increasing hard surfaces and altering natural stormwater flows, often leading to pollution and erosion.
- 6. Water harvesting infrastructure:** Dams, bores, and weirs were built to capture and control water, disrupting natural flow regimes and aquatic ecosystems.
- 7. Flood mitigation works:** Levees and flood control dams were constructed to protect infrastructure, especially along the South and North Para Rivers. Buckland Park Lake was created as part of flood management, altering the landscape and water dynamics.
- 8. Pollution from industry and urban areas:** Waste and pollutants from various land uses and towns entered the catchment, degrading water quality and harming wildlife.
- 9. Mining activities:** Loam and sand extraction near riverbanks disturbed soil stability and increased sedimentation in waterways.
- 10. Infrastructure on waterways:** Fords, bridges, and other structures were built across the main river channel and floodplain flow paths, affecting water movement and connectivity of habitats.

# The Gawler River today

Today, the Gawler River presents a vastly different landscape compared to its pre-European state. While it still serves as an important waterway, many of the ecosystems that once thrived along its banks have been altered. Native vegetation loss has been severe, with approximately 3% cover of pre-European vegetation estimated to remain in the Gawler River and surrounding area upstream of Port Wakefield Road. The cover of native vegetation however increases nearer the coast, with 17% estimated for the Buckland Park area and 40% at the coast.

Over the past 30 years, 215 native plant species have been recorded in the South Australian biological database (BDBSA). Yet, the area remains under-surveyed, and surveys conducted for this project have added 12 previously undocumented plant species to the list, highlighting the need for continued research and management to better understand the full extent of the region's biodiversity.



Figure 64: Small area of native grassland on a road verge near Evanston.

## Remnant vegetation

### The River Red Gum Riverine forest: Gawler to Port Wakefield Road

Most of the remaining native vegetation along the Gawler River is concentrated in a strip of River Red Gum forest that follows the river's winding path across the plains. This forest extends until about 3 kilometres inland from the coast, where the river disperses. The channel is deep and wide, with the forest canopy typically spanning 60 to 70 metres. Lower banks are dominated by native Common Reed, sedges, and herbs, alongside some introduced grasses. Upper banks are more affected by woody weeds, exotic trees, and introduced species, though a variety of native plants still persist.

### Black Box floodplain woodlands

The Black Box floodplain woodlands have been heavily cleared, and most remnants exist to the north of the Gawler River in degraded narrow roadsides and in paddocks with little native understorey. There are however a small number of reserves in the Lewiston area in good condition displaying a high diversity of native species, including in the ground layer. Rural properties in the Lewiston area also provide a relatively high proportion of native and planted tree canopy across an area of about 1100 hectares. There are very few remnants of Black Box woodland south of the river.

### Lower floodplain

Downstream of Old Port Wakefield Road, old River Red Gums occur out on the floodplain, mostly as paddock trees over introduced pastures. The River Red Gum floodplain woodland at this point is up to 1.5 kilometres wide (described in more detail in section 4.3). The cover of remnant native vegetation increases towards the coast and many pastures west of Old Port Wakefield Road contain remnant mixed chenopod shrublands and open chenopod shrubland (Section 4.4).

### The “Great Plain”

The grasslands that characterised the “great plain” were recognised by the early Europeans as being highly productive, readily converted to European agricultural practices and mostly cleared. Only a few very small native grassland areas remain in the areas surrounding the Gawler River, and these are mostly on roadsides (e.g. Figure 64) and some council reserves. This is consistent with the greater Adelaide plains and foothills south of the Light River where it is estimated that only 0.05% of native grasslands remain (Section 4.5).

## The Gawler River estuary

The Gawler River estuary refers to the area where the Gawler River meets the sea, just before it enters the Gulf St Vincent. This region is a vital ecological zone, as it is where freshwater from the river mixes with saltwater from the sea, creating a brackish environment that supports a diverse range of plant and animal life.

The healthy functioning of the Gawler River is critical to the downstream coastal habitats. The Gawler River flows into the Winaityinaityi Pangkara - Adelaide International Bird Sanctuary. The estuary and Buckland Park Lake are included in the Directory of Important Wetlands in Australia (DIWA) and the estuary is also within the Adelaide Dolphin Sanctuary. A number of threatened species have been recorded in the estuary area and the ecosystem is listed as a nationally vulnerable ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Numerous migratory bird species of international and national importance are dependent on estuaries of the Adelaide coastline. Although Buckland Park lake is not a ‘natural lake’, it is ecologically important for waterbirds with over 60 species of birds recorded including threatened migratory species.



Figure 65: Gawler River Riparian Restoration volunteers supported by Town of Gawler, Light Regional Council and Northern and Yorke Landscape Board

### Work in focus - community project restoration work along Gawler River and surrounds

*“As a volunteer,... seeing the young Rakali and small Bearded Dragon lizards appearing in the restored areas really warms my heart.”*

*“People need special places, rivers are special places”.*

*“the River is our escape, a place we can immerse ourselves,... Water breathes life and this place comes alive after rain. It’s also wonderful meeting so many great people and being a part of such an important project- “*



Figure 66: Wingate Road Wetlands - spring 2025

## Artificial wetlands

Artificial wetlands have been established at several sites along the Gawler River and nearby areas, including in disused loam pits. These wetlands enhance habitat diversity and support surface and groundwater management. Younger wetlands, such as those at Wingate and Bakers Road, attract many waterbirds—some of which nest there—but currently support fewer woodland birds (Figure 66). They also provide habitat for a wide range of insects, including aquatic species like dragonflies and damselflies, and terrestrial bugs and beetles in the planted woodlands. An older, privately managed wetland in the lower catchment supports even greater insect diversity, though bird surveys were not conducted there.

Constructed wetlands can also assist with flood control, water quality improvement, and groundwater recharge, while offering habitat for various fauna. Sites like Wingate Road wetland are used by migratory waterbirds nesting in seasonally flooded sapling River Red Gums. Diverse vegetation is essential for supporting invertebrate communities.

Wetland construction must be carefully planned to avoid disturbing Kurna cultural heritage, with thorough heritage assessments and monitoring required.

Past loam mining along the Gawler River has left behind many unused pits, which present opportunities for rehabilitation through artificial wetlands and stormwater management projects.



Figure 67: Two Wells Golf altered vegetation communities support a diverse range of flora suitable for habitat.

## Fauna found today

### Birds

The Gawler River remains an important corridor for birds moving between the Mt Lofty Ranges and the coast. Despite the degraded understorey, the relatively continuous strip of River Red Gum forest along the river provides suitable habitat for feeding and nesting. Some bird species rely on open areas adjacent to the forest for feeding during the breeding season, although these areas have been significantly impacted.

As the adjacent habitats have been heavily cleared and altered (Figure 67), many of the bird species that once lived in these habitats are no longer found in the region, including Painted Buttonquail, Malleefowl (Figure 61), Striped Honeyeater and Plains Wanderers.

The most important habitat features that remain for birds in the Gawler River and surrounds are:

- **Large River Red Gums** with multiple large hollows, as well as smaller hollows
- **Permanent waterholes** with reedbeds,
- **Shallow seasonal wetlands** filled by winter rains and floods, and
- **Low open shrublands** without tree canopy in the lower reaches.

The Lignum and Leafless Bluebush shrublands adjacent to the coast are important habitat for the regionally significant White-winged Fairywren that requires patches of shrubland without trees.

### Reptiles

Twenty-five species of reptiles have historically been recorded from the Gawler River and surrounds. While some have not been recorded in recent years it is considered that for some species this is likely to be due to lack of sampling.

Surveys undertaken for this Guide found that the cool wet environment with abundant leaf litter and fallen timber found in the Gawler River corridor provides habitat for species not usually recorded this far north on the Adelaide Plains such as the Garden Skink and Three-toed Earless skink. Garden Skinks and other small skinks are common, but there was a distinct lack of moderately sized skinks. Of the larger skinks, Blue-tongued Lizards are common but low numbers of Sleepy Lizards (also known as Stumpy Tail) were recorded; Sleepy Lizards usually only produce one offspring per year, are monogamous and vulnerable in landscapes with barriers e.g. roads and crops; the Blue-tongue on the other hand is a hardy generalist that produces multiple offspring and potentially has increased in numbers and these adaptations make it better suited to the modified environment.

Important habitat features for reptiles are:

- **surface ground cover:** such as logs, woody debris piles, rocks and artificial supplements for shelter as well as basking
- **grass tussocks with spaces between:** provide hunting and basking places.

## Invertebrates

A sample invertebrate survey (insects and spiders) was conducted to inform this Guide. Despite only covering five sites, it recorded 605 species, with each site supporting distinct invertebrate communities shaped by plant diversity, habitat features, and surrounding land use. Key findings for habitat restoration include:

- **Grasslands are vital for many invertebrates.** The locally significant Mottled Grass Skipper Butterfly, which relies on both native and introduced grasses, was found at two lower-reach sites. Plant diversity and open grassland areas free from trees and shrubs are important for supporting these species.
- **Wetlands—both natural and artificial—support a wide range of aquatic and riparian invertebrates,** including species found only in these environments.
- **Black Box woodlands at Lewiston Wetlands hosted few aquatic species but high terrestrial diversity,** including a jewel beetle dependent on native spear grasses. This beetle had not previously been recorded in the region, with the nearest known populations in Burra and Swan Reach.
- **Some invertebrates now rely on exotic plants for survival,** such as nectar from mustard family weeds, due to the loss of native nectar-producing species. This should be considered in site restoration planning.



