ebs ecology

Dry Creek Corridor

Biodiversity Plan 2021

8 June 2021

Version 8

Prepared by EBS Ecology for City of Tea Tree Gully

Document Control					
Revision No.	Date issued	Authors	Reviewed by	Date Reviewed	Revision type
1	14/04/2021	Jessica Skewes	Sabine Koolen, Michael Sneyd	19/04/2021	Draft
2	20/04/2021	Jessica Skewes	Sabine Koolen, CTTG, Green Adelaide	20/04/2021 – 30/04/2021	Draft
3	6/05/2021	Jessica Skewes	Sabine Koolen	10/05/2021	Draft
4	14/05/2021	Jessica Skewes	Chris Gibson	13/05/2021	Draft
5	26/05/2021	Jessica Skewes	Sabine Koolen	30/05/2021	Draft
6	31/05/2021	Jessica Skewes	Sabine Koolen	7/06/2021	Draft
7	24/06/2021	Jessica Skewes			Final

Distribution of Copies			
Revision No.	Date issued	Media	Issued to
1	14/04/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
2	20/04/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
3	6/05/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
4	21/05/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
5	26/05/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
6	31/05/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
7	08/06/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully
8 (Final)	24/06/2021	Electronic	Sabine Koolen City of City of Tea Tree Gully

EBS Ecology Project Number: EX201201

CITATION: EBS Ecology (2021) Dry Creek Corridor Biodiversity Plan 2021. Report to City of Tea Tree Gully. EBS Ecology, Adelaide.

Cover photograph: Druminor Lake at Druminor Reserve within the Dry Creek Corridor Concept Plan Project Area.

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ACKNOWLEDGMENTS

EBS Ecology and The City of Tea Tree Gully would like to acknowledge and pay our respects to the Kaurna Peoples and recognise their Native Title Rights to Country. We recognise the deep spiritual connection and relationship the Kaurna Peoples have to Country and we respect and value their past, present, and ongoing connection to the land and cultural beliefs.

GLOSSARY AND ABBREVIATION OF TERMS

AECR	Aquatic Ecosystem Condition Report
AMLR	Adelaide and Mount Lofty Ranges
BDBSA	Biological Database of South Australia (managed by DEW)
BCCM	Bushland Condition Monitoring Manual
CTTG	City of Tea Tree Gully
DEW	Department for Environment and Water
EBS Ecology	Environmental and Biodiversity Services Pty Ltd – trading as EBS Ecology
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ha	Hectares
IBRA	Interim Biodiversity Regionalisation for Australia, version 7
iNaturalist	Citizen science initiative available as a smart phone application (app) with which species sightings can be recorded. App can be used as a tool to collect information for specific projects or defined areas and as an educational initiative for community engagement.
km	Kilometres
LGA	Local Government Area
LMR	Land Management Region
m	Metres
SAMDB	South Australia Murray Darling Basin
MNES	Matters of National Environmental Significance
Modbury Precinct	Area of CTTG classed as Modbury Precinct, incorporating parts of Modbury, Modbury North, Ridgehaven and St Agnes (Appendix 1 for map).
NCSSA	Nature Conservation Society of South Australia
NPW Act	*National Parks and Wildlife Act 1972*
NRM	Natural Resource Management
NSW	New South Wales
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool

Project Area	Encompassing six reserves in the Concept Plan Project Area (Druminor, Oratanga, Fairleigh, Solandra, Edinburgh, Dawson) plus Vaucluse, Valley View and Kingfisher Reserves, to which the Plan and recommendations apply.
SSWFE	Southern and South-western Flatlands East cluster
sp.	Species
spp.	Species (plural)
ssp.	Subspecies
SPRAT	Species Profile and Threats Database
SWMA	Surface water management area
the Concept Plan	Dry Creek Corridor Concept Plan 2020
the Plan	Dry Creek Corridor Biodiversity Plan 2021

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1 INTRODUCTION

The City of Tea Tree Gully (CTTG) obtained a Green Adelaide Biodiversity Sensitive Urban Design Grant to develop a Biodiversity Plan for a stretch of Dry Creek, the Dry Creek Corridor Biodiversity Plan 2021 (hereafter 'the Biodiversity Plan' or 'the Plan').

The Plan first identifies the key assets and threats within the precinct, and then presents recommendations categorised by themes, such as water management, landscape connectivity, wildlife habitat, revegetation, threat management, community and cultural engagement and dedicated projects. These overarching management themes are then further explored in relation to faunal and floral themes identified within the Project Area. The Plan aims to be integrated with the Dry Creek Corridor Concept Plan 2020 (hereafter 'the Concept Plan'), while identifying opportunities for future biodiversity works, and provides an indication of where, when and how a recommendation or project can be implemented.

Any proposed activities in Dry Creek will be managed in accordance with the Council endorsed Green Adelaide's Best Practice Operating Procedure for Water Affecting Activities.

1.1 Objectives and Scope

Ultimately, the Dry Creek Corridor Biodiversity Plan aims to protect and enhance biodiversity, including threatened flora and fauna habitats, in the Section of Dry Creek and two additional reserves, by:

- Fostering partnerships with Kaurna to understand cultural knowledge and connections to Country to assist in realising the objective of this plan. This will include the recommendations from the Integrated Heritage Services (2021) *Short Report – Public Version. City of Tea Tree Gully Biodiversity Plan Aboriginal Cultural Heritage Inspection – Dry Creek* (refer Attachment of Appendices).
- Identifying existing biodiversity assets to protect and improve within the Dry Creek Project Area and City of Tea Tree Gully region.
- Identifying key areas for improvement including for habitat restoration / creation, improved habitat connectivity, weed and threat control.
- Enhancing community awareness and enjoyment of the Dry Creek Project Area recreational spaces, by identifying locations and opportunities for community engagement and citizen science.

The Biodiversity Plan presents opportunities, recommendations and project ideas to achieve these outcomes, which the CTTG can implement when suitable funding opportunities become available, thereby ensuring funding is optimised to create the greatest benefits for biodiversity.

1.2 Project Area

The Dry Creek Project Area in Modbury forms a section of the broader Dry Creek watercourse which extends from the Adelaide Hills to the Barker Inlet. Originating in the hills face escarpment to the north-east of Adelaide, it then flows down to the plains, where it winds through the northern suburbs of Adelaide, and drains into the Gulf St. Vincent via Dry Creek and its tributaries, forming a catchment area of over 100 km^2.

The upstream catchment area comprises steep hills, rural / residential, agricultural, livestock, mining and quarrying, moving into the central catchment of medium density urban residential development, and then flowing out downstream through medium density urban residential areas.

The Project Area itself comprises the Dry Creek Corridor Concept Plan focus area, which includes six reserves between Kelly Road and Milne Road in Modbury, running linearly for over three kilometres along the Dry Creek Corridor, interspersed by major road crossings between reserves, together comprising the largest connected open space within Modbury.

The Dry Creek Corridor Biodiversity Plan Project Area also incorporates three additional reserves - Valley View Reserve and Vaucluse Reserve, the southern extent of Dry Creek in the City of Tea Tree Gully, and Kingfisher Reserve, to the north, comprising an extra 1.8km of Project Area. These reserves were included into the Project Area due to their important existing natural assets and biodiversity input to the greater project area. Additionally, it is likely that they will be subject to increased visitation and pressures associated with the development of the greater Modbury Precinct, and therefore require inclusion in this Plan to protect and enhance their existing biodiversity assets. In total the Project Area covers nearly 6 kilometres and approximately 47 hectares of linear park in the City of Tea Tree Gully.

The reserves in the project area from south to north are:

- Vaucluse Reserve
- Valley View Reserve
- Dawson Reserve
- Edinburgh Reserve
- Solandra Reserve
- Fairleigh Reserve
- Oratanga Reserve;
- Druminor Reserve; and
- Kingfisher Reserve.

All land parcels which form the reserves and creek line, whether under public ownership or otherwise, are under the care and control of the CTTG.

Figure 1. The Dry Creek Corridor Biodiversity Plan Project Area in the context of the City of Tea Tree Gully and surrounding landscape

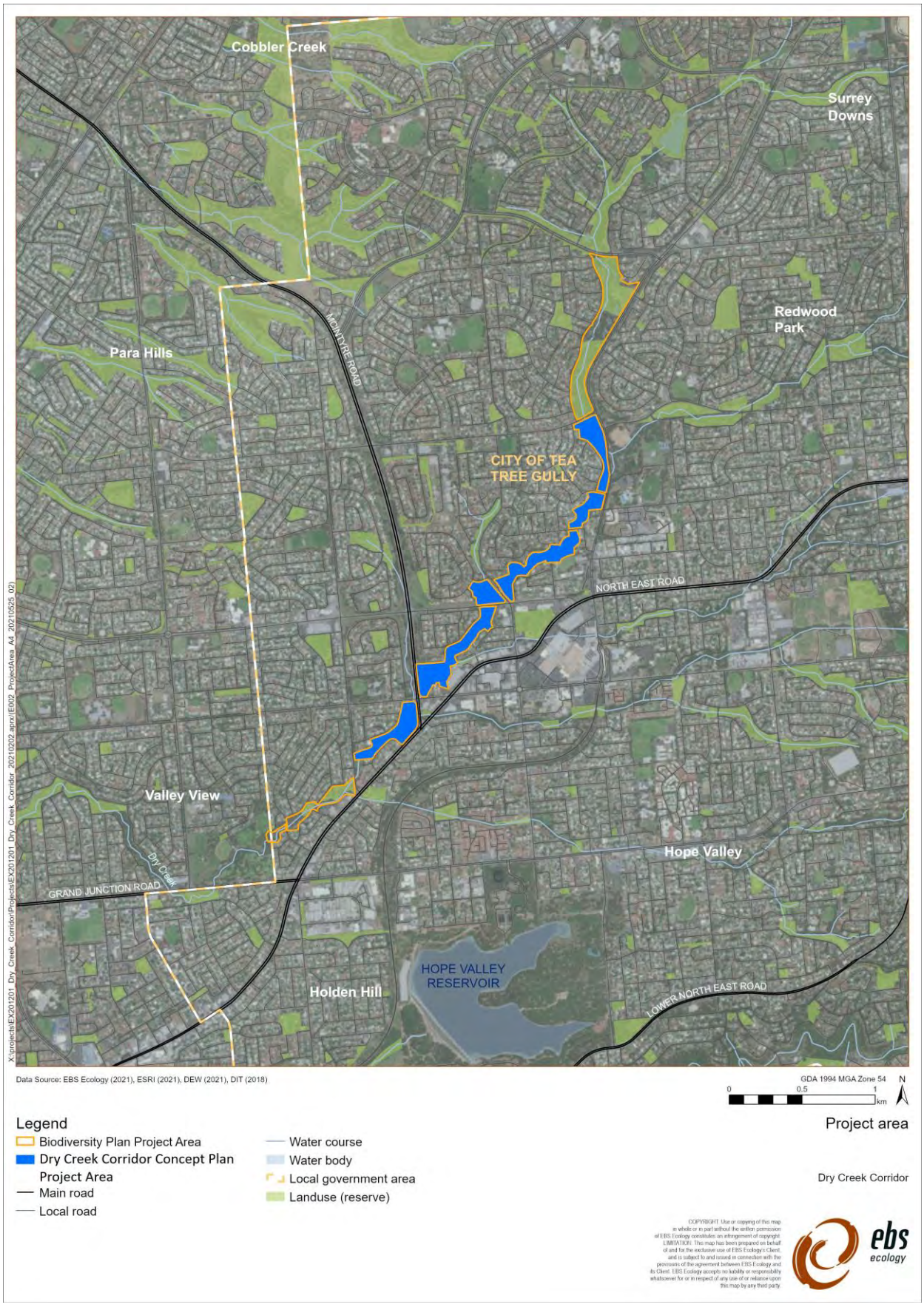
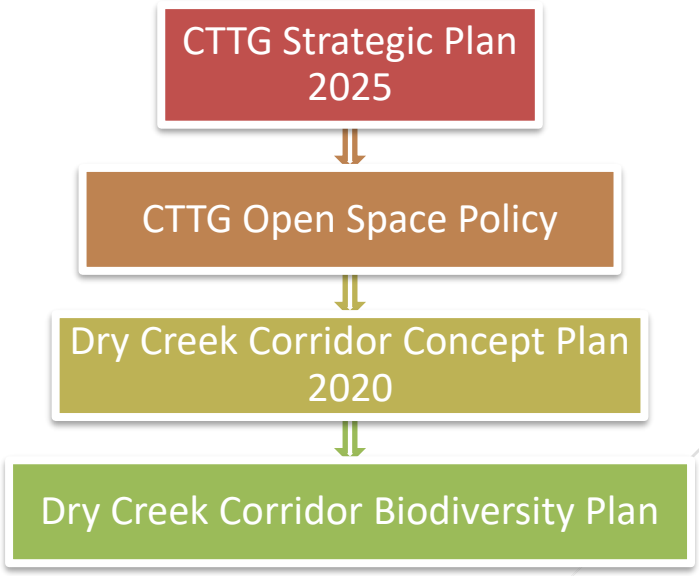


Figure 2. Biodiversity Plan Project Area

2 ALIGNMENT WITH PLANS AND POLICIES

2.1 City of Tea Tree Gully (CTTG) plans and policies



2.1.1 Strategic Plan

The Dry Creek Corridor Biodiversity Plan (the Plan) aligns with the following objectives in Council's Strategic Plan 2025.

Objective	Comments
Community	
People feel a sense of belonging, inclusion and connection with places, spaces and the community	The Plan considers the needs of biodiversity and the community and shall provide positive human-nature interactions and connection to the Dry Creek Corridor
There are opportunities for people to volunteer, give back and share their skills with others	Citizen science and other volunteer opportunities are recommended in the Plan
Environment	
Environmentally valuable places and sites that are flourishing and well cared for	The Plan shall improve the protection and enhancement of biodiversity in the Dry Creek Corridor
We are resilient to climate change and equipped to manage the impact of extreme weather events	Protecting and enhancing native flora and fauna shall mitigate some of the impacts of climate change
Our tree canopy is increasing	Enhancement of biodiversity in the Dry Creek corridor shall help to protect existing trees

	and will include the planting of additional native trees
Economy	
is revitalised as the city's key activity	The Plan shall assist in revitalising the natural values of the Dry Creek corridor within the
Places	
Streets, paths, open spaces and parks are appealing, safe and accessible	Considering the needs of biodiversity and the community shall provide for positive human-nature interactions
Infrastructure and community facilities are fit for purpose, constructed using sustainable practices and well maintained	Considering the needs of community and biodiversity shall ensure the project area is fit for purpose. The Plan informs biodiversity maintenance practices.
Leadership	
Leadership and advocacy is focused on the long term interests of the community	Biodiversity conservation and well-functioning ecosystems is essential for the long term health of the community
Planning considers current and future community needs	The Plan shall be regularly reviewed to consider current and future community needs
Decision making is informed, based on evidence and is consistent	The Plan shall incorporate research and data collection and as such will be built on evidence

2.1.2 Open Space Policy

The Dry Creek Corridor Biodiversity Plan aligns strongly with the Open Space Policy.