*Figure 68: This jewel beetle (Paracephala pistacina) depends on certain native spear grasses in full sun for their larvae; the species was once widespread but has now disappeared from most agricultural areas of the state. Photo: Peter Lang.*

Recovery of habitat for individual invertebrate species is difficult because of their very specific requirements that often change through their life stages. Therefore, a more general habitat management approach is recommended to achieve balanced outcomes for multiple species in most circumstances. To support thriving invertebrate populations, vegetation management should aim to minimise habitat disturbance. Recommended practices include:

- Mow grass longer or taller, allow greater height retention
- Designate unmowed grass “islands” across the landscape
- Retain grass around shrubs and tree bases
- Leave dead vegetation, especially fallen timber
- Preserve natural water flows wherever possible
- Retain some nectar-producing weed species where needed
- Create habitat connections and buffer zones between areas



Figure 69: Rakali photographed in the Wakefield River at the Rocks Reserve near Balaklava. Photo: Paul Taylor.

### Fish and other aquatic fauna

Recent surveys have recorded native fish species in the Gawler River, including Congolli—listed as vulnerable in South Australia—and Common Galaxias. Both are diadromous, meaning they migrate between the saline estuary and freshwater streams in the hills, and therefore require unobstructed channels. Silver Perch have been introduced from other catchments, along with exotic species such as European Carp.

Six species of frogs have been recorded in the Gawler River and surrounds: Painted Burrowing Frog, SA Tree Frog, Perons Tree Frog, Spotted Marsh Frog and Common/Brown Froglet and Banjo Frog. There have been declines in the records of all species including Spotted Marsh Frog and Common Froglet. Given the sensitivity of frogs to the health of ecosystems, their decline is likely to indicate a decline of waterway health.

The Common Long-necked Turtle is native to the Gawler River, and the Murray Short-necked Turtle has been introduced but is not widespread; there are no documented negative impacts made by Long-neck Turtles.

Rakali (Australian water rat) have been recorded from Buckland Park Lake and the lower Gawler River and in Gawler township and upstream, but there are no recent records between these two areas.

### Bats and other mammals

The forests and woodlands provide roosting sites for bats (at least seven species still occur) and the large hollows are ideal for Brushtail and Ringtail Possums.

Other fauna records include:

- Six species of bats from Buckland Park
- Brushtail and Ringtail Possums, with the latter rarely seen
- Western Grey Kangaroos and Euros.
- Echidnas



Figure 70: A composition map showing planned future development zones from two sources: 1. Emerging (Township) Activity Centres under Planning and Design Code Subzones (SA Property and Planning Atlas). 2. Relevant digital regional plans from the Greater Adelaide Regional Plan.

# Future development

The region is experiencing significant change, with the demand for housing driving land use change over to residential development. This change impacts nature and people with a historic and ongoing connection to place. The Greater Adelaide Regional Plan 2025 (GARP) identifies land for a further 96,871 greenfield dwellings for metropolitan Adelaide (in addition to greenfield dwellings within the existing zoning framework).

As a result of residential development and the change of land use, large areas along the southern boundary of the Gawler River, currently zoned as open space, are likely to become significant places for recreation, cultural activities, and biodiversity conservation. Land is typically transferred to council management through the subdivision process, and is occurring in the Riverlea, Angle Vale and potentially other areas.

GARP supports this transition through its proposal for the Northern Park Lands, which designates the Gawler River as a future greenway—a connected network of open spaces that link people and wildlife to natural and recreational areas across Greater Adelaide.

These greenways provide safe walking and cycling routes, while also enhancing ecological connectivity by linking watercourses and biodiversity corridors.

The GARP has a major focus on open space on both sides of the Gawler River and creating an open space corridor between Gawler and the coast.

**For more information:**

[Digital Regional Plans](#)

[The Kudla growth area and the Northern Park Lands](#)

# Administrative boundaries

## Native Title

Kaurna are the Aboriginal Traditional Owners and Native Title Holders in the Adelaide region of South Australia. Kurna Yerta Aboriginal Corporation (KYAC) is the Prescribed Body Corporate for the Kaurna Native Title Holders

and represents them in relation to cultural heritage. Cultural heritage refers to Kaurna or Aboriginal cultural heritage and not colonial, natural or other.

## Landscape Boards (relating to the *Landscape South Australia Act 2019*)

The Gawler River forms the boundary between Northern and Yorke Landscape region to the north (which includes the Town of Gawler area) and Green Adelaide Landscape region to the south. The Northern and Yorke Landscape Board and Green Adelaide work with partners to deliver practical, on-ground programs to manage landscapes.

## Local government

The Gawler River flows through four local government areas. It begins in the **Town of Gawler**, which spans both sides of the river up to Two Wells Road. From there:

- North of the river becomes **Light Regional Council** up to Boundary Road, and then transitions to **Adelaide Plains Council** all the way to the coast.
- South of the river remains within the Town of Gawler until Wingate Road, where it enters the **City of Playford**, continuing through to the coast.

## Land use and zones

The Gawler River floodplain supports a mix of land uses, including urban housing, horticulture, dryland cropping, lifestyle properties, and grazing. Livestock grazing is mostly limited to the lower reaches, meaning much of the river corridor remains ungrazed and largely unused for primary production.

Several council-owned reserves are located along or near the river, though some parcels are landlocked and currently inaccessible to the public. The river's lower reaches flow through the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara.

Under the *Planning, Development and Infrastructure Act 2016 (SA)*, parts of the river channel are zoned for Conservation, while sections of the banks and floodplain are zoned as Open Space.

For current Planning and Design Code zoning and other planning details for specific locations, visit the SA Property and Planning Atlas: <https://sappa.plan.sa.gov.au>

To learn more about the Planning and Design Code itself, including policies and assessment pathways, visit: <https://code.plan.sa.gov.au>

## Water management

The Gawler River is part of the Western Mount Lofty Ranges (WMLR) Prescribed Area under the *Landscape South Australia Act 2019*. Water use is managed through the WMLR Water Allocation Plan.

Flood management is overseen by the Gawler River Floodplain Management Authority (GRFMA), a regional subsidiary formed under the *Local Government Act 1999*. Its member councils include Adelaide Hills, Adelaide Plains, The Barossa, Town of Gawler, Light Regional, and City of Playford. The GRFMA focuses on flood mitigation for the Gawler River, which has a long history of flooding and associated damage to publicly and privately managed land. The Department for Environment and Water also plays a key role in flood management.

## More information

There are a range of additional resources available to assist with planning Gawler River Restoration works. The following are just a few (see also Section 6):

### Green Adelaide

Guide to looking after waterways – excellent resource available through the GA website and in hard copy.

<https://www.greenadelaide.sa.gov.au/>

### Gawler Environment Centre

8 Main North Road, Gawler

<https://www.gawlerenvironmentcentre.org.au/>

### Repairing our Rivers

Food Forest TV

[https://www.youtube.com/watch?v=m\\_r62zvWKhk](https://www.youtube.com/watch?v=m_r62zvWKhk)

### Kaurna Yerta Aboriginal Corporation

Phone (08) (08) 8110 2800.

Email: [info@kyac.org.au](mailto:info@kyac.org.au)

### Northern and Yorke Landscape Board

Unit 1 - 4 Seventh Street, South Gawler  
SA Ph: (08) 8523 0479

<https://www.landscape.sa.gov.au/ny>

### Gawler Environment and Heritage Association

Email: [geha1@bigpond.com](mailto:geha1@bigpond.com)

### Local council biodiversity and environmental staff

Contact your local council

### Habitat Restoration Planning Guide for Natural Resource Management

<https://cdn.environment.sa.gov.au/environment/docs/con-nv-habitatrestorationguide.pdf>





# 6. References and further reading



## Survey reports for the Gawler River Restoration project:

Carpenter, G. (2024). *A Bird Survey of the Lower Gawler River District, 2023*. Prepared for the Green Adelaide Landscape Board.

Draper, N., Maland, A., & Donald, A. (2023). *Gawler River Environmental Survey and Restoration Guide – Kurna Cultural Heritage Management*. Report by NDAA for Green Adelaide.

Kent, H., & Tibby, M. (2024). *Gawler River Reptile Surveys*. Prepared for Green Adelaide.

Miles, C. (2024). *Vegetation Surveys for Gawler River Restoration Guide*. Report by Miles Environmental for Green Adelaide.

Stolarski, A. (2024). *Gawler River Rapid Invertebrate Survey*. Report by Ento Search for Green Adelaide.

Fauna survey summaries are provided in Appendix 1.

## Other key surveys and data sources:

Anderson, B. (2009). *Buckland Park Proposal Fauna Technical Report*. Prepared for Walker Corporation Pty Ltd.

McGregor, J., & Durant, M. (2019). *Town of Gawler Biodiversity Management Plan*. Greening Australia.

Swanbury Penglase. (2009). *Gawler River Open Space Strategy*. Prepared for Gawler River Floodplain Management Authority.

## Watercourse management:

### Green Adelaide - Guide to looking after waterways:

- <https://www.greenadelaide.sa.gov.au/discover/looking-after-our-waterways>
- <https://cdn.environment.sa.gov.au/greenadelaide/images/Looking-after-waterways-property-owners-guide-V2.pdf>

## Northern and Yorke - Revegetating watercourses guide:

- <https://www.landscape.sa.gov.au/ny/water/managing-water-resources/watercourses/revegetating-watercourses>
- <https://cdn.environment.sa.gov.au/landscape/docs/ny/revegetating-watercourses.pdf>

## Historic accounts and photographs

Many of the historical accounts and records and key pieces of information have been compiled by other people, in particular Adrian Shackley and through *It's Blue with Five Petals* <https://www.facebook.com/ItsBlueWithFivePetals>

Condon, H. T., & Rix, C. E. (1936). The birds of Buckland Park. *The South Australian Ornithologist*, pp. 203–219.

Redden, B. (1985). *My mother said* (pp. 74–75). Hyde Park Press (self-published).

Stephen, G. M. (1839, February 21). Discovery of a splendid tract at the mouth of the Gawler River. *South Australian Gazette & Colonial Register*, February 28, pp. 8a–c.

Sweet, S. W. (c.1885). *Buckland Park, Gawler, with view of tall gums and herd of cattle* [Photograph]. State Library of South Australia, B 43096.

## Surface water and groundwater

Adelaide and Mount Lofty Ranges Natural Resources Management Board. (2013). *Water Allocation Plan – Western Mount Lofty Ranges*. Government of South Australia.

Department for Environment and Water. (2018). *Assessment of the needs of water dependent ecosystems for the Northern Adelaide Plains and Central Adelaide Prescribed Wells Areas* (DEW Technical Report 2018/03). Government of South Australia, Adelaide.

Smith, D. L. (1979). *Land Use and Groundwater History of the Northern Adelaide Plains*. Prepared by the University of Adelaide for the Engineering and Water Supply Department, South Australia.

## Flora and fauna

### General

Bekessy, S.A., Berthon, K., Garrard, G.E., Croeser, T., Keogh, C., Kirk, H. & Visintin, C. (2024), *Blueprint for a Nature-Positive Adelaide*, Interdisciplinary Conservation Science Group, RMIT University, Melbourne.

Smith, J.I.D. (2016), *Wildlife of Greater Adelaide*, Axiom Publishers, Adelaide.

### On-line plant and animal records and identification

iNaturalist (Australia)  
<https://inaturalist.ala.org.au>

NatureMaps (South Australia)  
<https://data.environment.sa.gov.au/NatureMaps/Pages/default.aspx>

Atlas of Living Australia  
<https://www.ala.org.au>

SA Seedbank – Seeds of South Australia  
<https://spapps.environment.sa.gov.au/seedsofsa>

Landscapes Hills and Fleurieu (2023)  
*South Australia Common Native Grasses: A South Australian Regional Guide*, Landscapes South Australia and Government of South Australia  
FrogWatchSA  
<https://frogwatchsa.com.au>

### Hard-copy plant identification resources

Bennett, E. (2023), *That Grass Book – Identifying Grasses in Southern Australia*, Ellen Bennett, South Australia.

Dashorst, G.R. & Jessop, J.P. (1990), *Plants of the Adelaide Plains and Hills*, State Herbarium of South Australia.

Nicolle, D. (2013), *Native Eucalypts of South Australia*, Lane & Print Post, Adelaide.

Prescott, A. (2012), *It's Blue With Five Petals* (2nd ed.), Ann Prescott, South Australia.

### Native vegetation

Bonney, N. & Miles, A. (1994), *Uses of Native Plants in the South East of South Australia* by

*the Indigenous Peoples before 1839*, Volume 4, Celebration South East, SEBP, Naracoorte.

Kraehenbuehl, D.N. (1996), *Pre-European Vegetation of Adelaide: A Survey from the Gawler River to Hallett Cove*, Nature Conservation Society of South Australia Inc.

Shackley, A., Allanson, A. & Kuys, J. (2015), *A Biological Survey of Lower North Grasslands of South Australia* (Revised Edition), Irongrass Environmental Rehabilitation Services & Gawler Environmental Heritage Association.

### Butterfly

Butcher, C. (2017). *Yellowish Sedge-skipper Butterfly Reintroduction Feasibility Project – Final Report*. Report prepared for the Nature Conservation Society of South Australia for the Adelaide and Mt Lofty Natural Resources Management Board.

Hunt, L., Grund, R., Keane, D., & Forrest, J. (2016). *Attracting Butterflies to Your Garden*. Butterfly Conservation SA Inc.

McQuillan, P., Forrest, J., Keane, D., & Grund, R. (2019). *Caterpillars, Moths and Their Plants of Southern Australia*. Butterfly Conservation SA Inc.

### Fish

Hammer, M., Wedderburn, S., & van Weenen, J. (2009), *Action Plan for South Australian Freshwater Fishes*. Native Fish Australia (SA) and Department of Environment and Heritage.

Schmarr, D., Thwaites, L., & Peters, K. (2022). *Biological review of the freshwater fishes of the Western Mount Lofty Ranges* (SARDI Aquatic Sciences Publication No. F2022/000250-1).

Whiterod, N., & Zukowski, S. (2023). *WMLR Fish Monitoring, autumn 2023*. Glenelg Nature Trust, Mt Gambier.

### Environmental water requirements

Bresciani, E., Batelaan, O., Banks, E. W., Barnett, S. R., Batlle-Aguilar, J., Cook, P. G., Costar, A., Cranswick, R. H., Doherty, J., Green, G., Kozuskanich, J., Partington, D., Pool, M., Post, V. E. A., Simmons, C. T., Smerdon, B. D., Smith, S. D., Turnadge, C., Villeneuve, S., Werner, A. D., White, N., & Xie, Y. (2015). *Assessment of Adelaide Plains Groundwater Resources: Summary Report* (Goyder Institute for Water Research Technical Report Series No. 15/31). Adelaide, South Australia.

Department for Environment and Water. (2018). *Assessment of the needs of water dependent ecosystems for the Northern Adelaide Plains and Central Adelaide Prescribed Wells Areas* (DEW Technical Report 2018/03). Government of South Australia, through Department for Environment and Water, Adelaide.

Rogers, K., & Ralph, T. (2011). *Floodplain and wetland biota in the Murray-Darling Basin – water and habitat requirements*. CSIRO Publishing.

## Estuary and Buckland Park lake

Anderson, B. (2009). *Buckland Park Proposal Fauna Technical Report*. Prepared for Walker Corporation Pty Ltd.

Australian Water Environments. (2015). *Preliminary feasibility study into Buckland Park Lake environmental flows*. Report to Adelaide & Mount Lofty Ranges Natural Resources Management Board.

Department for Environment and Heritage. (2007). *Adelaide and Mount Lofty Ranges Natural Resources Management Region Estuaries Information Package*. Department for Environment and Heritage, Adelaide, SA.

Durant, M. (2023). *Winaityinaityi Pangkara – Adelaide International Bird Sanctuary Buckland Park Conservation Operations Plan 2023–2033*. Greening Australia.

Greening Australia. (2022). *Adelaide International Bird Sanctuary and Flyway Site – Conservation Action Planning Summary*. Report to Department for Environment and Water (DEW).

## Weeds and pest animals

Primary Industries and Regions South Australia (PIRSA). (2018). *Weed Control Handbook for Declared Plants in South Australia* (July 2018 Edition). Government of South Australia. Available at: [https://www.pir.sa.gov.au/\\_data/assets/pdf\\_file/0020/232382/weed-control-handbook.pdf](https://www.pir.sa.gov.au/_data/assets/pdf_file/0020/232382/weed-control-handbook.pdf)

Bradley, J. (1988). *Bringing Back the Bush – The Bradley Method of Bush Regeneration*. In J. Larking, A. Lenning, & J. Walker (Eds.). Lansdowne Publishing, Brisbane.

Environment Protection Authority (EPA). (2017). *Safe and Effective Herbicide Use – A Handbook for Near-Water Applications*. EPA South Australia.

Native Vegetation Council. (2017). *Bushland Assessment Manual Appendix 11: Weed Threat Ratings*. Government of South Australia.

Robertson, M. (2000). *Stop Bushland Weeds*. The Nature Conservation Society of South Australia Inc.