The policy states;

> *The City of Tea Tree Gully is committed to protecting and improving biodiversity in open spaces including indigenous flora and fauna and ecological communities that have existed here since before European settlement and will actively work to restore biodiversity to the urban, suburban and rural parts of the City.*

2.1.3 Dry Creek Corridor Concept Plan

The Dry Creek Corridor Biodiversity Plan aligns and adds value to the Concept Plan by building on the expertise of Council staff and further enhancing their knowledge and experience with further evidence-based direction on biodiversity protection and enhancement in the corridor.

Collaboration between Council departments shall see biodiversity well integrated and complimentary of Concept Plan objectives including playgrounds and other infrastructure projects.

2.2 External Plans

2.2.1 Green Adelaide Draft Regional Landscape Plan 2021-2026

Biodiversity and Water Sensitive Urban Design (BSUD, WSUD) are one of seven key priorities for Green Adelaide. Green Adelaide has been a key stakeholder in funding and guiding the development of the Dry Creek Corridor Biodiversity Plan to assist in realising Green Adelaide's vision of a cooler, greener, wilder and climate-resilient city.

2.2.2 Resilient East – Regional Climate Adaptation Project

The Dry Creek Corridor Biodiversity Plan will complement the Resilient East direction by identifying opportunities to support the local ecology to adapt and thrive in an urban setting, while increasing the green infrastructure to address the heat island impact.

2.2.3 Green Adelaide - Best Practice Operating Procedure for Water Affecting Activities

Any proposed activities in Dry Creek will be managed in accordance with the Council endorsed Green Adelaide's Best Practice Operating Procedure for Water Affecting Activities.

3 BACKGROUND INFORMATION

3.1 Green Adelaide Grant

The Biodiversity Sensitive Urban Design (BSUD) Grant was offered by Green Adelaide to CTTG in 2020 with the primary objectives to:

- Reduce the impacts of urbanisation on native flora and fauna
- Expand and improve habitat resources in the urban area
- Contribute to the conservation of South Australian biodiversity; and
- Enhance environmental connections and wellbeing within the community

The BSUD grant identified key criteria required for each successful project, including:

1. Clearly identifies what species/habitats the project is targeting along with why it is being targeted.
2. Has clear project objectives.
3. Demonstrates an understanding of what factors are limiting the distribution or abundance of the species/habitat in the Project Area (e.g. threats, human / wildlife conflict/ barriers, lack of resources) and has identified design measures that are likely to be effective in addressing these factors.
4. Demonstrates well considered ways in which community benefit can be achieved with this project.
5. Explains why the location and scale of the project in relation to the species / habitat is sufficient to produce long term conservation AND community outcomes (i.e. are there particular sectors of the community that will benefit and if so is it located/accessible to them).
6. Shows consideration that any newly created resources are unlikely to create an overabundance of a known pest or impact causing species.
7. Defines how success will be measured.
8. Demonstrates how project learnings will be shared and utilised to improve biodiversity and community outcomes on future projects.
9. Demonstrates integration with other relevant disciplines and organisations (e.g. ecologists, architects, planners, council, NGO's, community experts, universities).
10. Demonstrates partnership with aboriginal communities to identify projects or elements that protect and enhance culturally significant biodiversity values within urban areas to increase connectedness of the community to nature through the eyes of its aboriginal custodians

3.1.1 Biodiversity Sensitive Urban Design

Biodiversity Sensitive Urban Design (BSUD) is an emerging approach to urban biodiversity conservation which aims to implement targeted design features within urban landscapes which provide a net benefit to native species and ecosystems. It differs from typical 'urban greening' in that it is targeted towards

outcomes rather than simply increasing 'green space' for aesthetic improvement. BSUD recognises five key principles that need to be implemented to reduce the impact of urbanisation on the target species/habitats:

- Maintain and create habitat
- Facilitate dispersal
- Minimise threats and disturbances
- Facilitate natural ecological processes
- Improve potential for positive human-nature interactions

The grant coincides with the development of the Dry Creek Corridor, Concept Plan (Jensen Plus 2020) which aims to:

- Elevate the profile of Dry Creek Corridor by rebranding, promotion, education and design;
- Create functional, safe and enjoyable linkages along the corridor;
- Encourage visitation;
- Create a balance of active and passive recreation to improve amenity, encourage visitation from people of all ages and demographics; and
- Slow the flow to improve the creek as a natural system to encourage biodiversity.

3.1.2 Community Wellbeing

BSUD aims not only to improve outcomes for nature in the urban landscape, but also has a strong focus on creating improved outcomes for human wellbeing. Studies have repeatedly shown that accessible urban greenspaces are important for community wellbeing and mental-health outcomes, and more recently, research is telling us that these benefits are further enhanced by biodiversity and functioning ecosystems (Taylor and Hochuli, 2014). More than just *'green spaces*', increasing biodiversity in an urban area adds multi-sensory elements including bird, frog, insect and water flow sounds, a variety of aromatic floral resources, and visually positive spaces which not only encourage engagement and physical activity, but also promote reductions in levels of stress and anxiety, and improvements in concentration, mood and emotional connection.

A study of a spectrum of 'natural' to 'pocket' park spaces in Adelaide by the University of South Australia (Schebella, Weber, Shults and Weinstein, 2019) found that attributes of 'biodiversity' and 'wildness' were important values in peoples' idea of their preferred natural environments, and that dynamic natural environments which show seasonal change and natural ecosystem processes are more likely to create this sense of emotional connection. Additionally, the study showed that structural heterogeneity in vegetation cover was the most easily perceived visual cue, with higher variation in cover correlating with more positive feelings.

3.2 Environmental setting

Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape-based approach to classifying the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity. The Project Area falls within the Finders Lofty Block IBRA Bioregion, Mount Lofty Ranges Subregion, and Rosedale IBRA Environmental Association. Native vegetation remnancy within the Rosedale Environmental Association is low with only 5% (3089 ha) of the association mapped as remnant native vegetation, of which 11% (331ha) is formally conserved in NPW Reserves or Heritage Agreements (Table 1).

Table 1. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Flinders Lofty Block IBRA bioregion	
Temperate to arid Proterozoic ranges, alluvial fans and plains, and some outcropping volcanics, with the semi-arid to arid north supporting native cypress, black oak (belah) and mallee open woodlands, *Eremophila* and *Acacia* shrublands, and bluebush/saltbush chenopod shrublands on shallow, well-drained loams and moderately-deep, well-drained red duplex soils. The increase in rainfall to the south corresponds with an increase in low open woodlands of *Eucalyptus obliqua* and *E. baxteri* on deep lateritic soils, and *E. fasciculosa* and *E. cosmophylla* on shallower or sandy soils.	
Mount Lofty Ranges IBRA subregion	
This subregion extends from north of the Fleurieu Peninsula to the Barossa Valley, and is predominantly an undulating to low hilly upland with steeper marginal ranges and hills. The Barossa Valley is the lowest area in this subregion and represents a structural basin. The rest of the subregion consists of hilly uplands on sandstone and shale with northerly trending strike ridges and dissected lateritic tableland remnants. Low open woodland commonly dominated by *Eucalyptus obliqua* and *E. baxteri* are found in higher rainfall areas on deep, lateritic soils. Shallower or sandy soils support *E. fasciculosa, E cosmophylla* and in the northern part of the region *E. goniocalyx. E leucoxylon* dominates the woodlands on podzolised soils in the lower rainfall areas, *E. viminalis ssp. cygnetensis* dominate the wetter and cooler woodlands and *E. odorata* characterises drier sites. Eucalypts give way to drooping sheoak (*Allocasuarina verticillata*) in the most arid woodlands and in coastal situations on shallow rocky soils.	
Remnant vegetation	Approximately 15% (46342 ha) of the subregion is mapped as remnant native vegetation, of which 27% (12706ha) is formally conserved
Landform	Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south,hilly dissected tableland.
Geology	Dissected lateritized surface in south
Soil	Hard setting loams with red clayey subsoils, Highly calcareous loamy earths, Hard setting loams with mottled yellow clayey subsoil, Coherent sandy soils, Cracking clays.
Vegetation	Eucalyptus woodlands with a shrubby understorey.
Conservation significance	129 species of threatened fauna, 270 species of threatened flora. 4 wetlands of national significance.
Rosedale IBRA environmental association	
Remnant vegetation	Approximately 5% (3089 ha) of the association is mapped as remnant native vegetation, of which 11% (331ha) is formally conserved

Landform	Undulating to rolling plain on shale with broad floodplains.
Geology	Shale and alluvium.
Soil	Hard pedal red duplex soils, reddish friable loams and brown self-mulching cracking clays.
Vegetation	Open parkland of SA blue gum, sugar gum, river red gum or exotic conifers.
Conservation significance	70 species of threatened fauna, 66 species of threatened flora.

3.3 Cultural significance

The Project Area is on Kaurna land and is subject to the Kaurna Peoples Native Title Claim and the ILUA Kaurna People Native Title Settlement ILUA (3468.46 sq km) (Tribunal ID SI2018/0949).

Green Adelaide provided advice as to the most appropriate way forward in engaging with Kaurna on this project.

A site inspection with senior Kaurna Traditional Owners and subsequent short report was undertaken and prepared by Integrated Heritage Services (IHS, 2021) to identify possible Aboriginal Cultural and Heritage values within the Project Area. Where suitable, suggestions from this report have been incorporated into this Biodiversity Plan.

The report highlighted the potential for cultural values within Dry Creek, with the significance of watercourses for Aboriginal occupation, with plentiful water and other useful resources, as well as their suitability as burial grounds, making them historically traditional living places in Australia.

Specifically, the report identified six primary areas of interest within the Dry Creek corridor, explained in detail in attached IHS report. In summary:

- Dawson Reserve and Edinburgh Reserve retain intact creek line and banks and historic configuration of mature River Red Gums and thick vegetation. Additionally:
    - Dawson Reserve has a prominent kink in its alignment harbouring deep water, reminiscent of a natural spring.
    - Edinburgh Reserve has a population of Ibis, which feature in traditional Kaurna stories and serve as a totem to some and is therefore considered a potential faunal theme that could be explored.
    - Edinburgh Reserve was identified as an area of potential Aboriginal heritage interest which could incorporate Aboriginal artwork, cultural markers, sculptures, educative, interpretive, and sensory opportunities geared towards families and children who would be primary users of the proposed Edinburgh playground development.
- Conservation patches of Kangaroo Grass (*Themeda triandra*) throughout the corridor (such as at Oratanga Reserve) were identified as possible locations to explore Aboriginal traditional management techniques.

- Druminor Lake and wider Druminor reserve were identified as areas where pre-European vegetation remains and natural features present opportunities for integrating Kaurna cultural values.
- Fairleigh Reserve was identified as an area featuring high Aboriginal heritage interest to Kaurna traditional owners.
- South Valley View Reserve (Vaucluse Reserve) was identified as an area of potential Aboriginal heritage sensitivity, and an area of opportunity to explore ethno-botanical research and interpretation.

4 METHODOLOGY

4.1 Desktop Assessment

4.1.1 Database searches

Desktop research was undertaken in preparing this report. This included database searches and a review of literature relevant to the Project Area to determine if any ecological constraints or opportunities exist. These searches helped to identify a list of threatened species and ecological communities and Matters of National Environmental Significance (MNES), as well as species of local importance that are known or likely to occur in the Project Area.

The following databases and resources were reviewed:

- Commonwealth Protected Matters Search Tool (PMST) to identify all MNES potentially within 5 km of the Project Area. MNES include threatened species, ecological communities and migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Species Profile and Threats Database (SPRAT) for entities listed under the EPBC Act, available at https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl;
- Records including National (EBPC Act) and State (National Parks and Wildlife Act 1972 [NPW Act]) listed species, filtered to those since 1995, within 5 km of the Project Area from the South Australian Government's Biological Databases of South Australia (BDBSA), accessed through the NatureMaps web portal; http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps;
- Regional Recovery and Action plans relevant to species within the Adelaide and Mount Lofty Ranges (AMLR) region
- Other relevant websites, reports, fact sheets and papers.

4.1.2 Threatened species likelihood of occurrence

The likelihood of threatened species and communities predicted as occurring by database searches, and those identified additionally as locally uncommon or threatened, were assessed as to the likelihood of their presence within the Project Area using the criteria outlined in Table 2.

Table 2. Likelihood assessment criteria

Likelihood	Description
Unlikely	There are no records of the species within 5 km of the Project Area and / or habitat is unsuitable.
Possible	Habitat is suitable for the species but there are no recent (> 1995) records within 5 km of the Project Area. Species may possibly exist or be candidates for reintroduction / targeted rehabilitation.
Likely	Habitat is likely to be suitable and / or there are recent records (> 1995) within 5 km of the Project Area. Targeted and non-targeted rehabilitation is likely to be beneficial to these species.

Present	Habitat is suitable and the species has recently (<10 years) been recorded within the Project Area. Targeted rehabilitation will improve habitat suitability and may increase species abundance.

4.2 Consultation

The Green Adelaide Grant for BSUD identified consultation and collaboration as an important criterion for undertaking successful community projects. As part of the Plan, feedback and ideas were sought from a range of relevant sources including the scientific community, local experts, members of the community, local interest groups and Kaurna representatives.

4.2.1 Expert Consultation

A semi-structured interview approach was undertaken to ask conservation organisations, community groups and local experts and enthusiasts about their understanding of urban biodiversity and knowledge on the Dry Creek and general Adelaide Plains region.

Participants were recruited from research into relevant local organisations, from recommendations and though professional and personal networks, leading to further recommendations.

During a 30–60-minute casual phone interview participants were asked to provide their perspective within their area of expertise, including:

1. Recommended focal species based on their:
    a. decline / threat due to urban activities
    b. response to change
    c. potential for successful outcomes
2. What flora / fauna occur in the area or surrounds (Adelaide Plains / Mount Lofty) which could benefit from urban biodiversity planning such as:
    a. habitat creation
    b. wildlife corridors
    c. water management
    d. reduction in threats
3. Ideas and aspirations for urban biodiversity in Adelaide
4. Knowledge of other similar or related projects within the region that have/have not been successful and why
5. Ideas for community engagement

The research design sought to generate qualitative data and detailed local knowledge and ideas from local knowledge bases and experts in their field. Several participants were interviewed from a range of local and state government agencies, non-government organisations and community groups (Listed in Appendix 3), in addition to experts consulted as part of ongoing collaborations with CTTG and Green Adelaide.

4.2.2 Community Consultation

Community consultation was undertaken as part of the Dry Creek Corridor Concept Plan. As such, feedback from this process was considered as part of the Biodiversity Plan and no further community consultation was undertaken. In summary, 52 contributors made 152 comments and/or submissions about the Concept Plan, via the online map, and/or via email / phone / mail, during the '*Have Your Say'* consultation period. Additionally, feedback was received at two onsite feedback sessions, and via phone (McDougall, 2019).

Many comments related to structural elements including accessibility (pedestrian and cyclist road crossings, shared use paths) and useability (provision of drinking water stations, seating, toilet facilities and bins), and have been addressed as part of the Concept Plan designing process.

In general, feedback expressed a strong interest in improving the corridor for a variety of shared use opportunities and indicated a desire to improve the natural values of the corridor to increase habitat for wildlife, and to enhance visual amenity for park users. Comments relating to trees / landscaping and general biodiversity which have been addressed as recommendations in this plan include, but are not limited to:

- Cultural engagement, including interpretation, and dedicated features such as an Indigenous food plant garden.
- Improvements to existing playgrounds and addition of nature play elements throughout the corridor.
- Installation of wildlife related infrastructure including bee hotels and nest-boxes.
- Revegetation to improve visual amenity, increase shade and improve habitat for animals.
- Interpretive signage relating to biodiversity to educate and draw attention to natural features such as biodiversity and significant sites and regarding growing seasons and flowering.
- Butterfly gardens in area identified as barren / disused (Oratanga), with additional security concerns around planting nearby property boundary fence lines addressed.
- Expansion of environmental works to include additional extent of Dry Creek, such as Kingfisher Reserve.
- Improvements to water quality in Dry Creek, including works to Druminor Lake, wetlands and the creek.

While not all feedback has been addressed individually, comments have been incorporated in conjunction with the Concept Plan and the Biodiversity Plan, taking into consideration expert consultation, practically creating the best outcomes for biodiversity, and reflecting the needs of the public such as amenity and safety.

4.3 Field Assessment

Detailed flora and fauna assessments were not part of the scope of this Biodiversity Plan, but instead form part of the recommendations going forwards to determine the location and size of populations and to implement ongoing monitoring of species.

A site walkthrough of all reserves was undertaken on 4th February 2021 with a range of local experts to discuss implementation of the Concept Plan, and opportunities for biodiversity improvements. Following expert consultation, an additional broad field assessment was undertaken on 19th March 2021 to identify areas of interest and refine targeted / recommended action areas.

4.4 Limitations

The Project Area has several environmental limitations which are likely to impact the success of projects which aim to increase populations of fauna and attract new species, including:

- The size of the Project Area (~47 ha) may not be large enough to support permanent populations of some species which require larger areas to support all stages of their lifecycle.
- The interior: edge ratio may limit the likelihood of urban avoider species inhabiting the reserve, and limits opportunities to exclude aggressive urban exploiter species such as Noisy Miners.
- The Project Area is not in close proximity to large patches of remnant vegetation linked by vegetated corridors which may support immigration of new species.
- The urbanised nature of the reserve may be a limiting factor for some declining species (i.e. woodland birds)

A review of urban biodiversity conservation (Threfall et al. 2019) identified several common barriers to the success of urban biodiversity projects including:

- A lack of financial and political capacity including budget and staffing resources.
- Difficulty engaging with external partnerships which may contribute funding or on-ground works.
- Reliance on grants, especially for long-term projects, of which many biodiversity projects are.

Additionally, restrictions posed by urban design such as safety, community, stormwater management and land management may not always align with biodiversity values, representing a trade-off between benefits to the community and biodiversity gains.

The *Dry Creek Corridor Concept Plan (2020)* is a concurrent document which guides works within the Concept Plan section of the Project Area. Where works have been identified, biodiversity recommendations aim to complement and refine these works to create the greatest benefit to biodiversity. In some instances, works on riparian and wetland areas are subject to the City of Tea Tree Gully Stormwater Management Plan (SMP) which is not yet finalised as of June 2021. In these locations, the Biodiversity Plan provides the information required to address biodiversity, but ongoing and future collaboration with the CTTG Biodiversity Team is required.

No dedicated or targeted fauna surveys were undertaken at the time of the field assessment, however likelihood of occurrence of species identified in the desktop assessment is based on vegetation and habitat

features observed across the reserves and proximity of recent records. Threatened species records include only those that were returned based on the database searches at the time of the assessment and may include records that have not been adequately verified or may not include all species that could occur in the Project Area.

5 NATURAL ASSETS

5.1 Matters of National Environmental Significance

A search using the Protected Matters Search Tool (PMST) with a 5 km buffer around the Project Area identified three Matters of National Environmental Significance summarised in Table 3. These are explored further in the following sections.

Table 3. Protected Matters Search Tool summary table

Search Area (5 km buffer)	Matters of National Environmental Significance	Identified within the search area
	World Heritage Properties	None
	National Heritage Places	None
	Wetlands of International Importance	None
	Listed Threatened Ecological Communities	1
	Listed Threatened Species	27
This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010	Listed Migratory Species	15

5.2 Native Vegetation

Native vegetation within the reserve consists of remnant *Eucalyptus camaldulensis var. camaldulensis* (River Red Gum) Open Woodland over an open understorey of sedges, rushes and mixed native and introduced grasses, and occurs along the drainage line and floodplains of Dry Creek. Pre-European mapping coupled with the presence of some remnant tree species identified the surrounding area to have likely been Woodland comprising *Eucalyptus porosa* (Mallee Box) *+/- E. socialis ssp. socialis* (Red Mallee) and *Eucalytpus leucoxylon ssp* (SA Bluegum) *+/- E. odorata*.(Peppermint Box).

The Nature Conservation Society of South Australia (NCSSA) Bushland Condition Monitoring Manual (BCMM) for the Southern Mount Lofty Ranges (Croft, Pedler, Milne, 2008), identifies the Benchmark community to be Community 5 – Watercourse Vegetation. More specifically Community 5.3 Deep Channel with Big Gum Woodland, which contained variable densities of vegetation, on a gradient from areas of higher rainfall and elevation to the lower and drier slopes and plains. Common species in this community included are presented in Table 4, however the list is by no means exhaustive, and provides an indication of only the most common and widespread species.

One Listed Threatened Ecological Community was identified as occurring within the region – Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia (EPBC: Critically Endangered). Individual Peppermint Box specimens exist within Dry Creek; however, no remnant vegetation of notable quality remains, and natural regeneration of this species is not evident.

Table 4. Flora species typical of Southern Lofty Ranges benchmark community 5.3

Common	Scientific
Upper Storey	
Red Gum	*Eucalyptus camaldulensis*
SA Bluegum	*Eucalyptus leucoxylon*
Pink Gum	*Eucalyptus fasciculosa*
Manna Gum	*Eucalyptus viminalis ssp. Viminalis*
Mid-storey	
Drooping Sheoak	*Allocasuarina verticillata*
Native Cherry	*Exocarpos cupressiformis*
Golden Wattle	*Acacia pycnantha*
Blackwood	*Acacia melanoxylon*
Swamp (Wirilda) Wattle	*Acacia retinodes*
Banks and Riparian Buffer Zone (variable density)	
Silky Tea-tree	*Leptospermum lanigerum*
River Bottlebrush	*Callistemon sieberi*
Sweet Bursaria	*Bursaria spinose*
Kangaroo Thorn	*Acacia paradoxa*
Silver-leaved Banksia	*Banksia marginata*
In-stream vegetation (most common species)	
Common Reed	*Phragmites australis*
Bulrush (Cumbungi)	*Typha domingensis*
Spiny Flat-Sedge	*Cyperus gymnocaulos*
River Club-rush	*Shoenoplectus validus*
Salt Club-rush	*Bolboshoenus caldwellii*
Water Ribbons	*Triglochin procerum*

5.3 Significant flora species

Threatened flora species possibly occurring within the Project Area were identified using the desktop assessment methods outlined in Section 3. A comprehensive list, provided in Appendix 4, identifies those species present, likely, or possibly occurring within the reserve, with the idea that these lists may be used to incorporate threatened species into revegetation lists where suitable habitat occurs. While some species were considered as potentially occurring within the Project Area, those considered collectable, such as orchids, have not been recommended for reintroduction into public reserves due to the heightened risk of theft for private collections.

5.4 Significant fauna species

Threatened fauna species with the possibility of occurring within the Project Area were identified using the desktop assessment methods outlined in Section 3. A comprehensive list, provided in Appendix 5 identifies those species present, likely, or possibly occurring within the reserve, with the idea that these lists may be used to guide habitat creation for species which may occur following habitat improvement.

Many additional unlisted species are likely to occur within the reserves, either as permanent residents (small reptiles), or occasional migrants (bird species), but their likelihood is not presented in this report. Restoration works are likely to have positive implications for these more widespread and generalist species. It is recommended that additional fauna survey work is undertaken within the Dry Creek Corridor to determine the species that currently exist within the reserves, so that habitat creation and revegetation may be focussed to benefit their ongoing survival.

5.5 Existing revegetation areas

Multiple existing revegetation projects are evident in Dry Creek corridor, occurring in association with established wetlands and throughout the corridor (Figure 3). Revegetation works have been undertaken by the CTTG Biodiversity Team, contractors employed by CTTG and by members of the community, including Friends of Dry Creek Trail. The current revegetation program follows comprehensive guidelines detailed in the CTTG Biodiversity Standard Methods (BSM) document, which sets out sequential steps for revegetation from site preparation, to planting, maintenance and additional infill planting of various species mixes. The current revegetation planting species list comprises indigenous species in Stage 1 to Stage 4 plants, plus additional trial species which are intended to provide climate resilience to the revegetation mix. Broadly, the structure of each stage is as follows:

- Stage 1: Planting of fast-growing trees and dense shrubs (to shade out and reduce weed invasion)
- Stage 2: Removal of some dense shrubs and introduction of lower shrub layer (increase diversity)
- Stage 3: Removal of additional dense shrubs and introduction of ground covers and grasses
- Stage 4: Continue infill planting at ground layer to increase plant species diversity

The revegetation planting list is presented in Appendix 1, where the seasonal flowering calendar has been included to provide an idea of the flowering phenology of the current Dry Creek corridor. The list also presents suggestions for additional locally indigenous species which may provide greater variation in the

timing of floral diversity (autumn and winter focus) in revegetation planting mixes. Further consultation is recommended to guide staging of these species.

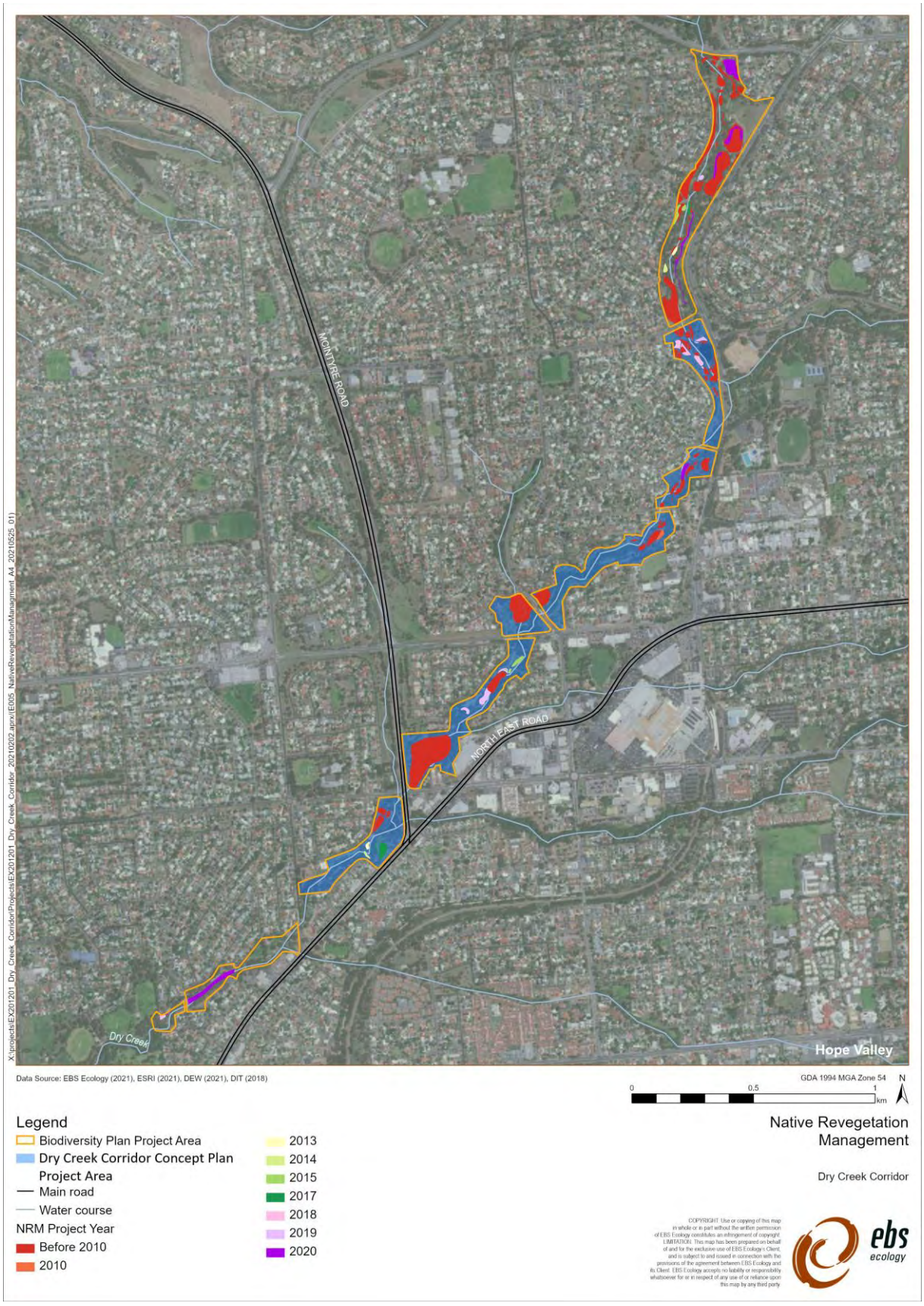


Figure 3. Past revegetation in Dry Creek Corridor - Biodiversity Plan Project Area

6 THREATS TO BIODIVERSITY

6.1 Altered hydrology

Dry Creek is within a non-prescribed surface water management area (SWMA) which includes two discrete streams, Dry Creek and Cobbler Creek, with an urban catchment area of 141.9 square kilometres (DEWNR, 2016). Approximately 70% of stormwater from the City of Tea Tree Gully area eventually finds its way into Dry Creek. The total length of the creek system is 28km, 15km of which lies within the City of Tea Tree Gully. Urban development within the Dry Creek catchment area and its associated storm water system has significantly changed the flow volumes and frequency of flow events experienced by the watercourse. This increase in both the magnitude and frequency of flows has accelerated the rate of erosion in the watercourse. In addition, the physical changes to the catchment from the effect of greater impervious areas has altered and increased the sediment and pollutant loads entering the system.