## Web resources:

- PIRSA Biosecurity – Weeds: <https://pir.sa.gov.au/biosecurity/weeds>
- Green Adelaide – Pest Animal Support: <https://www.greenadelaide.sa.gov.au/discover/get-help-with-pest-animals>
- Northern and Yorke Landscape Board – Pest Plants and Animals: <https://www.landscape.sa.gov.au/ny/plants-and-animals/pest-plants-and-animals>
- Trees for Life – Bush Regeneration Workshops: <https://treesforlife.org.au/>

## Acknowledgement of contributions

- Kurna representatives
- Gawler River Flood Management Authority
- Department for Environment and Water
- SA Water
- Green Adelaide
- Northern and Yorke Landscape Board
- Walker Corporation – Buckland Park
- Private land managers
- Virginia Horticulture Centre
- Northern Adelaide Plains Food Cluster
- Gawler Environment Centre
- Gawler Environment and Heritage Association
- Adelaide International Bird Sanctuary
- Local Councils:
  - City of Playford
  - Adelaide Plains Council
  - Light Regional Council
  - Town of Gawler

# Appendix 1: Priority level and control methods for common weeds

Table 10: This table provides a list of declared and environmental weeds observed in the Gawler River and surrounding areas of remnant native vegetation and their general priority for control.

Common name	Scientific name	WoNS*	Declared	Env. threat**	Control method	Timing
<b>Western Coastal Wattle</b>	<i>Acacia cyclops</i>			3	Cut and swab large plants; hand pull small seedlings.	All year
<b>Golden Wreath Wattle</b>	<i>Acacia saligna</i>			3	Cut and swab large plants; hand pull small seedlings, ensure all roots are removed	August to December
<b>Coastal Galenia</b>	<i>Aizoon pubescens</i>			2	Spot spray or hand pull where revegetation to take place and amongst native vegetation and follow-up	September to February
<b>Giant Reed</b>	<i>Arundo donax</i>		Yes	1	Slash anytime and spot spray re-growth when actively growing, or cut and swab; ensure all material is removed from site and appropriately disposed of	Spring to Summer
<b>Bridal Creeper</b>	<i>Asparagus asparagoides f.</i>	Yes	Yes	5	Spot spray before fruit matures; hand remove small plants provided all bulbs are removed	June to August
<b>Kikuyu</b>	<i>Pennisetum clandestinum</i>			3	Spot spray where revegetation to take place and follow-up	Any time when actively growing
<b>Coral/Rope Cactus</b>	<i>Cylindropuntia sp.</i>	Yes	Yes	2	Basal bark or cut and treat stump with herbicide; remove cut material from site and bury deeply. Ensure all 'branches' are treated. Manual removal can be done any time, ensure all parts are removed.	December to February
<b>Artichoke Thistle</b>	<i>Cynara cardunculus ssp. flavescens</i>		Yes	3	Spot spray rosette through to pre-flowering (when actively growing and before flowering)	June to October

Common name	Scientific name	WoNS*	Declared	Env. threat**	Control method	Timing
<b>Couch</b>	<i>Cynodon dactylon</i> var. <i>dactylon</i>			2	Spot spray where revegetation to take place and follow-up	When actively growing
<b>Drain Flat-sedge</b>	<i>Cyperus eragrostis</i>			NA	Grub out isolated plants before seed set ensuring all underground parts are removed.	June to October
<b>Salvation Jane</b>	<i>Echium plantagineum</i>		Yes	2	Spot spray before flower/seed heads are produced, monitor bare areas especially where pre-revegetation weed control has taken place	May to September
<b>Edible Fig</b>	<i>Ficus carica</i>			1	Cut trees close to ground and immediately apply herbicide to stump. Monitor for and spot spray any re-growth. Control while actively growing (e.g. late Spring to early Summer	November to January
<b>Fennel</b>	<i>Foeniculum vulgare</i>			2	Slash and spray re-growth where accessible; spot spray before flowering finishes otherwise.	September to April
<b>Desert Ash</b>	<i>Fraxinus angustifolia</i> ssp. <i>angustifolia</i>		Yes	3	Mechanically remove trees where possible and cut and swab stumps. Monitor for and control re-growth from plants for minimum one year.	October to March
<b>Gazania</b>	<i>Gazania linearis</i>		Yes	3	Spot spray when actively growing or grub out	All year
<b>Broad-leaf Cotton-bush</b>	<i>Gomphocarpus cancellatus</i>			2	Handpull or grub out	All year

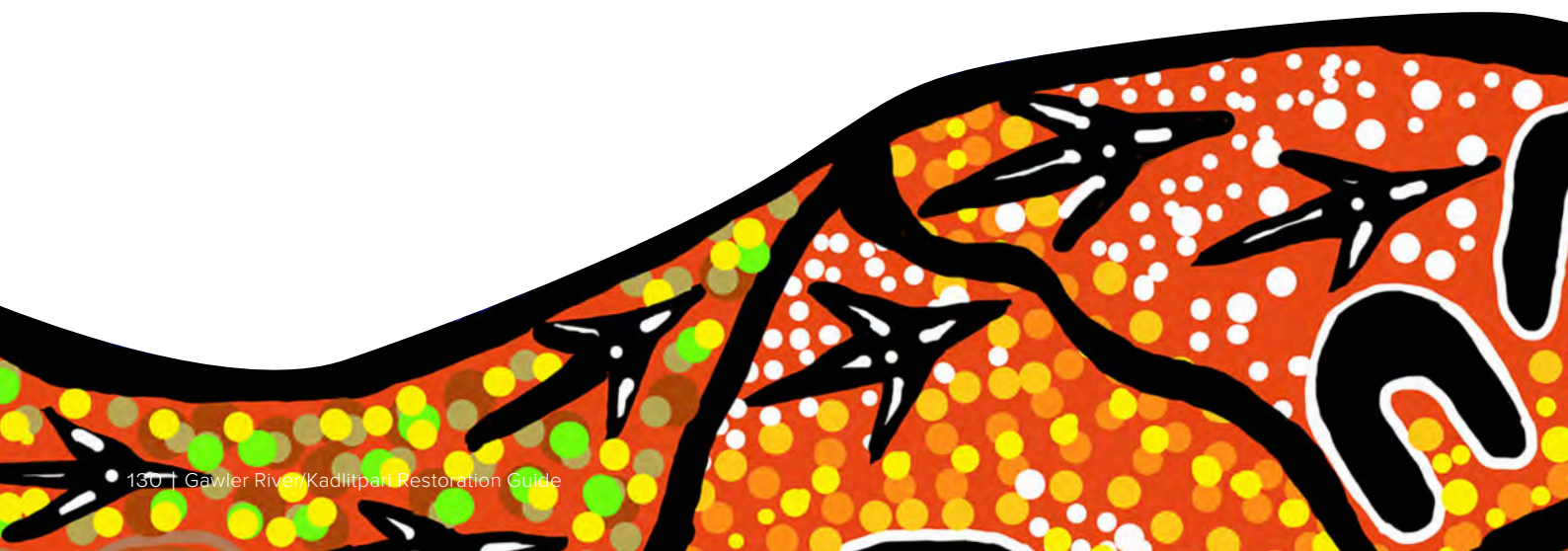
Common name	Scientific name	WoNS*	Declared	Env. threat**	Control method	Timing
<b>African Boxthorn</b>	<i>Lycium ferocissimum</i>	Yes	Yes	4	Mechanically remove large shrubs and cut and swab stumps. Spot spray or cut and swab small plants. Monitor for and control re-growth from plants for minimum two years.	June - October (optimal but all year if actively growing)
<b>Ice Plant</b>	<i>Mesembryanthemum</i> spp.			2	Handpull or grub out	All year
<b>Olive (feral)</b>	<i>Olea europaea</i> ssp. <i>europaea</i>		Yes	4	Cut and swab small and larger plants; medium-sized trees may be drilled and filled. Monitor cut stumps for re-growth and spot spray if required. Control will be on-going due to abundance of this species in local area	July - October (optimal but all year if actively growing)
<b>Prickly Pear</b>	<i>Opuntia</i> sp.	Yes	Yes	2	Manual removal of plant (including all fragments) and bury > 1 metres deep or dispose of appropriately; or spot spray, or stem injection; biological controls are being trialled. Take care not to spread via vegetative parts stuck to tyres or boots.	Spray only when plants are healthy and not stressed
<b>Soursob</b>	<i>Oxalis pes-caprae</i>			3	Spot spray for revegetation projects or isolated plants	Winter
<b>Lippia</b>	<i>Phyla canescens</i>			2	Spot spray after rain or while soil is moist, at flowering. Take care not to spread seed or vegetative parts on shoes or tyres.	Spring to Summer

Common name	Scientific name	WoNS*	Declared	Env. threat**	Control method	Timing
<b>Rice Millet</b>	<i>Piptatherum miliaceum</i>			2	Where access is suitable, slash any time then spray re-growth in mid-spring to mid-summer, otherwise spot spray active growth.	Spring to Summer
<b>Castor Oil Plant</b>	<i>Ricinus communis</i>			2	Slash mature plants to prevent seed set where site conditions are suitable. Spot spray re-growth or small plants with non-selective herbicide. Cut and swab may also be used. Refer NSW WeedWise. Note poisonous: wear protective clothing.	When actively growing
<b>Black Locust</b>	<i>Robinia pseudoacacia</i>			NA	Cut trees close to ground and immediately apply herbicide to stump. Monitor for and spot spray any re-growth. Control while actively growing (e.g. late Spring to early Summer	November to January
<b>Dog Rose/ Briar</b>	<i>Rosa</i> sp.		Yes	3	Cut and swab mature plants ideally before seed set; spot spray re-growth and seedling	October to January
<b>Blackberry</b>	<i>Rubus fruticosus</i>	Yes		5	Cut and swab; slash and spray re-growth; spot spray or grub out seedlings and re-growth	November to April

Common name	Scientific name	WoNS*	Declared	Env. threat**	Control method	Timing
<b>Pepper-tree</b>	<i>Schinus molle</i>			2	Cut and swab; medium-sized trees may be drilled and filled. Monitor cut stumps for re-growth and spot spray if required.	Any time when actively growing
<b>African Daisy</b>	<i>Senecio pterophorus</i>			3	Handpull small plants or spot spray	October - February
<b>Silver-leaf Nightshade</b>	<i>Solanum elaeagnifolium</i>	Yes	Yes	2	Spot spray or grub out.	Spring to Autumn
<b>Tall Wheat-grass</b>	<i>Thinopyrum elongatum</i>			3	Slash any time then spray re-growth in mid-spring to mid-summer,	October to January
<b>Caltrop</b>	<i>Tribulus terrestris</i>		Yes	2	Spot spray prior to seed set. Ensure seed not spread on shoes and tyres.	September to April
<b>Watsonia</b>	<i>Watsonia</i> sp.		Yes	2	Grub out bulb ensuring new bulbs are removed or spot spray or wipe herbicide on to leaves.	July to October
<b>Noogoora Burr</b>	<i>Xanthium strumarium</i>		Yes	NA	Spot spray when actively growing, before flower and burr formation	October to January

\*WoNS = Weeds of National Significance

\*\*Env. threat = ratings are 1 (lowest) to 5 (highest) environmental weed threat for Southern Mt Lofty Ranges and Northern and Yorke (Bushland Assessment Manual Appendix 11 Weed Threat Ratings).



## Appendix 2: Fauna surveys summary

As part of the Gawler River Restoration Guide the following fauna surveys were conducted:

Carpenter, G. (2023). *Lower Gawler River Bird Survey*.

Stolarski, A. M. P. (2024). *Rapid Invertebrate Assessment of the Gawler River Survey Areas*. Report prepared for Green Adelaide.

Kent, H., & Tibby, M. (2024). *Gawler River Reptile Survey*. Amended report.

These surveys have provided valuable insights into the current state of biodiversity and offer essential guidelines for effective revegetation projects. The key findings are summarised in this appendix.

### Bird survey insights – summary

#### Habitat diversity and its importance

The survey area extends along the Gawler River downstream from Hillier to the coast, including adjacent floodplains between Angle Vale–McEvoy Roads to the south and Two Wells–Gawler River and Port Gawler Roads to the north. This includes the township areas of Two Wells, Angle Vale, and Lewiston. Coastal habitats (including Buckland Park Lake and Port Gawler) have been excluded, as these have been well documented elsewhere (e.g., Condon 1935; Condon & Rix 1936; Paton et al. 2001; Day 2005). However, the woodland habitat around Buckland Park Homestead is included.

Bird surveys were undertaken on eleven properties selected by Green Adelaide during November–December 2023. No nocturnal birds were surveyed.

The field surveys recorded a total of 90 bird species, including 85 from the 11 selected properties. The list includes 7 introduced species and 31 waterbirds. Species recorded at the most properties were: Magpie-lark (11 properties), Red-rumped Parrot (10), White-plumed Honeyeater (10), Crested Pigeon (9), Spotted Dove (9), Willie Wagtail (9), Common Starling (9), and Common Blackbird (9). Records of an additional 90 species have been sourced from the region. Of these, 36 are recent (within the last 20 years) and could still be expected to occur in the survey area.

It is clear that the Gawler River study area once supported an impressive diversity of birdlife, largely due to the range of habitats—from permanent and temporary wetlands, River Red Gum and other woodlands, to open grass plains. Additionally, drier mallee habitats and dunes extend into the region from the north, supporting mallee specialists and species pairs (vicariants) such as Noisy and Yellow-throated Miners. Hybrids have also been collected at Two Wells. As evident from the list of common species, introduced birds—particularly Common Starling, Common Blackbird, House Sparrow, Spotted Dove, and Rock Dove—are abundant in the study area.

In contrast, the near-total clearance of adjacent box woodlands, mallee, shrublands, and native grasslands has severely impacted much of the region's bird fauna. Small areas that have been replanted (e.g., Bakers Ford) are yet to be used by woodland specialists, likely because they are too limited in extent—most woodland birds have home ranges of several hectares.

## Significant species

The field survey located four species listed as rare or threatened in SA, namely Australasian Darter (rare), Peregrine Falcon (rare), Elegant Parrot (rare) and Crested Shrike-tit (rare).

Additional species of significance that have been reported from the survey area, many based on early specimens, include Malleefowl, Pink Cockatoo, Plains-wanderer, Australian Bustard, Regent Honeyeater, Striped Honeyeater, Letter-winged Kite, Swift Parrot, Painted Buttonquail, White-bellied Cuckoo-shrike, Black-chinned Honeyeater, Black Falcon, Brown Quail, Bush Stone-curlew, Flame Robin, Gilbert's Whistler, Grey Falcon, Olive-backed Oriole, Yellow-tailed Black Cockatoo.

It is likely that a range of other conservation-listed birds once inhabited the region, but unfortunately these have not been documented or supported by specimens. These would have included Diamond Firetail, Southern Whiteface, Hooded Robin, Brown Treecreeper and White-winged Chough. Most of these still occur in the more vegetated areas east of Gawler, so could potentially recolonise if sufficient habitat was re-established.

## Other locally significant bird populations located during the survey

- **Zebra Finch** – Small colonies were observed at Lewiston Wetlands (south) and Wingate Wetlands sites, in native grassy areas with scattered shrubs such as Kangaroo Thorn and Sennas, which provide shelter and nesting habitat. This species has declined extensively in the Adelaide area over the past 30 years, making the study area an important refuge.
- **Dusky Woodswallow** and **White-browed Babbler** – Small populations occur on the margins of the study area, particularly at the Two Wells Golf Course.
- **Laughing Kookaburra** – A scattered population inhabits riverine woodlands throughout the survey area, where large tree hollows offer suitable nesting sites.
- **Peaceful Dove** – Widespread in small numbers upstream of Port Wakefield Road. Areas of bare ground, such as those around orchards, provide feeding habitat.
- **White-winged Fairywren** – Confined to lignum and cottonbush shrublands downstream of Port

Wakefield Road. Introduced African Boxthorns are also used for shelter, especially in areas with low shrub density. These birds occur in groups of up to 10–20 individuals, ranging over a few hectares. The species avoids wooded areas and is disadvantaged by the planting of trees and larger shrubs.

- **Superb Fairywren** – Small groups were found at scattered sites with a higher density of taller shrubs. The **Variiegated (Purple-backed) Fairywren** was also recorded in drier parts of the survey area (e.g., Two Wells Golf Course), but may now be locally extinct.
- **Sacred Kingfisher** – Several breeding pairs were observed along the Gawler River, nesting in hollows of River Red Gums. Their diet consists mainly of insects and small reptiles. During autumn and winter, they disperse to coastal mangroves and beyond.
- **Rainbow Bee-eater** – Sandy banks along the river and in numerous quarries within the study area are visited each spring–summer by small numbers of bee-eaters for nesting.

## Management issues and actions

Due to the extent of habitat clearance and degradation of remaining remnants, it is difficult to recommend effective management actions to benefit existing rare or threatened species, as further declines are likely inevitable. A key priority is to maintain the health of River Red Gums along the entire Gawler River to preserve its value as a habitat corridor.

## Suggested management actions (in no particular order) include:

1. Maintain seasonal water flows along the Gawler River – to support the health of River Red Gum woodlands and associated wetlands, and to provide water for Buckland Park Lake.
2. Increase the area of reserved and revegetated land – relatively large areas of River Red Gum and box woodland remain at Buckland Park. Where possible, reserved areas away from the river should be linked to the river via vegetated corridors.
3. Discourage the increase in Noisy Miner populations – Noisy Miners are known to establish colonies in semi-urban areas and aggressively exclude smaller bird species. Small populations already exist in the study area, particularly where trees and watered lawns are present (e.g., Dawkins Reserve near

Angle Vale). The expansion of suburban land use and associated lawns will likely increase Noisy Miner numbers, to the detriment of other birds. Future planning should ideally quarantine areas near the river for horticultural purposes, similar to the approach used in the McLaren Vale district.

4. Avoid tree and tall shrub planting within existing lignum/chenopod shrublands – to preserve habitat for the remnant population of White-winged Fairywrens.
5. Minimise physical disturbance to patches of remnant grassland – to prevent colonisation by more vigorous introduced species. Mowing is encouraged as a management tool.
6. Reduce or prevent the entry of pollutants into the river – council hard rubbish and toxic waste collection days may assist in reducing pollution.
7. Reduce cover of mid-storey perennial weeds along the river corridor – sites with dense mid-storey weed cover had lower diversity of woodland birds and higher numbers of introduced species such as Common Blackbirds and Spotted Doves. Notably, scattered African Boxthorns are used by White-winged Fairywrens in the lower reaches of the study area. This should be considered during weed control efforts, and dead or treated plants could be retained in situ.