The surrounding land use is dominated by mid-density urban development and commercial applications. Urban catchments face a range of issues which stem primarily from the impacts of stormwater including:

- Poor water quality (pH, turbidity, oxygenation, siltation, eutrophication, water temperature) caused by nutrients and pollutants in the stormwater runoff.
- Change to natural flow regimes leading to:
    - Changed seasonality of flows
    - Reduction in frequency of minor flooding
    - Reduced water quality
    - Interruptions to fish movement
    - Poor recruitment of native fish
- Increased runoff (due to impervious surfaces) leading to temporary flooding and resulting in:
    - Erosion and unstable banks
    - Increased sediment load (smothering of riffles, infilling deep pools and channels)
- Reduction in soil quality in the reserve from pollutants and runoff erosion
- Reduction in aquatic fauna (macroinvertebrates, fish, frogs) and correspondingly, a limited food chain within the riparian habitat
- Reduced habitat for waterbirds

In addition, riparian habitats in urban environments often exist in less than pristine conditions, having undergone extensive vegetation clearance and suffered from weed invasion. These issues further accentuate the problems caused by stormwater runoff, where typically riparian vegetation in the creek and buffer zone would provide services, such as stabilising the banks from erosion, absorbing nutrients before they enter the waterway, and reducing the volume and velocity of water entering the system. Additionally, a healthy vegetated riparian corridor forms the basis of the aquatic food web and serves as a natural passageway for a variety of wildlife. A report by Abernethy and Rutherford (1999) suggests that for bank

stabilisation, the riparian zone should be at least 5 metres wide *plus* the height of the bank. Similarly, a guide by Roberts (2008) on riparian vegetation restoration in the Eastern Mount Lofty Ranges recommended that a healthy riparian corridor should be at least 15 metres wide either side of the bank.

In 2008 the Environment Protection Authority (EPA) Aquatic Ecosystem Condition Report (AECR) was undertaken at two sites. The up-steam site (Wynn Vale 34.81°S, 138.69°E) reported *very poor* condition, showing significant breakdown of ecosystem processes and disturbance, with poor water quality, minimal vegetation and very low macro-invertebrate diversity [14 tolerant species) (EPA 2015a). For the downstream site (Valley View, 34.85°S, 138.66°E), condition was reported as *poor* with reduced plant and animal diversity (24 macroinvertebrate species, no sensitive species) and moderate ecosystem breakdown caused by stormwater and runoff impacts and weed impacts (EPA 2015b).

Previously, *The 5 Year Plan for the Restoration of Dry Creek 2013-2018* (CTTG, 2013) was implemented, with the primary goal of the project to guide the restoration of the Dry Creek water way and its tributaries in the CTTG. The plan was implemented over 5 years, beginning in 2014 and co-funded with the then AMLR NRM Board. Within the Dry Creek Corridor Biodiversity Plan Project Area, significant erosion control works occurred in Fairleigh and Dawson Reserves, with some associated revegetation works.

Going forward, the Dry Creek Project Area faces complex issues which require ongoing collaboration between the CTTG biodiversity team and hydrologists to ensure water quality and metropolitan water drainage aims (Stormwater Management Plan) are aligned with biodiversity outcomes.

6.2 Fragmentation and Isolation

Urbanisation has resulted in an ongoing decline in natural areas available for biodiversity services and wildlife habitat. Infill development is causing a further reduction in the amount of available habitat for fauna species in our urban environments. For some species, the urban environment has become uninhabitable, either through loss of resources, lack of sufficiently sized habitat fragments to support populations, and other unknown impacts of urbanisation. These species have been forced back into the less developed regions such as the Adelaide Hills, where they persist in low numbers, but are threatened with ongoing decline.

Currently, the Dry Creek Project Area encompasses approximately 47 hectares of degraded riparian and associated habitat, with approximately 12.16 kilometres of edge (Table 5).

Table 5. Approximate dimensions of each reserve within the Project Area

Reserve	Perimeter (m)	Area (ha)
Kingfisher Reserve	2,622	14.12
Edinburgh Reserve	1,889	7.52
Fairleigh Reserve	1,725	5.93
Dawson Reserve	1,438	5.07
Druminor Reserve	1,261	4.29
Valley View Reserve	1,324	3.87
Solandra Wetlands	664	2.69
Oratanga Reserve	789	2.45
Vaucluse Reserve	449	0.84
Total	**12,161**	**46.78**

Fragmentation and fragment size is widely documented as a serious issue for flora and fauna. In urban environments these impacts are amplified, with an extremely hostile 'gap' environment in which barriers such as roads and housing developments further limit the ability of some species to move around. The impacts of fragmentation are wide and varied but the impacts include:

- Insufficient space to fulfil life cycle (breeding, dispersal)
- Insufficient resources for breeding / feeding
- Increased likelihood of mortality (roadkill, predation susceptibility)
- Reduced connectivity limiting dispersal and immigration and thereby reducing metapopulation genetic diversity
- Barriers to plant cross-pollination systems

Aside from Dry Creek corridor, much of the remnant native vegetation within the council area is contained within three distinct conservation parks and reserves (Anstey Hill, Cobbler Creek and Angove Conservation Park) which are separated by the urban landscape. While the size of the Dry Creek Project Area cannot be increased, management should aim to buffer the impacts of isolation and fragmentation by improving the integrity of the vegetation and existing habitats and facilitating linkages between these remnant areas. Actions should be focused on developing community awareness to increase connectivity, including in the private realm, considering long term goals and landscape scale connections to source populations contained in larger remnant patches of vegetation, as indicated in Figure 4.

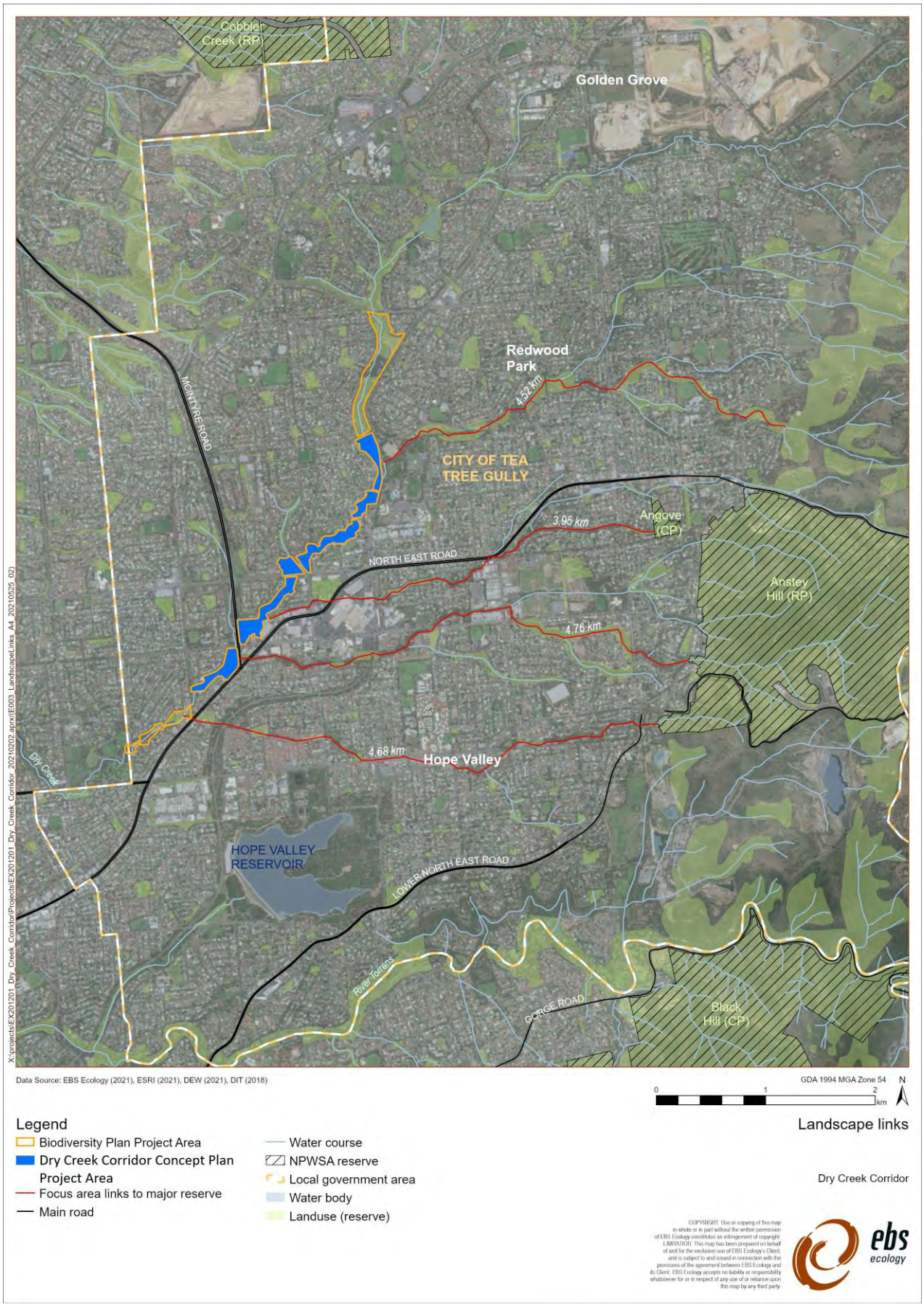


Figure 4. Landscape linkages to the nearest patch of remnant vegetation greater than 50 ha in size (Anstey Hill Recreational Park).

6.3 Weeds

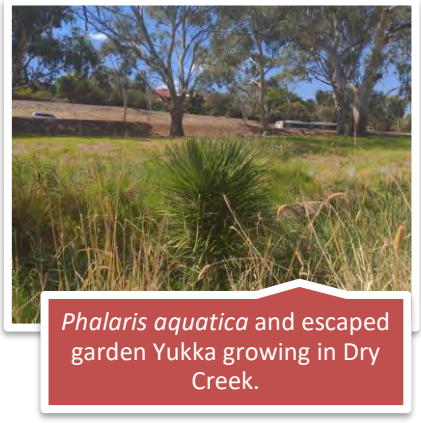
Environmental weeds are an ongoing threat to all ecosystems but are particularly prevalent in areas impacted by urban development, where disturbance, seed dispersal potential, and the presence of runaway garden species are exacerbated. Riparian environments provide perfect conditions for the establishment of weeds spreading easily along pathways and waterways and taking advantage of the heightened nutrient availability from runoff, and water availability (Croft *et al*. 2008).

Weeds cause a range of environmental and management issues including:

- Competition with native vegetation for space, sun, water, nutrients; and
- Smothering native vegetation and preventing recruitment and establishment.

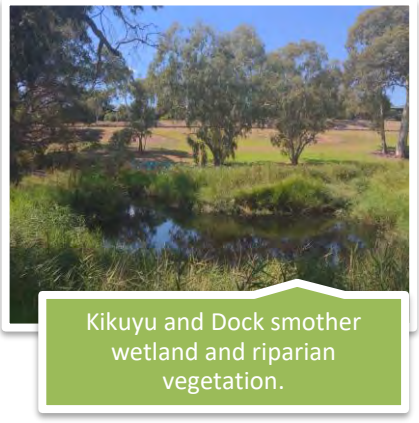
Within the Dry Creek Project Area, woody weeds typical of riparian areas, such as blackberry (*Rubus fruticosus sp.)*, olive (*Olea europeas)*, and ash (*Fraxinus sp.)*, have been professionally managed, and do not pose an ongoing threat to the creek system, provided that ongoing management contains any new infestations and prevents establishment. One patch of Swamp Oak (*Casuarina glauca)* is present in Dawson Reserve, which should be managed to minimise suckering and / or undergo a staged removal, replacing with other vegetation.

The primary weeds of concern which remain include Kikuyu (*Pennisetum clandestinum*), *Phalaris aquatica*, Castor oil plant (*Ricinus communis)* and Dock (*Rumex sp.).* These plants dominate the ground layer and in places, smother the in-stream habitat. Management of weeds shall be of high priority when considering revegetation projects, particularly in the direct riparian zone, and a weed management plan should accompany all revegetation works.



Phalaris aquatica and escaped garden Yukka growing in Dry Creek.

Castor Oil Plant (Ricinus communis) is prevalent in the in-stream habitat.



Kikuyu and Dock smother wetland and riparian vegetation.

6.4 Pest animals

Introduced and domestic predators

Urban parklands provide refuges for animals which are able to exploit urban resources such as foxes (*Vulpes vulpes)*. Similarly, parklands provide hunting grounds for both feral and domesticated pets, in particular cats, which are allowed to roam free. These predators pose significant threats to any wildlife

remaining in the corridor, with reduced vegetation and ground shelter (logs and rocks) features minimising the amount of protection native animals can find.

Control options for these animals are difficult in urban environments, where the use of poison baits is not suitable due to the risk to domestic pets. Many of the issues stem from irresponsible domestic pet ownership, where cats are allowed to roam free, resulting in widespread predation on native wildlife such as frogs, small birds, small mammals and reptiles. Councils have a responsibility to enact the *Dog and Cat Management Act 1995* and opportunities exist to both educate and incentivise owners to participate in responsible pet ownership. Examples of by-laws introduced by local councils include:

- Adelaide Hills Council have introduced by-laws which require domestic cats to be kept at home at all times unless on a leash (Adelaide Hills Council, 2020)
- Marion City Council introduced by-laws which limits ownership of cats to only two desexed cats

Additional measures which may be implemented to encourage responsible pet ownership might include:

- The use of education and citizen science programs to inform residents of the local wildlife in their area and the impacts cats have.
- Incentivising cat owners to engage in responsible cat ownership by introducing penalty variations for trapped cats based on factors such as ID, collar, desexed (for example, the owner of a desexed cat with a microchip and a bell collar would receive a lower penalty than a microchipped cat that wasn't desexed or collared).
- The use of signage to indicate sensitive biodiversity and 'quiet' zones to encourage on-lead dog areas.