## Invertebrate survey insights – summary

### Survey methods and diversity

The survey results of terrestrial invertebrates of the Gawler River survey areas are presented. Five key sites were chosen based on their habitat types; end of natural River corridor; artificial wetland system adjoining the river system; narrow section of altered remnant riverine system abutting farmland; remnant Black Box flood out channel and an artificial wetland system adjoining the river system. These areas were investigated for terrestrial invertebrate diversity and abundance.

It is important to note that this survey does not represent a complete range of taxa present within study areas, however it does capture a large proportion of species and allows for species analysis. Nocturnal and aquatic surveys were not undertaken. Monthly site surveys were conducted over a six-month period from October

2023 to March 2024 with additional visits targeting species of conservation significance. The two main collection methods of colour attracting pots and sweep nets are highly biased towards flying and foliar dwelling invertebrates and therefore reflect the results.

A combined total of 605 unique species were identified across all sites. Invertebrate species richness was found associated with specific habitats and associated plant diversity. The surveys provide baseline data of the species present within the varied habitats and allows for future surveys and comparisons to be undertaken.

The insects collected represent the following Orders:

- Blattodea (cockroaches, termites)
- Coleoptera (beetles, weevils)
- Dermaptera (earwigs)
- Diptera (flies, mosquitoes, midges)
- Ephemeroptera (mayflies)
- Hemiptera (bugs, cicadas, plant/leaf-hoppers)
- Hymenoptera (ants, wasps)
- Lepidoptera (moths, butterflies)
- Mantodea (mantids)
- Neuroptera (lacewings, mantis, antlions)
- Odonata (dragonflies, damselflies)
- Orthoptera (crickets, grasshoppers, katydids)
- Phasmida (stick insects)
- Trichoptera (caddisflies)

Coleoptera, Diptera, Hymenoptera and Hemiptera orders make up most of species richness across all survey areas.

### Habitat requirements

Grassland invertebrates depend on the plant diversity within these systems, which largely determines the species present. These habitats are important for many rarely encountered or uncommon invertebrate species, such as the Mottled Grass Skipper Butterfly, a species of local conservation significance that relies on both native and introduced grasses as larval host plants. It is important that these grassland systems are retained and not altered by the planting of trees and shrubs, which often occurs during revegetation efforts.

Wetland systems—whether natural or artificial—provide suitable habitat for many aquatic and riparian zone-dependent invertebrate species. These invertebrates are often highly habitat-specific and may be entirely

reliant on wetland conditions. Many species in the orders Coleoptera, Diptera, Ephemeroptera, Odonata, and Trichoptera have aquatic larvae and terrestrial adults. For example, *Eurispa albipennis* (Coleoptera) was found associated with *Juncus* species, with both adults and larvae present. This small beetle from the Chrysomelidae family is rarely observed and appears to be dependent on wetland systems.

Woodland systems, such as those at Lewiston Wetlands, form a unique habitat comprising a remnant *Eucalyptus largiflorens* flood-out channel and surrounding lifestyle properties. This habitat influences the dominant invertebrate species found, despite limited connectivity to the riverine system. *Paracephala pistacina* (Buprestidae – Coleoptera), a jewel beetle and grass specialist (associated with *Austrostipa*), was recorded here and represents an outlier population within South Australia. The closest known populations are at Burra and Swan Reach, making the Lewiston Wetlands a significant record.

## Management

### Invertebrate habitat management and recovery

Invertebrate habitat management and recovery is a complex process, often requiring consideration of multiple factors. The habitat requirements of individual species or families are highly varied and can sometimes conflict with broader management strategies (A. Stolarski, pers. comm.). Given these challenges, general habitat management approaches often provide balanced outcomes that meet the needs of most species.

Understanding the basic requirements of species of conservation significance and their associated habitats allows for the implementation of targeted management strategies. This typically involves a

minimal-intervention approach, focusing on preserving habitat connectivity and establishing buffer zones where possible (A. Stolarski, pers. comm.).

Vegetation management at sites is critical for supporting invertebrate habitats. Activities such as grass slashing, weed removal, tree pruning, dead wood retention, and water flow management all influence species outcomes. Each site often represents a unique habitat and requires an individual approach to management. However, broadly applied, simple management steps can help support thriving invertebrate populations. These include:

- Allowing for greater height retention when mowing grass
- Retaining unmown grass areas to create habitat islands
- Maintaining grass cover around the bases of shrubs and trees
- Retaining dead vegetation, especially fallen timber
- Preserving water flows where possible
- Retaining nectaring weed species where necessary

A number of invertebrates are dependent on exotic plant species for survival and this must be taken into consideration when undertaking site remediation works.



## Reptile survey insights – summary

### Survey methods and diversity

Table 11: Pre-existing records in the Atlas of Living Australia were reviewed to exclude inaccuracies, leaving 246 reptile records and 129 amphibian records within Gawler River survey area

Species	Common name	Total records
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	47
<i>Crinia signifera</i>	Common Froglet	45
<i>Hemiernis decresiensis</i>	Three-Toed Earless Skink	35
<i>Hemiernis peronii</i>	Four-Toed earless Skink	25
<i>Pogona barbata</i>	Eastern Beard Dragon	24
<i>Limnodynastes dumerilii</i>	Banjo Frog/Pobblebonk	19
<i>Pseudonaja textilis</i>	Eastern Brown Snake	18
<i>Christinus marmoratus</i>	Marbled Gecko	18
<i>Lerista bougainvillii</i>	Bougainville's Slider	18
<i>Tiliqua rugosa</i>	Sleepy Lizard	17
<i>Neobatrachus pictus</i>	Painted Burrowing Frog	16
<i>Cryptoblepharus pannosus</i>	Ragged Snake-Eye Skink	15
<i>Varanus gouldii</i>	Sand Goanna	13
<i>Tiliqua scincoides</i>	Eastern Blue tongue Lizard	13
<i>Menetia greyii</i>	Dwarf Skink	12
<i>Pseudemoia entrecasteauxii</i>	Southern Grass Skink	5
<i>Aprasia striolata</i>	Lined Worm Lizard	5
<i>Lampropholis guichenoti</i>	Garden Skink	4
<i>Tympanocryptis petersi</i>	Peter's Earless Dragon	4
<i>Morethia adelaidensis</i>	Saltbush Morethia	4
<i>Anilius bituberculatus</i>	Prong-Snouted Blind Snake	3
<i>Lerista dorsalis</i>	Southern Slider	2
<i>Delma mollerii</i>	Gulf Delma	2
<i>Pseudechis porphyriacus</i>	Red-Bellied Black Snake	2
<i>Ctenotus orientalis</i>	Oriental Ctenotus	2
<i>Tiliqua occipitalis</i>	Western Blue Tongue Lizard	1
<i>Anilius bicolor</i>	Dark Spined Blind Snake	1
<i>Suta spectabilis</i>	Spectacled Hooded Snake	1
<i>Strophurus intermedius</i>	Southern Spiny-Tailed Gecko	1
<i>Litoria calliscelis</i>	South Australian Tree Frog	1
<i>Litoria peronii</i>	Peron's Tree Frog	1

## Species survey results

111 reptiles were observed during the January survey period, across 11 sites. This consisted of 16 confirmed species:

- 46 Garden Skinks – *Lampropholis guichenoti*
- 4 Four-toed Earless Skinks – *Hemierngjs peronii*
- 9 Three-toed Earless Skinks – *Hemierngjs decessiensis*
- 1 *Hemierngjs* sp.
- 3 Eastern Bearded Dragons – *Pogona barbata*
- 5 Eastern Brown Snakes – *Pseudonaja textilis*
- 3 Sleepy Lizards – *Tiliqua rugosa*
- 3 Dwarf Skinks – *Menetia greyii*
- 1 Bougainville’s Slider – *Lerista bougainvillii*
- 2 *Lerista* sp.
- 2 Eastern Blue-tongue Lizards – *Tiliqua scincoides*
- 2 Ragged Snake-eyed Skinks – *Cryptoblepharus panossus*
- 3 Boulenger’s Snake-eyed Skinks – *Morethia boulengeri*
- 3 *Morethia* sp.
- 2 Marbled Geckos – *Christinus marmoratus*
- 10 Common Froglets – *Crinia signifera*
- 9 Spotted Marsh Frogs – *Limnodynastes tasmaniensis*
- 3 Southern Spiny-tailed Geckos – *Strophurus intermedius*  
(Observed at Port Gawler during the survey period but not officially surveyed as part of this project)

## Limitations

Due to time constraints, all surveys were conducted in January, which likely influenced the number of reptiles observed across the survey sites. High daytime temperatures, reaching the low to mid-30s (°C), are generally too hot for most reptiles to remain active, as they typically retreat into deep soil cracks or dense vegetation to avoid heat stress.

For example, cool-climate species such as the Red-bellied Black Snake (*Pseudechis porphyriacus*) are less active during hot conditions, which may explain their absence in this survey. Conducting reptile surveys in spring would likely increase the chances of detecting such species.

## Habitat complexity and requirements

The most interesting species observed on a Carmelo Road parcel was the presence of both Three-toed Earless Skinks (*Hemiergis decresiensis*) and Four-toed Earless Skinks (*Hemiergis peronii*). Not only were both species present in the area, but they were also found using the same shelter sites. Generally, in the Adelaide region, these two species don't interact—*H. peronii* typically prefers warmer, drier regions, while *H. decresiensis* is more restricted to cooler, wetter climates such as the Adelaide Hills, eastern suburbs, and along the River Torrens / Karrawirra Parri. This suggests that the Gawler River may act as a corridor, allowing cooler-climate species to extend into drier environments. The floodplains and wetlands along the western extent of the river appear to support *H. decresiensis* further from the river's edge.

Another notable observation on the parcel was the abundance of ground cover shelter sites, including large fallen tree limbs, stumps, wooden pallets, and rocks. Although rocks were limited, Bougainville's Slider (*Lerista bougainvillii*) was mostly found using them as preferred shelter. Woody debris was generally favoured by both *Hemiergis* species, as well as by Eastern Bearded Dragons (*Pogona barbata*) and Eastern Blue-tongue Lizards (*Tiliqua scincoides*). The blue-tongue was observed using a large remnant wooden log, while the bearded dragon was found sheltering under a wooden pallet.

The samphire flats on the parcel also appear ideal for several species observed during the surveys. Species such as the Southern Spiny-tailed Gecko (*Strophurus intermedius*), Mallee Black-headed Snake (*Suta spectabilis*), Western Blue-tongue (*Tiliqua occipitalis*), and Peter's Earless Dragon (*Tympanocryptis petersi*) all occur in nearly identical habitats north of the river but have not been seen south of the river in decades—except for *T. petersi*, which was rediscovered in 2023 after last being recorded in 1979. The land size may not support viable populations, but further, more in-depth surveys are needed to confirm this.

The Lewiston Wetlands parcel shows promise, with large areas of open grasslands, cracking clay soils, and some revegetation. This habitat is ideal for Boulenger's Snake-eyed Skink (*Morethia boulengeri*)

and other small ground-dwelling skinks. It's likely that all *Morethia* individuals observed were *M. boulengeri*, but many disappeared into soil cracks before they could be captured, making it difficult to rule out similar-looking species such as *M. obscura* and *M. adalaidensis*, both of which have been recorded nearby. The main limiting factors for this reserve are the lack of ground cover shelter sites and the density of grass tussocks. While tussock grasses are beneficial for small reptiles, excessive density can restrict movement and foraging opportunities. Additionally, most of the site lacks rocky cover and woody debris.

At Carclew Cemetery, large saltbushes provide excellent basking platforms for dragons while maintaining a cool microclimate underneath, with ample leaf litter for burrowing skinks.

At the Bakers Ford Wetland, the garden skink population survives almost exclusively along the river corridor. These records represent the furthest extent of the species along the corridor—approximately 10 km from the next nearest record. Individuals were found in leaf litter and reeds around the base of large River Red Gums, likely due to the cooler microclimate, reduced direct sunlight, and shelter provided by the litter.

The creek line exhibited a variety of microhabitats, including built-up woody debris, open sunny areas, thick reeds, and dappled sunlight. The upper banks featured open grassy areas, more heavily wooded zones, and old human structures that added environmental complexity and shelter opportunities.

A Sleepy Lizard (*Tiliqua rugosa*) was observed in the creek bed among reeds. This species is resilient to degraded habitats but still requires remnant vegetation, unlike *T. scincoides*, which thrives in urban environments. Due to its lower agility and reproductive rate (1–2 offspring per year), *T. rugosa* is more vulnerable to predation and less commonly seen south of the river, where roadside vegetation is limited in agricultural areas.

At Roediger Road Reserve, bearded dragons were found within the riverbanks rather than on the flats above the creek lines. Both individuals were located higher on the bank than typical water flow levels but still below the top of the banks. They were observed cryptically basking in dappled sunlight near the base of large River Red Gums, rather than in exposed full sun.

At the Wingate Road Wetlands, garden skinks were the most commonly observed skink species. Unlike other sites, they were seen away from the river's edge. The well-established wetland and surrounding wooded area provide a full canopy, creating dappled sunlight across the reserve. Garden skinks were found throughout, especially in areas with retaining rocks near the river and closer to the road. These rocky areas offer excellent shelter and cooler microclimates for thermoregulation. The large boulders also create gaps suitable for larger animals. One Eastern Blue-tongue was observed basking before retreating into a rock wall when disturbed.

Notably absent from these areas were medium-sized skinks such as the Eastern Striped Skink (*Ctenotus robustus*) and Eastern Water Skink (*Eulamprus quoyii*). While *E. quoyii* is common along creek lines in Adelaide, *C. robustus* typically replaces it in drier northern landscapes, occupying a similar ecological niche.

## Key findings

This report has provided the following insights of the diversity and abundance of herpetofauna across the Gawler River region:

- The most commonly observed species recorded in this survey were Garden Skinks. However, there was a noticeable absence of moderately sized skinks, such as *Ctenotus* or *Eulamprus*. The cause of this remains unknown.
- Species like the Garden Skink and Three-toed Earless Skink rely on the river corridor, which offers ample shade, leaf litter, and cooler conditions—essential for survival in the drier climates north of Adelaide.
- Grass tussocks, while important for many local species, must be carefully managed to prevent overcrowding. Excessive tussock density can limit hunting and basking opportunities for many reptiles.
- Surface ground cover—including logs, woody debris piles, rocks, and artificial supplements—is necessary to provide habitat for a range of small and large reptiles.
- Future surveys should be conducted at different times of the year (e.g., winter or spring), and more intensive, site-specific surveys are recommended to detect rarer and more elusive species in the region, such as *Tympanocryptis*.



# Gawler River / Kadlitpari – 10-step restoration planning worksheet

Use alongside the Gawler River/Kadlitpari Restoration Guide. To allow for more input, we recommend downloading this or creating your own document using these headings. Create a property map to mark and name sites, calculate area sizes, and identify nearby features that may impact or support restoration plans.

---

Site / Project name

---

Location (GPS / address)

---

Land manager / contact

---

Timeline

---

## Read this before starting steps then check them off as you work through the steps

- Pick your site** – choose the best condition patch that’s worth investing in.
- Decide what work is needed** – preserve, improve, replant, or a mix.
- Walk the site** – note key natives, weeds, water flow, and access.
- Check for any approvals and legal requirements** – especially, weeds, water, and soil disturbance.
- Talk with Kaurna reps early** – especially before digging or machinery use.
- Set a simple goal** – what you want the site to look like in a few years.
- Choose how plants will return** – natural regrowth, direct seeding, or planting seedlings.
- Plan weed control** – decide what to remove now, later, or leave as temporary habitat.
- Think about wildlife needs** – keep hollows, logs, open grassland areas, and safe shelter.
- Plan how you’ll track progress** – photos, notes, surveys or simple monitoring each year.

## Step 1: Prioritise sites - Refer to: Section 2, pages 12–14

---

List potential restoration sites and highlight those in good condition (larger; near high-quality native habitat; remnant vegetation present).

---

---

**Prioritise sites or feature** of sites using Fig 4 on p. 14. Protect threatened species, generally focus on improving your biggest and best site(s).

---

---

**Notes & decisions:**

---

---

## **Step 2: Select a restoration approach - Refer to: Section 2, page 15**

---

**Select the restoration approach(es)** that suit your site(s). Note if your site(s) should be Preserved, Improved, Reconstructed or elements of each.

---

---

**Consider legislative requirements** – this refers to Aboriginal Heritage, water affecting activities, weed management, etc. (covered in Step 9)

---

---

**Notes & decisions:**

---

### Step 3: Assess your sites - Refer to: Section 2, p. 16–19, Section 3, p. 28-35, Section 4 p. # depends on veg community

Identify vegetation communities present (Map 2 p. 40; Section 4 p. 42–103). Set Objectives, Goals, and Targets (p. 16)

Site 1

Objective(s)

Site 2:

Goal(s)

Site 3:

Target(s)

Using lists in Section 4, guidebooks and apps like iNaturalist, **list native plants you have**. Note the abundance of each species?

**List weeds** and **note wildlife** using them as substitute **habitat**; consider staged removal of weeds (Section 3 p. 28–35; Appendix 1, p. 126).

How does **water** move across your site(s)? Consider: river/stream flow, surface runoff, ground water recharge, levees, erosion (p. 19, 107-109)

Record **practical considerations**: access, neighbour cooperation, reliable water for planting, disposal of weeds/litter, levees (p. 19).