Other pests

Brown & Black Rats

The Brown Rat (*Rattus norvegicus*) and the Black Rat (*Rattus rattus*) are the two common pest rats found in the metropolitan area. Rats can pose a serious threat to domestic animals and humans through such things as disease transmission (e.g. *Salmonella*) and the physical damage of property. The Black Rat can also have an impact on native animals and environments, predating on the eggs of native bird and reptile species, and causing damage to banks of waterways by way of undermining burrows.

European Honeybees

European honeybees (*Apis mellifera*) are an often-understated threat to native species, and are publicized as important pollinators, and at risk of extinction. Recognition is finally emerging that feral colonies of bees actually cause significant conflict with native flora and fauna, and as such the NSW Scientific Committee has determined that competition from feral honeybees is a Key Threatening Process to biodiversity (NSW DPIE 2019). Impacts include:

- Competing with native species (birds, microbats, mammals and native insects) for floral resources and tree hollows (~20% of Australia's birds are hollow nesting (Saunders et al 1982; Trainor 1995; Goulson, Stout & Kells 2002).
- Reducing pollen / nectar availability for nectarivores, removing up to 80% of floral resources provided
- Reducing seed set and limiting long-distance pollination services for native flora (De Barro P. 2007)

It has also been suggested that if the invasive mite *Varroa destructor* enters Australia, our reliance on feral bees over managed hives for agriculture and honey production could facilitate its dispersal and ultimately be detrimental to agricultural pollination services (De Barro, P. 2007).

In Dry Creek the impact of feral honey bees is highly visible, with a large number of old *E. camaldulensis* trees, with hollows that take over 100 years to develop, being almost unanimously filled with feral bee colonies. Riparian zones are particularly susceptible to bee infestations due to their proximity to a year-round water supply, and a study by Oldroyd (1998) found 50 to 150 colonies per square kilometre in riparian woodlands in Victoria

Management measures are difficult and can be controversial due to the profile of bees as a welcome inhabitant of natural spaces, however, management should coincide with education programs and may include:

- The application of insecticide to nests and subsequent hollow restoration to enable its reuse by native species
- The use of 'swarm traps' to draw colonies from hollows into hives
- Remote application of insecticide (acephate) via foragers using feeding stations
- Policy implementation to encourage use of managed hives for agriculture and use of hive infrastructure such as queen excluders to help reduce swarming.

6.5 Human-nature conflict

Human-nature conflict covers a range of aspects, from direct negative interactions with animals (e.g. snakes encounters and possums nesting in suburban rooves) to indirect impacts surrounding safety (e.g. 'unsafe' dense vegetation), and other damaging interactions (e.g. rubbish dumping).

A range of management actions can lead to community engagement through:

- Interpretation (education of general passers-by)
- Structural (use of paths and signage to guide pedestrians to areas of interest)
- Outcomes (home-owners benefiting from landscaping)
- Community (such as integrating management aspects with objectives of school curriculum)
- Advocacy (through particular interest in focussed projects)
- Stewardship (involvement and establishment of local Landcare groups)

Biodiversity management actions should aim to maximise positive outcomes of direct human interactions with nature while minimising the negative consequences for both humans and nature with the recognition that community interest is an integral factor in achieving successful biodiversity outcomes (Threfall et al 2019). As local environmental advocate and botanist said '*there are people who dump rubbish, and people who pick it up. We need to make more people want to pick it up'* (R. Taplin, *pers.comms.* 2021).

6.6 Climate Change

Australia has experienced warming of 0.09 degrees Celsius (°C) per decade since 1911 and mean temperatures are projected to continue rising this century. By 2030 mean annual temperatures in Australia are projected to increase by 0.6 to 1.3 °C (compared to 1986-2005), with the magnitude of change going forward, dependent on the trajectory of global emissions (Hancock, Harris, Broadhurst and Hughes 2018).

Climate projections vary across the continent, however the climate change projections for this region are within the *Southern Australia super cluster*, identified by the Climate Change in Australia online guide (CSIRO, 2021). It has an extensive coastal zone and a diversity of local climates, predominantly Mediterranean, with high winter rainfall and low summer rainfall. Predicted trends include:

- Average temperatures will increase in all seasons
- More hot days, fewer frosts
- Decreasing winter and spring rainfall
- Increased intensity of extreme rainfall events
- Mean sea level rise increases, and increases in extreme sea level events
- Harsher fire weather climate

Specifically, the Adelaide region falls within the *Southern and South-western Flatlands East Cluster* (SSWFE). Trends in the SSWFE include:

- Prolonged period of extensive drying from the 1990s particularly in early winter and autumn, with a southward shift of winter storm systems and greater prevalence of high-pressure systems, which drives down the winter rainfall.
- Rainfall is predicted to decrease by up to 15 percent by 2030.
- Temperatures have increased over the past century, with the rate of warming greater since 1960. The mean total temperature increase between 1920 and 2013 was 0.7°C.
- By 2030 the annually averaged warming across all emission scenarios is projected to be around 0.4°C to 1.1°C above the climate of 1986-2005.

While climate change and its spectrum of forecast impacts may be inevitable, with careful management and consideration based on understanding of these projections, revegetation and restoration programs can be designed to build resilience and adaptiveness into existing ecosystems, so that they remain useful as habitat, wildlife corridors, and biodiverse community spaces into the future.

7 BIODIVERSITY MANAGEMENT PLAN

7.1 Reserve Management Objectives

The Biodiversity Plan aims to fulfil a range of management objectives for the future outlined in Table 4.

Table 6. Reserve Plan objectives

1	To identify where biodiversity values and Kaurna cultural values align and use these to foster cultural connections with the broader community.
2	To manage the reserve for biodiversity in accordance with existing objectives of the Dry Creek Corridor Concept Plan, and to continue collaboration in future works.
3	To create resilient ecosystems that will provide resources for wildlife into the future and create a flora and fauna refuge.
4	To identify and improve landscape linkage opportunities to increase likelihood of species migration into the corridor from nearby remnant habitat.
5	To improve habitat elements and linkages for existing fauna species to increase reserve abundance and occupancy.
6	To regenerate and / or restore degraded areas of native vegetation to support a more diverse array of fauna.
7	To create suitable habitat for regionally threatened and / or declining species and investigate opportunities for introductions and reintroductions once suitable habitat has been achieved.
8	To encourage community engagement with the biodiversity and cultural values of the reserve and involve community in management.

7.2 Reserve Management Zones

For this Plan seven broad biodiversity themes have been identified across the reserve based on the key biodiversity threats and assets (Section 7.3). Recommendations are then explored further in relation to key faunal and floral themes. Each reserve is presented as a management zone, with specific themes and projects linked to the major biodiversity themes (Table 7)

Table 7. Reserve management theme summary

#	Theme	Description
1	Living Streams	Works related to hydrology, water quality, and aquatic species including in Dry Creek and associated wetlands and ponds.
2	Linking Landscapes	Works related to improving connectivity and addressing the issue of fragmentation at local and landscape levels.

3	Habitat for Wildlife	Works directly aimed at improving or increasing habitat specific to species.
4	Plantings for the Future	Revegetation works directed at one or all of three categories: a) mid-storey and upper-storey, b) grassland, or c) riparian and wetland.
5	Dedicated Projects	Packaged, discrete projects ranging in scale from simple biodiversity infrastructure installations to long-term ongoing projects in set locations.
6	Threat Management	Works related to mitigating threats identified in section 6.
7	Community and Cultural Engagement	Any activity, installation, or project which incorporates involvement from Kaurna or the broader community.

Reserve recommendations are categorised by theme (above) and then coded to indicate how and when they might be implemented, as follows:

- Recommendations which can be incorporated during the design and implementation phase of the existing Dry Creek Corridor Concept Plan (C).
- Operational recommendations which can be built into existing methodologies and standard procedures to improve their effectiveness in BSUD (O).
- Small Projects which may require internal funding or grant funding and are primarily isolated / discrete (S).
- Large Projects which may require internal, grant and /or ongoing funding, and could benefit from the involvement or establishment of community *Landcare* or *Friends Groups* (L).
- Policy changes may be internal (IP) or broad (BP) and may require small internal changes or lobbying for creation of by-laws (P).

These broad management recommendations and projects are then applied to the flora and fauna biodiversity themes (Section 8), identified during the research phase, in more detail. Each reserve is then presented with a schematic design of where the management recommendations should ideally be integrated into the reserve design.

7.3 Management Recommendations

Theme Number	Management Theme	Recommendation ID	Management recommendations
1	Living Streams 	1.1 [L]	Research and document current conditions (water quality, macroinvertebtrate diverstiy, fish species)
		1.2 [C, S]	Stormwater management including catchment management and installation of eco-infrastructure to mitigate runoff impacts.
		1.3 [S, L]	Targeted erosion control planting and structure installation at bank toe (i.e. large woody debris, rocks, matting, revegetation)
		1.4 [P]	Re-create natural flow regime based on findings of research.
		1.5 [O, C]	Ensure on-going collaboration and consultation between water management works and biodiversity team to enable identifcation of ongoing and future biodiversity opportunities.
		1.6 [O, S]	Undertake regular monitoring of water quality and macroinvertebrate diversity (possible integration with local school biology program)
		1.8 [C]	Riparian in-stream restoration to introduce more structural and species diversity. Where SMP, Concept Plan and targeted erosion works are planned, revegetation works should coincide.
		1.9 [C, O, S]	Investigate potential for reuse / recycling of sediment from de-silted ponds (Kiani et al 2020;) (dependent on results of sediment testing for contamination and required permits)
2	Linking Landscapes 	2.1 [O]	Strategic revegetation to improve connectivity throughout corridor
		2.2 [S, L]	Build connections to improve connetivity between reserves (culverts, crossing and roadside planting)
		2.3 [O]	Consider landscape linkages to remnant vegetation when prioritising future biodiversity work across the council area (i.e. corridors linking Dry Creek to the foothills [Anstey Hill], Hope Valley Reservoir [rail corridor], Wynn Vale Dam [Jubilee Reserve] and Cobbler Creek. Target existing programs such as *Get Growing* towards these areas, including private property.

3	**Habitat for wildlife** 	3.1 [O,S]	Improve habitat by introducing missing habitat elements (rocks / logs), or creating landscape features specific to needs of fauna.
		3.2 [S]	Install artificial habitat (i.e. microbat hotels and PVC nest boxes for Parda-L'otel) specific to species of interest.
4	**Planting for the future** 	4.1 [O, S]	 Revegetate with lower and mid-storey vegetation
		4.2 [O, S]	 Extend and protect native grassland
		4.3 [O, S]	 Revegetate wetland and riparian habitat
		4.4 [O]	Investigate floral resource distribution and integrate findings into revegetation species list and CTTG Biodiversity Standard Methods
5	**Dedicated Projects** 	5.1 [L]	Establish butterfly garden for variety of local and threatened species and investigate feasibility of threatened butterfly species reintroduction project.
		5.2 [L]	Install native botanic garden in Fairleigh Reserve and link with community programs such as *Get Growing* plant sale.
		5.3 [S]	Establish Peppermint box (*E. odorata*) seed collection and population regeneration from existing remnant tree in Kingfisher Reserve
		5.4 [S, L]	Investigate potential for threatened plant reintroductions based on findings of desktop research and futher enquiries.
		5.5 [O, S]	Establish 'habitat tree' arboricultural experiment to plant trees for the future (i.e. lateral branching, hollow creation)
		5.6 [O]	Incorporate evaluation and monitoring component into all projects to enable organisational learning and better guidance for future projects and measure success (i.e. record success rate of revegetation species; monitor 'usage' of butterfly food plants to determine frequency of maintenance schedule, and indicate success of butterfly recruitment etc.). Incorporate tools for Citizen Science projects to enhance engagement (e.g. remote cameras, bat detectors).
		5.7 [S, L]	Design bush tucker garden in Fairleigh Reserve based on Kaurna recommendations, and integrate interpretive signage.

		5.8 [S,L]	Undertake targeted species habitat improvements for Eastern Water Skink and frog species (i.e. Brown Toadlet)
		5.9 [S,L]	Undertake targeted biodiversity surveys at selected reserves to establish baseline understanding of species present (especially reptiles, frogs and birds)
6	**Threat Management** 	6.1 [O, L]	Further investigate options for feral European bee control
		6.2 [O, P]	Investigate apiarist by-laws for ongoing bee containment in CTTG
		6.3 [O, L]	Undertake a periodic fox and cat trapping program
		6.4 [O, P]	Explore options for by-laws to reduce impacts of pet predators (e.g. City of Marion)
		6.5 [C,O]	Staged Kikuyu (*Pennisetum clandestinum*) and riparian weed control in conjunction with riparian restoration projects.
		6.6 [O]	Build climate change resilience by provenance and species selection into revegetation species lists and standard methods.
		6.7 [O]	Undertake ongoing control of woody weeds in corridor including staged removal of *Casuarina glauca* in Dawson Reserve.
7	**Community / Cultural Engagement** 	7.0 [C, O]	Foster project partnerships with Kaurna including key focus areas as indentified in the the Integrated Heritage Services (2021) short report.
		7.1 [C,O,S]	Identify natural biodiversity assests which align with Kaurna values and integrate community engagement opportunities.
		7.2 [O,S]	Develop opportunities for Citizen Science (ABBC, camera trap monitoring, nest box building and monitoring, FrogWatch).
		7.3 [O, S]	Engage with existing groups (such as Friends of Dry Creek Trail) and / or establish new landcare groups to focus on particular projects throughout the reserves (esp. Kingfisher Reserve)
		7.4 [C, S]	Establish natureplay connections throughout the reserve

		7.5 [O]	Utilise social media to engage public with natural features
		7.6 [C,S]	Identify opportunities for biodiversity interpretation installations
		7.7 [O,S]	Establish and advertise an iNaturalist ‘Project’ for the Dry Creek corridor
		7.8 [C]	Consider placement of tracks and trails to draw community to areas of interest and / or away from sensitive areas
		7.9 [S]	Draw attention to reserve themes, by building specialist infrastructure such as bird hides (i.e. Kingfisher / Druminor / Edinburgh Reserves)
C = Concept Plan, O = Organisational, S = Small Project, L = Large Project, P = Policy			

8 BIODIVERSITY FAUNA AND FLORA THEMES

8.1 Fauna and Flora Themes and Projects

Many recommendations outlined in the Biodiversity Plan thus far are applicable to a range of species. The Plan aims to improve the health of populations of fauna and flora which, through the key threatening processes already identified, are at risk of declining.

Species that are threatened nationally, within the State or within the greater Adelaide Mount Lofty Ranges (AMLR) region have been selected where plausible improvements to their populations can be made. Otherwise, species have been selected based on their current presence within the reserve, their biological importance and / or their general charisma as iconic species for community engagement purposes. Species were selected following desktop assessment and literature review, expert consultation, and broad field assessment, described in detail in section 3 Methodology.

The following section outlines focal species or species groups to which management recommendations and projects can be assigned to increase community engagement opportunities, and as measures of success.

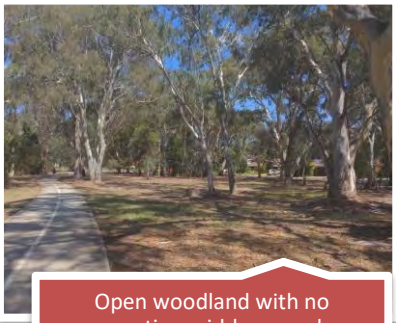
8.1.1 Birds

Over 85% of Australians currently reside in urban environments. Urban infill development has resulted in Australian backyards shrinking, and with them, many populations of our most familiar birds. A recent report based on long-term surveys of woodland birds in the AMLR region (Mount Lofty Ranges Woodland Bird Monitoring Program), stated that there has been a 45% decline in the total number (abundance) of birds within the region over 20 years, and that 75% of specialist woodland birds and 60% of generalist bird species are in decline. There is not one identifiable driver for species decline, however the common broad-scale threats of predation, reduction in habitat (size and quality) and decline in ecosystem function are all at play (Paton D., O'Connor P., 2021).

There is not a 'one size fits all' approach to habitat restoration for bird species, as they have extraordinarily varied diet, foraging, space, and other requirements, many of which are not fully understood. Recognising the limitations within the Dry Creek Project Area, the species identified as potential target species for biodiversity recommendations are based on increasing the landscape contribution of the corridor for the greatest diversity of species possible, not necessarily creating habitat which will support permanent breeding populations for all species.

Superb Fairy-wren (*Malurus cyaneus*) and small insectivorous allies

- The 2020 Aussie Backyard Bird Count (ABBC) recorded lower than the national reporting rate of small insectivorous birds including Superb Fairy-wrens, Grey Fantails and Striated Pardalotes in the CTTG council area – however all were reported within the Project Area.
- While many birds can travel 10's of kilometres in search of resources, movements of small forest dependent and weak-flying birds have been shown to be strongly impacted by fragmentation, in particular the presence of roads of varying widths (Taylor and Goldingay, 2010).
- Superb Fairy-wren territories have been recorded ranging from 0.5 - 8.2ha (Parsons, 2009; Allan, 2016). Superb Fairy-wrens have been shown to spend more time feeding on the ground in urban compared to rural environments, purportedly because of the reduced body size of insects, resulting in increased foraging time to consume the same biomass, exposing birds to predation (Parsons, 2009).
- Degradation of native grassland and lack of invertebrate friendly habitat (logs, leaf litter etc.), as well as reduction in suitable near ground shelter and perching habitat in urban environments has led to a gap in suitable habitat for these small weak-flying birds. Management should aim to increase connectivity to facilitate dispersal and establishment of new populations and create more suitable habitat.



Open woodland with no connecting mid-layer makes movement difficult for small weak-flying bird species.

Species such as the Red-capped Robin (*Petroica goodenovii*; AMLR: V) could also benefit from strategic understorey planting.

Kingfisher Reserve, where a population of Superb Fairy-wrens persists in dense vegetation around a reconstructed wetland.

Threats

- Insufficient dense low shrub habitat with access to short grasslands for feeding and foraging.
- Lack of suitable vegetation connectivity between reserves reducing dispersal opportunities.
- Exposure to predation by cats and foxes and aggressive urban birds such as Noisy Miners.
- Limited access to a variety of invertebrate food resources.

Recommendations

- **[2.1 O]** Strategically plant 'island' shrub vegetation to provide suitable nesting, sheltering and foraging habitat, and facilitate movement through corridor.
- **[3.3 O, S]** Collect and place woody debris around shrub islands to add shelter and increase invertebrate diversity.
- **[4.2 C, O]** Retain and plant informal short but un-manicured native grasslands around shrub plantings to provide foraging resources.
- **[4.3 O, S]** Target planting of shrubs and sedges around constructed wetlands to mimic current suitable habitat structure present at Kingfisher Reserve.
- **[6.3 O, L]** Implement predator control measures (i.e. fox trapping).
- **[7.2 O, S]** Establish permanent ABBC bird monitoring site locations.
- **[7.6 C, S]** Opportunity for public education (responsible pet ownership) and signage (quiet areas).

Benefits

- Increase in habitat for other associated species including Red-capped Robin (*Petroica goodenovii*; AMLR: V).
- Reduced presence and impact of aggressive urban species such as Noisy Miners.
- Increased observations of Superb Fairy-wrens thoughout the reserve.
- Engagement through citizen science.
- Improved knowledge of bird populations and species composition.

Measures

- Observations of Superb Fairy-wrens and allied species in other (previously unoccupied) reserves in the corridor.
- Increased bird diversity and decreased Noisy Miner abundance observed in ABBC.

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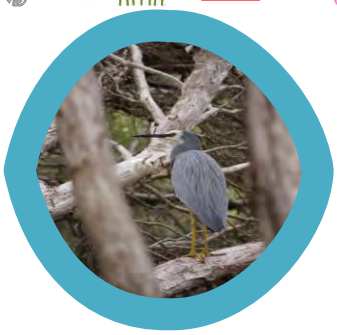
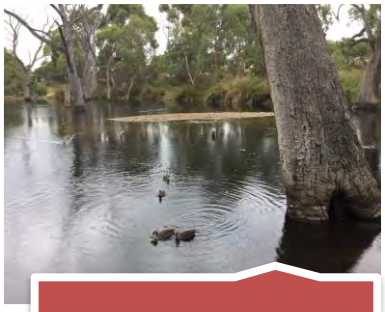
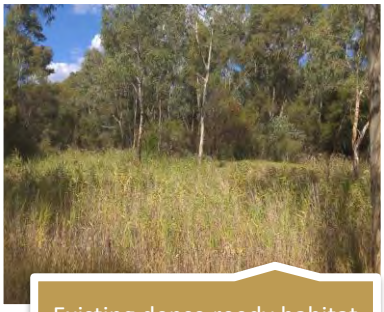
Aquatic / wetland and riparian dependent birds



- The Dry Creek corridor has a variety of aquatic habitat types, including wetlands, riparian, lakes, and floodplains, which have the potential to cater for a diverse range of aquatic bird species. Currently, there are considerable patches of reedy habitat, but associated riparian vegetation is lacking along with a diversity of stream-side sedges.
- EPBC Listed (EPBC Act 1999) birds such as the Australasian Bittern (*Botaurus poiciloptilus*; Endangered) and Australian Painted Snipe (*Rostratula australis*; Endangered) are not currently recorded within the Dry Creek corridor but have historic observations within 5 km of the site. They are considered as possibly re-occurring should suitable habitat become available.
- Other species of interest, which may also benefit from riparian and wetland habitat improvements include Spotless Crake (*Porzsana tabuensis*; SA: Rare); Sacred Kingfisher (*Todiramphus sanctus sanctus*); Buff-banded Rail (*Gallirallus phillippensis mellori*; AMLR: Rare), and Lewin's Rail (*Lewina pectoralis pectoralis*; SA: Vulnerable, AMLR: Vulnerable).



Druminor Lake



Existing dense reedy habitat in Edinburgh Reserve

Dawson Reserve, where revegetated banks would improve habitat.

Threats

- Lack of habitat diversity and sufficient cover in riparian vegetation.
- Predation on birds and nests by cats, foxes, dogs and rats.
- Limited food resources (fish, macroinvertebrates, frogs).
- Missing habitat features such as in-stream large woody debris and overhanging branches for perching.

Recommendations

- **[3.1 O, S]** Plant (create) laterally branching tree species along creek edges and around permanent pools for perching (Cormorants, Ibis, Sacred Kingfisher). Create interim perches with large woody debris.
- **[3.3 O, S]** Reuse large woody debris in strategic locations around deep pools and wetlands.
- **[4.3 O, S]** Plant a diversity of low and mid-storey riparian vegetetation on banks of creek.
- **[4.3 C, O, S]** Plant diversity of sedges and rushes around constructed wetlands.
- **[6.3 O, L]** Implement predator control measures (i.e. fox trapping).
- **[7.2 O, S]** Establish permanent ABBC bird monitoring site locations.
- **[7.4 C, S]** Construct bird-hides and / or bird viewing areas at Kingfisher Reserve, Druminor Lake, Solandra Wetlands and Edinburgh Reserve to encourage engagment.
- **[7.1 C, O, S]** Opportunity for Kaurna interpretation around species such as Australian White Ibis (*Threskiornis molucca*) currently inhabiting Druminor Lake and Edinburgh Reserve.

Benefits

- Increase and improve habitat for a variety of wetland and riparian birds including migratory / nomadic species such as Spotless Crake (*Porzana tabauensis*, SA: Rare) and Sacred Kingfisher (*Todiramphus sanctus sanctus*, AMLR: Uncommon / declining).
- Engagement through citizen science.
- Improved knowledge of bird populations and species composition.
- Pest insect predation.

Measures

- Increase in the number of locations along Dry Creek with healthy riparian vegetation.
- Observations of uncommon aquatic bird species.
- Observations of birds utilising strategically placed woody debris.

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Woodland dependent birds and honeyeaters

- Woodland dependent birds have suffered documented declines across the AMLR region, with charismatic birds such as the Crested Shrike-tit (*Falcunculus frotnatus frontatus*; SA: Rare, AMLR: Vulnerable) recording a decline in observations from 42% to 5% of surveys pre-1980 and post 1995.
- Mature trees with large lateral branches used to be common in open grassy woodlands but are now only found in remnant patches (Paton et al. 2004). In the absence of shrubs, these trees provided important layers of habitat for nesting, perching, foraging and protection. Trees used in revegetation often do not acquire this branching form, and it has been suggested that experimental pruning of the apical meristem could be attempted to simulate this growth form.
- Honeyeaters can travel vast distances in search of nectar resources, however the disproportionate clearing of gum woodland vegetation from the lower elevation areas such as the Adelaide Plains, has altered the availability of floral resources though summer and autumn, such that food availability has become a limiting resource for many nectarivores during this time, contributing to declines and local extinctions (Paton, Rogers, Harris, 2004).
- The 2020 Aussie Backyard Bird Count identified Rainbow Lorikeets and Noisy Miners as the most common birds within the City of Tea Tree Gully and were reported at considerably higher rates than the nation-wide average (BirdLife Australia 2020). Both species are urban exploiters and are known to feed on prolifically flowering plants such as *Eucalyptus sp*. often found in urban areas, aggressively excluding other species (Taylor 2012). Adding diversity of structural layers and floral resources, can open microhabitats for less urban adapted nectarivores and foliar insectivores such as Little Lorikeets and Striated Pardalotes.

Consideration of floral timing, structure and diversity would create a *Bird Cafe* for nectarivores.

Habitat trees with lateral branches are rare in revegetation plots. Experimental arboriculture techniques could be used to shape trees for future habitat.

Rainbow Lorikeets thrive in urban environments where they outcompete less common species for nectar resources.

Threats

- Seasonal limitations to floral resource availability.
- Competition from European honeybees for nectar resources and nesting opportunities.
- Lack of structural diversity in lower and mid-storey facilitating competition from aggressive. urban-exploiter birds such as Noisy Miners and Rainbow Lorikeets.
- Size of corridor too small to support permanent populations of many species.

Recommendations

- **[3.2 S]** Experiment with PVC constructed nest boxes for various bird species (i.e. Parda-L'otel for Striated Pardalote) to reduce bee inhabitation.
- **[4.1 O, S]** Continue planting of mid-storey vegetation to improve habitat and reduce competition from urban-exploiters.
- **[4.4 O]** Create a 'Bird Cafe' by selecting species for revegetation which include a diverse array of year-round floral resouces, considering variety in floral structure and plant height (Appendix 1). Investigate opportunity for varied provenance planting of *E. leucoxylon* for perpetual upper-storey floral resources (Merigot and Paton, 2018)
- **[5.5 O, S]** Consult arborist and undertake experimental 'habitat tree' plantings / pruning to create lateral branching canopies on future mature trees.
- **[6.1 O, L]** Undertake feral bee control across reserve precinct to reduce foraging competition and open up suitable nesting hollows.
- **[6.2 O, P]** Explore opportunity to implement policy changes for apiarists operating in the council area (Johnstone R,) (recommend mapping of current use of site by bees).
- **[7.2 O, S]** Establish permanent ABBC bird monitoring site locations.

Benefits

- Increase in habitat for other associated species .
- Reduced presence and impact of aggressive urban species such as Noisy Miners.
- Increased bird diversity and future habitat provision for declining species.
- Aesthetic benefits of year-round flower resource.
- Engagement through citizen science.
- Improved knowledge of bird populations and species composition.

Measures

- Increased bird diversity and decreased Noisy Miner abundance observed over time and reported in ABBC survey results.
- Decrease in number of hollows occupied by feral bees and decrease in incidence of re-occupation by swarming bees.