**Notes & decisions:**

## Step 4: Speak with Kurna representatives - Refer to: Section 2, p. 20

For major ground-disturbing works i.e. any work beyond hand-pulling weeds, within 500 m of the river, **organise a cultural heritage assessment**. List & tick where appropriate:

- |                                     |                            |                                     |
|-------------------------------------|----------------------------|-------------------------------------|
| <input checked="" type="checkbox"/> | Track building for access  | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | River, creek, wetland work | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | Holes for tube stock       | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | Ripping woody weeds        | <input checked="" type="checkbox"/> |

What alternatives are there to ground-disturbing works? Refer to figure 20 p. 35 for weed control options.

Has your site already had an Aboriginal Heritage assessment? If so, when?

How can the site be **co-managed** (e.g., cultural burning; monitoring, maintenance).



**Choose a Vegetation Target** based on what you have and what you can invest. List the services (e.g. surveys), time and other resources required to meet the standard each year.

Basic	Advanced

**Notes & decisions:**

Basic Vegetation Target

Advanced Vegetation Target

## Step 6: Establishing and supporting native vegetation - Refer to: Section 2, p. 22–23

This guide outlines **three main ways** to establish native vegetation (see right). Often, planting trees or shrubs isn't necessary to meet Vegetation Targets.

<input checked="" type="checkbox"/> Natural regeneration	<i>If a site has some native plants, help regrowth with site management instead of planting.</i>
<input checked="" type="checkbox"/> Revegetation - direct seeding	<i>For large, disturbed sites, machine seeding is effective but disturbs soil, so check with Kaurna to avoid impacting Culturally sensitive sites.</i>
<input checked="" type="checkbox"/> Revegetation - planting seedlings	<i>If revegetation is needed, planting local native seedlings works best at most Gawler River sites.</i>

**Preparation is important.** Choose the suitable way(s) above and check the preparation and care steps for your site (see right).

<input checked="" type="checkbox"/> Create a target species/ plant density list.	<input checked="" type="checkbox"/> Clear woody and/ or invasive weeds	<input checked="" type="checkbox"/> Guard seedlings (natural or planted)
<input checked="" type="checkbox"/> Source local provenance seedlings	<input checked="" type="checkbox"/> Install fencing to exclude stock	<input checked="" type="checkbox"/> Dig seedling bowls
<input checked="" type="checkbox"/> Arrange cultural heritage assessment	<input checked="" type="checkbox"/> Protect native habitat(s)	<input checked="" type="checkbox"/> Create watering plan if needed (2-3 yr)

---

Follow the **timing schedule** (p. 23), consider key actions for year-before, year-of and year-after actions.  
*Calendar on final page.*

---

*Year before:*

*Year of:*

*Year after:*

---

**Notes & decisions:**

---

---

## **Step 7: Consider wildlife and future development**

### **- Refer to: Section 2, p. 24**

---

Refer to the site assessment (Step 3) and consider how the site **can affect water movement** or how it is being used by **native species**.

---

**Retain/provide habitat features:** hollows, fallen timber, basking areas; maintain open grasslands (no trees) for raptors and fairy-wrens.

---

---

Apply Water/Biodiversity Sensitive Urban Design (WSUD and BSUD).

---

---

**Notes & decisions:**

---

---

## Step 8: Plan to monitor your progress - Refer to: Section 2, p. 25

---

How will you **monitor the success** of your work? Use photo-points for small projects; recognised methods for larger or advanced targets.

---

---

Set **monitoring frequency and responsibilities**; engage ecologists as needed.

---

---

**Notes & decisions:**

---

## Step 9: Consider your legal responsibilities - Refer to: Section 2, p. 26

**Identify approvals/permits** likely required: Aboriginal Heritage Act; PDIA; Landscape SA water affecting activities; Biodiversity Act (transition).

**Notes & decisions:**

## Step 10: Use the restoration checklist - Refer to: Section 2, p. 27 (Checklist)

Confirm vegetation community (Section 4 pages) and set restoration goals and targets

List key stakeholders and various Kaurna engagement methods.

---

Summarise your site assessment: key features, key native species, soil type, major weeds, habitat use, and water movement.

---

---

Explain the planned work in simple words

---

---

Outline how the site will be surveyed and monitored.

---

---

List the required or suspected permits and legislative requirements

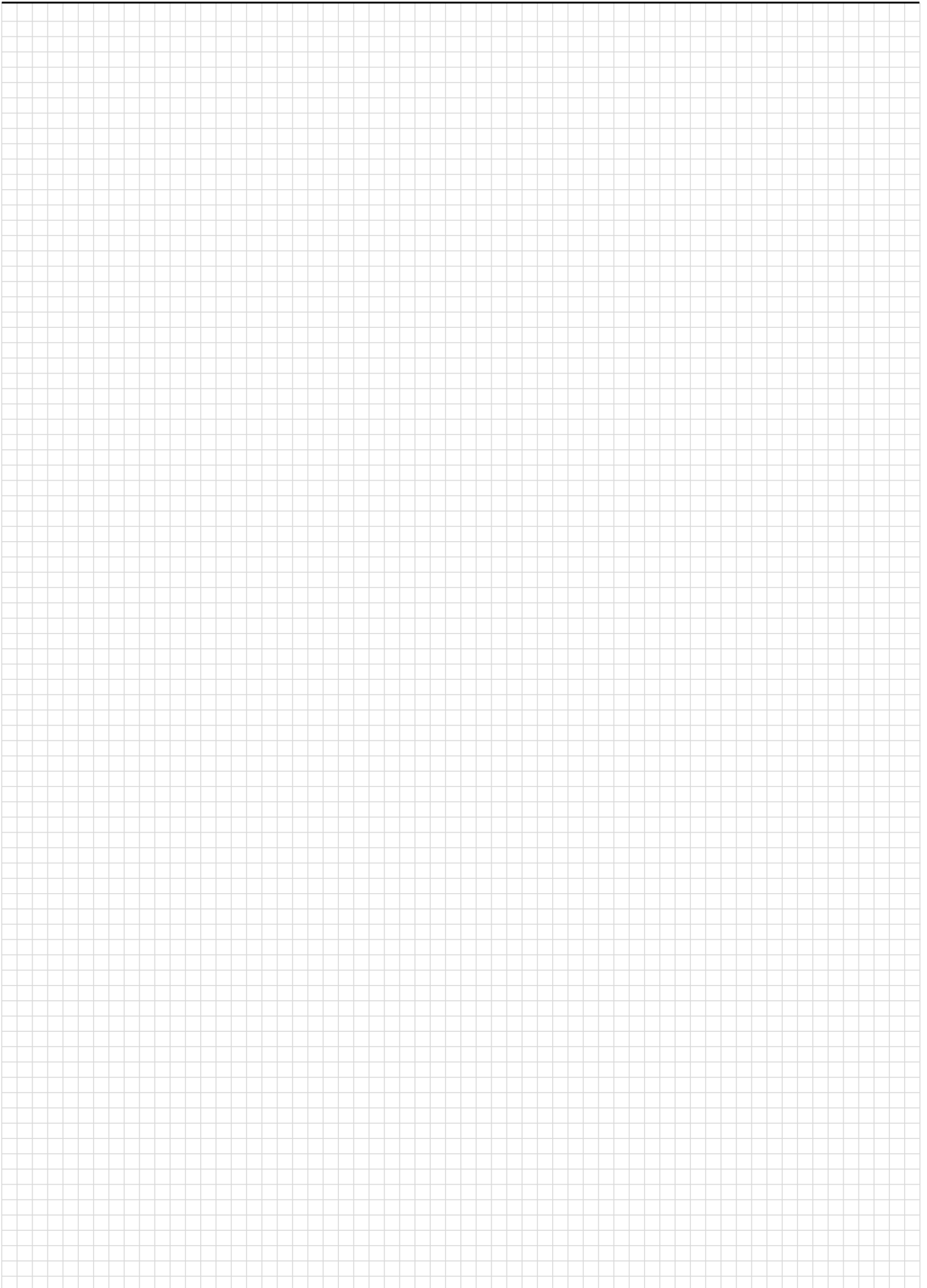
---



---

Sketch /workspace

---



## Plan your site restoration activities over 4 years

Activity		Prep	Y1	Y2	Y3
Jan		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Feb		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Mar		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Apr		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
May		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Jun		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓

Activity		Prep	Y1	Y2	Y3
Jul		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Aug		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Sep		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Oct		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Nov		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓
Dec		✓	✓	✓	✓
		✓	✓	✓	✓
		✓	✓	✓	✓



With the exception of the Piping Shrike emblem, and other material or devices protected by Aboriginal rights or a trademark, and subject to review by the Government of South Australia at all times, the content of this document is licensed under the Creative Commons Attribution 4.0 Licence. All other rights are reserved.

Disclaimer: The Green Adelaide Board and the Government of South Australia, their employees and their servants do not warrant or make any representation regarding the use or results of use of the information contained herein as to its correctness, accuracy, currency or otherwise. The Green Adelaide Board and the Government of South Australia, their employees and their servants expressly disclaim all liability or responsibility to any person using the information or advice contained herein.

© Crown in right of the State of South Australia  
2026 | FIS 1050490

The logo for Green Adelaide, featuring the words 'GREEN' and 'ADELAIDE' in a bold, white, sans-serif font. A stylized white leaf icon is positioned between the 'A' and 'E' of 'ADELAIDE'.