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8.1.2 Mammals

- Urbanisation has caused many species of mammal to decline with more sensitive species such as the Yellow-footed Antechinus (*Antechinus flavipes*), Western Pygmy Possum (*Cercateus concinnus*) and Southern Brown Bandicoot (*Isoodon obesulus ssp. obesulus*) no longer present in the Adelaide Plains.
- An echidna (*Tachyglossus aculeatus*) has been observed using Druminor Reserve in an area with dense shrub cover *(Acacia paradoxa*) and native grasses, within an established revegetation plot. Echidnas are 'ecosystem engineers' improving ecosystems with their diggings (up to 7 tonnes of soil a year), by trapping moisture and nutrients, and hosting unique microbial communities which create microhabitats for seeds to germinate (Eldrige and Koen 2021)
- Rakali (*Hydromys chrysogaster*) are known from the River Torrens but have recently been observed in Dry Creek (Peter Matejcic, *pers comms*.). They are one of only two freshwater semi-aquatic animals in Australia, with home ranges of 1.2 to 11.5 ha (Bettink, 2016). Habitat preferences include the presence of low-lying dense vegetation (shelter and food resources), steep (but stable) riverbanks suitable for burrowing and woody debris in the waterway (Torcini et al. 2015). Studies are underway to determine if Rakali provide the added pest management benefit of competitively excluding introduced black rats (Banks, 2015)
- Nine resident microbat species can be found across Adelaide including two species suspected to have disappeared from urban areas – the Inland Broad-nosed Bat (*Scotorepens balstonii*) and Little Forest Bat (*Vespadelus vulturnus*) (Scanlon and Petit, 2008). Understanding the health and diversity of microbat populations can be an indicator for the health of an ecosystem, as they rely on a diversity of invertebrates for food.
- Koalas can occasionally be sighted utilising *Eucalyptus* trees within Dry Creek corridor, however their status within South Australia is considered stable and well adapted to urban landscapes, and therefore this plan does not provide specific or targeted recommendations to enhance their population. It is expected that revegetation and biodiversity restoration measures implemented across the reserve will benefit a range of extant species, including the Koala.

Small improvements to vegetation within and around culverts could encourage dispersal.

Increased diversity in riparian vegetation and structure would benefit a multitude of species.

Echidna habitat in Druminor Reserve.

Threats

- Competition from European honeybees for roosting hollows.
- Lack of habitat features such as large woody debris around creeks and vegetation.
- Limited food resources (aquatic and terrestrial invertebrates and frogs).
- Hazardous connections betweeen reserves (roads and culverts), providing limited cover from predators and creating a possible barrier or deterrent to movement between reserves.
- Aritifical light pollution reucing the use of parks by a diversity of microbat species.
- Predation by introduced predators and domestic animals

Recommendations

- **[1.6 C]** Maintain areas of open water for bat feeding and drinking.
- **[2.2 S, L]** Improve vegetation and landscaping around culverts to increase cover and provide dry entry, passage and egress in low flows, and lay a natural substrate to encourage fauna movement (VicRoads, 2012). Consider fauna friendly design features when constructing new roads and culverts.
- **[3.1 O, C]** Ensure dark areas are maintained in the corridor (away from trafficked areas and pathways) to encourage microbat species diversity.
- **[3.2 S]** Experiment with design and placement (i.e. on live/dead trees, inside culverts, near water, around well lit / dark areas etc) of microbat roost furniture.
- **[4.3 O, S]** In-stream and bank revegetation to improve habitat for Rakali and encourage invertebrate diversity.
- **[5.6 O]** Invest in bat detectors (i.e. Anabat) to monitor populations utilising roost-boxes and the Dry Creek corridor.
- **[5.6 O]** Undertake targeted monitoring using covert camera traps before and after design features (i.e. culvert improvements) are implemented.
- **[6.1 O, L]** Undertake feral bee control across reserve precinct.
- **[6.2 O, P]** Explore opportunity to implement policy changes for apiarists operating in the council area (recommend mapping of current use of site by bees).
- **[6.3 O, L]** Undertake predator control (foxes) in Dry Creek and consider the use of imagery (remote cameras) of native wildlife to promote responsible pet ownership.
- **[7.2 S]** Consider Citizen Science project to map sightings of Rakali in Dry Creek to determine their distribution within the corridor (i.e. Trocini et al. 2015).

Benefits

- Gain a better understanding of the impact of culverts on the movement of native fauna, and whether design changes improve landscape connections.
- Engagement through citizen science with the use of camera trap images, Anabat recordings, microbat roost furniture and citizen science surveys.

Measures

- Decrease in number of hollows occupied by feral bees and decreased incidence of re-occurence of swarming bees.
- Increased number of successful crossing attempts using culverts for native wildlife.
- Increased diversity and/ or abundance of microbat species utilising the Dry Creek Corridor .
- Occupation of roost-boxes by microbat species.
- Increased observations of Rakali in Dry Creek Corridor.

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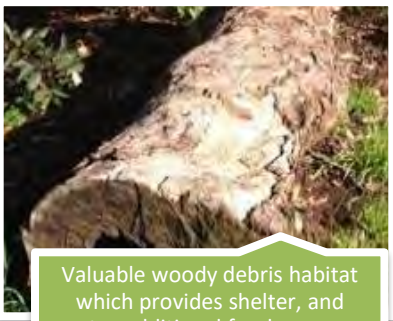
8.1.3 Reptiles

- Reptiles cover a broad group of species from tiny skinks (i.e. *Menetia greyii*) which flit about in the litter, to larger charismatic species such as the Heath Goanna (*Varanus rosenbergi*; SA: Vulnerable, AMLR: Endangered).
- Reptiles typically rely on diverse structural ground cover, to provide food and shelter resources, including healthy soil, abundant leaf litter, woody debris, sun basking platforms (rocks and logs), grass and shrubs. Depending on their size, their diet ranges from invertebrates to fruit, frogs, eggs, and even other reptiles.
- The Dry Creek corridor is likely home to a variety of common reptile species (e.g. Eastern Bluetongue [*Tiliqua scincoides scincoides*], Three-toed Earless Skink [*Hemiergis decresiensis*], Grass Skink [*Lampropholis guichenoti*] and Southern Marbled Gecko [*Christinus marmoratus*]), but their diversity and abundance could be improved with some simple habitat enhancements, which would also create a bottom-up food chain improvement for other species living in the corridor.
- Locally vulnerable species such as the Eastern Water Skink (*Eulamprus quoyii*) which are typically found near permanent water, have been recently sighted in the Dry Creek corridor (Peter Matejcic, *pers. comms*). Adding shelter elements and improving and expanding rocky creek bed habitat around pools will ensure that these charismatic species thrive in Dry Creek.
- Other threatened species such as the Flinders Ranges Worm Lizard (*Aprasia pseudopulchella*) (EPBC:V), with historical records within the Dry Creek vicinity, could be considered for reintroduction following restoration of suitable habitat.

An area at Edinburgh Reserve which would be greatly improved with added woody debris for shelter.

Eastern Water Skinks are viviparous, meaning they give birth to live young (Photo: Ken Griffiths).



Valuable woody debris habitat which provides shelter, and creates additional food resources when inhabitated by invertebrates.

Threats

- Missing habitat features for shelter and improved food resources (rocks, logs, hollows, leaf litter).
- Predation from cats, foxes and dogs.
- Hazardous connections betweeen reserves (roads and culverts), providing limited cover from predators and creating a possible barrier or deterrent to movement between reserves.

Recommendations

- **[2.2 S, L]** Improve the passage of culverts between reserves by adding natural substrates and increasing vegetation and shelter features around the entrances.
- **[3.3 S]** Increase available habitat by collecting and strategically placing large woody debris such as hollow logs and basking rocks in vegetated and riparian areas.
- **[4.2 O, S]** Extend patches of native grassland to provide habitat for a variety of small reptile species.
- **[4.3 O, S]** Undertake in-stream and riparian vegetation plantings to enhance cover and food resource diversity for species such as Eastern Water Skink.
- **[5.8 S, C, O]** Target areas for restoration with existing suitable habitat such as Fairleigh Reserve, Kingfisher Reserve and Druminor Reserve (see maps section 9).
- **[6.3 O, L]** Implement predator control measures (i.e. fox trapping).

Benefits

- Increase in habitat for other associated species .
- A healthy small reptile population creates resources for larger species, restoring the food chain.
- Charismatic and visible species provide opportunity for community engagement through interpretation, particularly for species such as the Eastern Water Skink (*Eulamprys quoyii*; AMLR Vulnerable).

Measures

- Increase in density of large woody debris.
- Increased sightings of diurnal reptile species.

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8.1.4 Aquatic vertebrates

In 2008 the EPA Aquatic Ecosystem Condition Report was undertaken at two sites. The up-steam site (Wynn Vale 34.81°S, 138.69°E) reported *very poor* condition, showing significant breakdown of ecosystem processes and disturbance, with poor water quality, minimal vegetation and very low macro-invertebrate diversity [14 tolerant species) (EPA 2015a). For the downstream site (Valley View, 34.85°S, 138.66°E), condition was reported as *poor* with reduced plant and animal diversity (24 macroinvertebrate species, none sensitive) and moderate ecosystem breakdown caused by stormwater and runoff impacts and weed impacts (EPA 2015b).

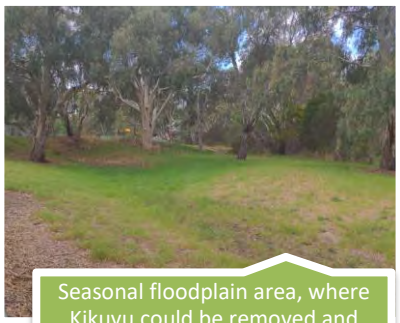
Since the reporting period in 2008, considerable improvements have been made to the system, including woody weed removal, and the installation of several bio-filtration wetlands. Nevertheless, the condition of the creek is likely to remain in the *poor* to *fair* condition range, and requires management to achieve further improvements.

Studies have shown that the most effective stream restoration projects start at the catchment level, where effective imperviousness (EI) caused by the proportion of a catchment covered by impervious surfaces (TI) combined with the proportion of impervious surfaces directly connected to streams by stormwater drains (DC) is known to be a primary cause of stream degradation (Walsh *et.al* 2005;).

Amphibians

- Three common species of frog have been recorded within the Dry Creek Project Area including the Common Froglet (*Crinia signifera*), Banjo Frog (*Limnodynastes dumerilii*) and Spotted Marsh Frog (*Limnodynastes tasmaniensis*).
- Other species recorded within 5 km of the reserves include Brown Tree Frog (*Litoria ewingii*, pictured), Burrowing Frog (*Neobatrachus pictus*) and Brown Toadlet (*Pseudophryne bibronii*; SA: Rare).
- Improvements to riparian and wetland habitat, including water quality and flow improvements, and creation of specialist habitat could significantly improve the abundance and diversity of frog species, including for the Rare Brown Toadlet, which requires grassy litter covered areas with plenty of cover, which are inundated during winter rain events.

Location in Kingfisher Reserve where collapsed bank could be transformed into seasonally inundated, vegetated backwater for frog habitat.



Seasonal floodplain area, where Kikuyu could be removed and replaced with native semi-aquatic grasses for Brown Toadlet (*Pseudophryne bibronii*) habitat.

Threats

- Missing habitat features for shelter and food resources (rocks, logs, hollows, leaf litter).
- Urbanisation - water quality, stormwater, erosion.
- Predation from cats, foxes and dogs.
- Unsuitable habitat features including flow regimes, backwaters and floodplains.

Recommendations

- **[1.4 P, L]** Consider flow regimes which enable winter flooding of grassy plains and explore opportunities for re-location / reintroduction project of Brown Toadlet once adequate habitat has been achieved.
- **[2.2 S, L]** Improve the passage of culverts between reserves by adding natural substrates and increasing vegetation and shelter features around the entrances.
- **[3.3 O, S]** Improve habitat features and invertebrate abundance by collecting and strategically placing large woody debris such as hollow logs and basking rocks in vegetated and riparian areas.
- **[4.3 O, S]** Plant in-stream and riparian vegetation to enhance cover and food resource diversity for species.
- **[5.8 S, C, O]** Target areas for restoration with existing suitable habitat such as Fairleigh Reserve and Kingfisher Reserve (see maps section 9).
- **[6.3 O, L]** Undertake predator control (foxes) in Dry Creek and use imagery of native wildlife to promote responsible pet ownership.
- **[7.2 C, S]** Add interpretive frog-call signage near suitable frog habitat and encourage use of apps such as FrogWatch or FrogID to record calls within Dry Creek (Citizen Science).

Benefits

- Increase in habitat for other associated species.
- A growing amphibian population increases food resources for larger species such as wetland birds, restoring the food chain from the bottom up.
- Charismatic and visible species provide opportunity for community engagement through interpretation.

Measures

- Increase in density of large woody debris.
- Increased in number of locations where frog calls are heard.
- Permanent population establishment of Brown Toadlet.

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Freshwater Fish

Photo: Mountain Galaxias, Neil Armstrong

- Globally, fish make up over half of the world's vertebrates, with around 10,000 (or 40%) freshwater species, and 60 species recorded in SA. With freshwater habitats making up only 0.01% of the earth's surface, and SA known for being the driest state on the driest continent on earth, this level of diversity is astounding (Hammer, Wedderburn, van Weenen, 2009).
- Fish are remarkably resilient, to which their diversity is owed, often persisting in tiny fragments of suitable habitat. Even still, altered hydrological ecosystems are having a detrimental impact, putting many species at threat of extinction.
- Many freshwater fish live diadromous lifecycles, with part of their lifecycle completed in freshwater, and part in the ocean, relying on seasonally timed flows for flushing of eggs, or adult re-entry into the system. These lifecycles complicate management across multiple jurisdictions, which is why stream management should ideally be tackled as a system. Regardless, management of sections of catchments can create habitat for populations to persist in until conditions are suitable to fulfil their cycle.
- Based on habitat requirements, and distribution it is possible that at least three species of native freshwater fish inhabit Dry Creek – Mountain galaxias (*Galaxias olidus*; SA: Vulnerable), Climbing galaxias (*Galaxias brevipinnis)* and Congolli (*Pseudaphritis uryillii*; SA: Vulnerable). Additionally, with ocean connectivity (outside of the management area) species such as the Pouched Lamprey (*Geotria australis*; SA: Endangered) and Shorthead Lamprey (*Mordacia mordax)* may persist, however further research is required to determine the status of all species in the Dry Creek catchment.

Riffle habitat (when flowing) is an important element of freshwater fish ecosystems.

Stormwater drain improvements aimed to reduce pollutant runoff and erosion will help to improve water quality.

Deep pools are used as refuges for fish during low flow. Bank vegetation helps keep the water cool.

Threats

- Altered hyrdology of Dry Creek due to urbanisation, including poor water quality, erosion and significanlty changed flow regimes.
- Loss of connecting riparian and catchment vegetation.
- Depauperate macroinvertebrate population (lacking food resources).
- In-stream barriers to dispersal.
- Predation and competition from introduced fish species.

Recommendations

- **[1.1 L]** Foster relationships with organisations to undertake a monitoring program in the Dry Creek corridor, to determine what species of fish currently exist and in what abundance, and how to ensure their population persists.
- **[1.1 L]** Establish baseline for aquatic ecosystem condition at permanent monitoring sites upstream, mid and downstream (e.g. Wynn Vale [upper], Valley View [lower].
- **[1.2 C, S]** Implement dispersed small scale stormwater treatment at stormwater / creek connection sites to intercept low rainfall events, and limit the instream impacts to only large rainfall events.
- **[1.3 S, L]** Identify areas of high erosion and focus planting or structural features (gabion rock walls, erosion matting) to prevent further erosion.
- **[1.4 P]** Investigate natural flow regimes and liaise with experts (i.e. NatureGlenelgTrust) to redesign flow regimes with fish species in mind. Alternatively, regional studies show that flows which boost the volume and duration of autumn and spring flows are likely to provide the largest benefit to native fish and broader aquatic ecosystem health across all the western Lofty Ranges reaches (McNeil, Schmarr, Wilson, Reid, 2011).
- **[1.5 O, C]** Ensure ongoing collaboration and consultation with Biodiversity Team and when undertaking and/or planning hydrological works. Consider establishing links with adjacent councils to discuss stream restoration goals and actions.
- **[1.7 C]** Where complementary to the Stormwater Management Plan, install design features includng riffles, backwaters / billabongs and flood plains for habitat diversity.
- **[3.3 O, S]** Install large woody debris and instream rocks and gravel to provide habitat for feeding and breeding (e.g. egg attachment points for Mountain Galaxias).
- **[4.3 O, S]** Plant riparian vegetation to stabilise banks, reduce erosion, increase natural infiltration processes, regulate water temperate and create habitat (shelter, food, breeding). Start in areas of better condition before starting works in highly degraded areas (see indicative maps, Section 9).

Benefits

- Contribute to a greater understanding of the distibution of native freshwater fish in Adelaide waterways.
- Restore natural and sustainable flow cycles to Dry Creek, contributing to improved water quality and species diversity and abundance.
- Contribute to the safe-guarding populations of South Australian freshwater fish species.

Measures

- Species inventory of native and introduced fish species.
- Improvement water quality from baseline level (as per Australian Ecosystem Condition Report methods) within 5 years.

C = Concept Plan, O = Organisational, S = Small Project, L = Large Project, P = Policy

8.1.5 *Invertebrates*

Photo: Rayed Blue Butterfly, Marvin Purvis

- Invertebrates are an extraordinarily diverse group of animals, occurring in all ecosystems from terrestrial to freshwater and marine. They perform important ecosystem services such as decomposition (termites and cockroaches), soil conditioning (worms), pollination (bees and butterflies), and seed dispersal (ants), and serve to provide an important part of the food web.
- The diversity of invertebrate species goes underappreciated, as they are often small or living out of sight, under the ground or in litter, woody debris, and foliage. For example, within Australia, there are over 1700 species of native bees, of which eight of the ten major groups occur in South Australia – Green Carpenter Bees, Reed Bees, Blue Banded Bees, Teddy Bear Bees, Leafcutter Bees, Resin Bees, Homalictus Bees and Masked Bees.
- At least 17 butterfly species are associated with vegetation within the Dry Creek Corridor, including Genoveva Azure (Rare), Rayed Blue (Rare), White-banded Grass-dart (Rare) and Wood White (Rare, vagrant) (Butterfly Conservation SA, 2021).
- Extensive clearing and alteration of wetlands has caused many butterflies dependent on this habitat to become threatened. Projects, such as the Samphire Coast Icon Project, have been successful in rehabilitating populations of endangered species, for example the coastal plains butterfly Yellowish Sedge-skipper (*Hesperilla flavescens*) which relies on *Gahnia filum*.
- The habitat of Dry Creek provides opportunities to extend the refuge for this Endangered invertebrate species and others, by planting sympatric larval food plants, improving water quality, and providing invertebrate homes such as woody debris ground cover and installations such as bee-hotels.
- Appendix 2 provides an overview of butterfly species associated with habitat in the Dry Creek Project Area, and further information regarding their larval food host plant and other specific requirements.

Location at Oratanga Reserve proposed for butterfly garden planting

Mount Lofty Speedwell *(Veronica derwentiana. ssp. homalodonta)*, a threatened plant which is also the larval host of rare butterfly species Rayed Blue.

Small-leaved Mallee-pea (*Eutaxia microphylla*) growing in Fairleigh Reserve is the larval food plant of the Fringed Heath-blue butterfly.

Threats

- Butterfly larval host plants absent from the environment.
- Diversity, density and timing of floral resources limited throughout the year.
- Mismanagement of native grasslands (i.e. un-protected from horticulture management).
- Competition for floral resources by European honeybee.
- Sympatric ant species missing from environment.
- Poor water quality resulting in low aquatic macro-invertebrate diversity.
- Depauperate microhabitat (i.e. leaf litter, woody debris).

Recommendations

- **[2.1 O]** Utilise existing grassland areas to augment species specific butterfly habitat and use grassland plantings as connection corridors.
- **[3.1 O, S]** Clump plantings of larval food plants throughout reserves and integrate ongoing management to ensure resource remains plentiful (i.e. larvae may decimate plantings if occuring in high density).
- **[3.3 C, O]** Landscape plantings to ensure mid-morning and mid-afternoon sun is available, and habitat features such as basking rocks are plentiful.
- **[3.3 O, S]** Reuse / recycle large woody debris around reserves to improve invertebrate biodviersity and abundance across the project area.
- **[4.5 O]** Incorporate a variety of larval food plants (including floral structure diversity) into standard revegetation species list (Appendix 2).
- **[5.1 L]** Undertake targeted planting in Oratanga Reserve for a variety of resident butterflies (Appendix 2) considering location restraints near residential area (i.e. low vegetation planting to reduce risk).
- **[5.4 S, L]** Explore opportunity for threatened plant / rare butterfly planting with endemic plant Mount Lofty Speedwell (*Veronica derwentiana;* SA: Endangered) and Rayed Blue (*Candalides heathi*, Rare)
- **[5.7 L]** Explore opportunity for butterfly reintroduction of Lithochroa Hairstreak (*Jalmenus lithochroa;* SA: Endangered; SA endemic), sympatric with *Acacia pycnantha* and *Iridomyrmex sp*. of ant. Establish connections with Butterfly Conservation SA for advice.
- **[7.6 C, S]** Install native bee hotel and use opportunity for education about native bee species and the problems caused by European honeybees when outside of a managed food / honey production scenario.
- **[7.6 O]** Install interpretive signage about butterfly conservation and lifecycles at Oratanga Reserve and at Fairleigh Reserve where existing planting of *Eutaxia microphylla* provides larval food host for Fringed Heath-blue (*Neolucia agricola agricola*) .
- **[7.1 O, S]** Opportunity for Kaurna engagement using traditional burning methods for grassland maintenance.

Benefits

- Opportunity to improve conservation status of threatened butterfly species.
- Creation of visually aesthetic and engaging nature education space.
- Supporting the food chain from the bottom-up.
- Opportunity to explore reintroduction opportunity for Endangered butterfly Lithochroa Hairstreak, once widespread across the Adelaide Plains.

Measures

- Presence of diversity of butterfly species and evidence of host plant use.
- Successful establishment of threatened butterfly population (Rayed Blue / Lithochroa Hairstreak / Yellowish Sedge-skipper)

C = Concept Plan, O = Organisational, S = Small Project, L = Large Project, P = Policy

8.1.6 Native flora

- Climate change is predicted to cause a rise in temperature of 0.6°C to 1.3°C by 2030. Plant species have evolved to exist within a specific suite of biotic and abiotic factors, however across their range they have adapted to a spectrum of conditions. Using seed provenances from drier or hotter populations and introducing species from arid environments that fulfil a similar ecological function, can help to build future resilience into revegetation projects (DELWP, 2020).

- The AMLR Regional Recovery Plan (Willson and Bignall, 2009) lists several priority Ecological Communities which are under threat. Communities associated with riparian habitat which may occur in Dry Creek include:
    - *Eucalyptus ovata +/- E. viminalis ssp. cygnetensis +/- E. camaldulensis* Low Woodland (high priority) of valleys and drainage lines (Vulnerable)
    - *E viminalis ssp cygnetensis/viminalis* Woodland, alluvial soils in moist areas (Vulnerable)
- Other priority habitats which may occur within Dry Creek and/or could be reconstructed include:
    - *Themeda triandra +/- Danthonia spp*. Tussock Grassland (very high priority) heavy and fertile soils of plains and hill slopes
    - *E. fasciculosa +/- E. leucoxylon* Heathy Woodland (high priority); and
    - *Leptospermum lanigerum* Closed Shrubland (non-saline wetlands).
- Priority riparian and grassy woodland plants identified in the AMLR Regional Recovery Plan which could be considered for introduction include *Crassula siberiana* (SA: E), *Gahnia radula (*SA: R), *Glycine tabicina* (SA: V), *Helichrysum rutidolepis* (SA: E), *Correa calycina var.calycina (*EPBC: V, SA: V), *Dianella longifolia var.grandis (*SA: R), and *Glycine latrobeana* (EPBC: V, SA: V).
- Appendix 1 provides the phenology of the current CTTG revegetation species list, and provides additional suggested species to incorporate.

Kangaroo Grass (*Themeda triandra*) is larval host for multiple common butterfly species. Grassland extensions would help boost butterfly populations

Feral swarms of European honeybee may threaten long distance pollination processes for some species.

Pale Everlasting (*Helichrysum rutidolepis*) a possible plant for introduction to Dry Creek. (Photo M. Fagg)

Threats

- European honeybees reducing pollination distance and genetic dispersal.
- Availability of pollinators (honeyeaters).
- Lack of natural regeneration/ recruitment of remant and planted species such as *E. porosa (*remnant, Kingfisher Reserve) and *Acacia paradoxa* (planted, Druminor Reserve).
- Weed encroachment choking riparian vegetation and threatening revegetation projects.
- Dieback (causes unknown, but possible insect infestation due to low numbers of insectivorous birds).
- Climate change .

Recommendations

- **[4.2 O, S]** Investigate and utilise novel approaches to grassland restoration, such as removal of topsoil before direct seeding.
- **[5.2 O, S]** Establish floral botanical diversity garden within Fairleigh Reserve and integrate with *Get Growing* program.
- **[5.3 S]** Collect and propogate seed from remnant individuals such as Peppermint Box (*Eucalyptus odorata)* growing in Kingfisher Reserve (see Map in Section 9.1).
- **[5.4 S, L]** Plant sympatric threatened plant / butterfly species including *Gahnia radula* and *Veronica derwentiana.*
- **[5.4 S, L]** Establish connection with South Australian Seed Conservation Centre to investigate ex-situ conservation opportunities for AMLR and State priority plant species to safeguard against regional species extinction.
- **[5.6 O]** Build formal system for monitoring success of revegetation plantings (i.e. species and provenance success) to inform ongoing revegetation.
- **[5.7 O, S]** Establish bush food garden in Fairleigh Reserve, with opporunity for Kaurna involvement and interpretation.
- **[6.6 O]** Build resilience into regeneration species list by selecting plants with low rainfall / higher temperature provenances. Consider multi-provenance or targeted provenance plantings of *E. leucoxylon* for upper-storey floral continuity (Merigot and Paton 2018).
- **[7.1 O, S]** Investigate opportunity to implement cultural burning practices in sections of native grassland. Ensure timing does not coincide with larval phase of host butterfly species.
- **[7.3 O, S]** Establish connections with plant conservation groups.

Benefits

- Opportunity to expand threatened plant species populations and provenance on public land and to create insurance populations.
- Ensure the future viability of native vegetation within the corridor by building resilience and self-sufficiency into plant populations.
- Opportunity to build knoweldge on plant populations and successful restoration techniques.

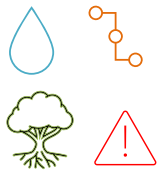
Measures

- Evidence of natural plant recruitment of a variety of species within corridor.
- Successful establishment of threatened plant species.

C = Concept Plan, O = Organisational, S = Small Project, L = Large Project, P = Policy

9 RESERVE PLANS

Reserve	Theme	Recommendations and Project Ideas
Kingfisher 	▪ Small insectivorous birds ▪ Microbats ▪ Frogs ▪ Reptiles ▪ Kaurna connections ▪ Targeted erosion control	▪ Collaboration with future wetland restoration and stormwater management projects ▪ Linking habitat for Superb Fairy-wrens and creating additional habitat ▪ Novel habitat features including reptile rockeries, frog backwaters, habitat trees and microbat hotels. ▪ Integration of biodiversity and Kaurna cultural elements into Lot 50 works ▪ Establish ABBC monitoring points ▪ Ongoing weed management.
Druminor 	▪ Microbats ▪ Echidnas ▪ Landscape Linkages (to adjacent corridor) ▪ Kaurna water connections (Druminor Lake)	▪ Collaboration wetland restoration and stormwater management projects and undertake riparian in-stream restoration. ▪ Incorporate Kaurna values into Druminor Lake interpretation ▪ Habitat restoration at culverts to improve linkages ▪ Habitat restoration for echidna habitat. ▪ Ongoing weed management.
Oratanga 	▪ Butterflies ▪ Grassland restoration ▪ Kaurna cultural burning	▪ Butterfly garden for common and endangered species including habitat features and nature-play ▪ Extend and protect native grassland ▪ Investigate potential for cultural burning. ▪ Ongoing weed management.
Fairleigh 	▪ Kaurna occupation ▪ Community focus – botanic garden, bush-tucker garden	▪ Install floral diversity garden – botanic garden of Dry Creek – integrate with *Get Growing* program. ▪ Bush-tucker Garden and interpretation around Kaurna occupation ▪ In-stream habitat restoration (water use by Kaurna) – Eastern Water Skink focus. ▪ Ongoing weed management.

Solandra 	▪ Wetland restoration ▪ Cultural connections	▪ Collaboration on wetland restoration and stormwater management projects ▪ Integration of Kaurna and Japanese culture – sister city ▪ Habitat plantings. ▪ Ongoing weed management.
Edinburgh 	▪ Wetland birds ▪ Habitat features (logs / rocks) ▪ Frogs	▪ Floodplain restoration planting for frogs (Brown Toadlet) ▪ Bird hide / observation space ▪ Landscape linkage plantings along road. ▪ Ongoing weed management.
Dawson 	▪ Connectivity ▪ Kaurna water connections	▪ In-stream restoration for Kaurna water connections ▪ Connectivity plantings for linkages to Anstey Hill via corridor. ▪ Ongoing weed management.
Vaucluse and Valley View 	▪ Threatened plants ▪ Microbats	▪ Microbat roost site installation ▪ Possible threatened plant reintroduction (collaborate with working group already in Valley View / Vaucluse). ▪ Ongoing weed management.

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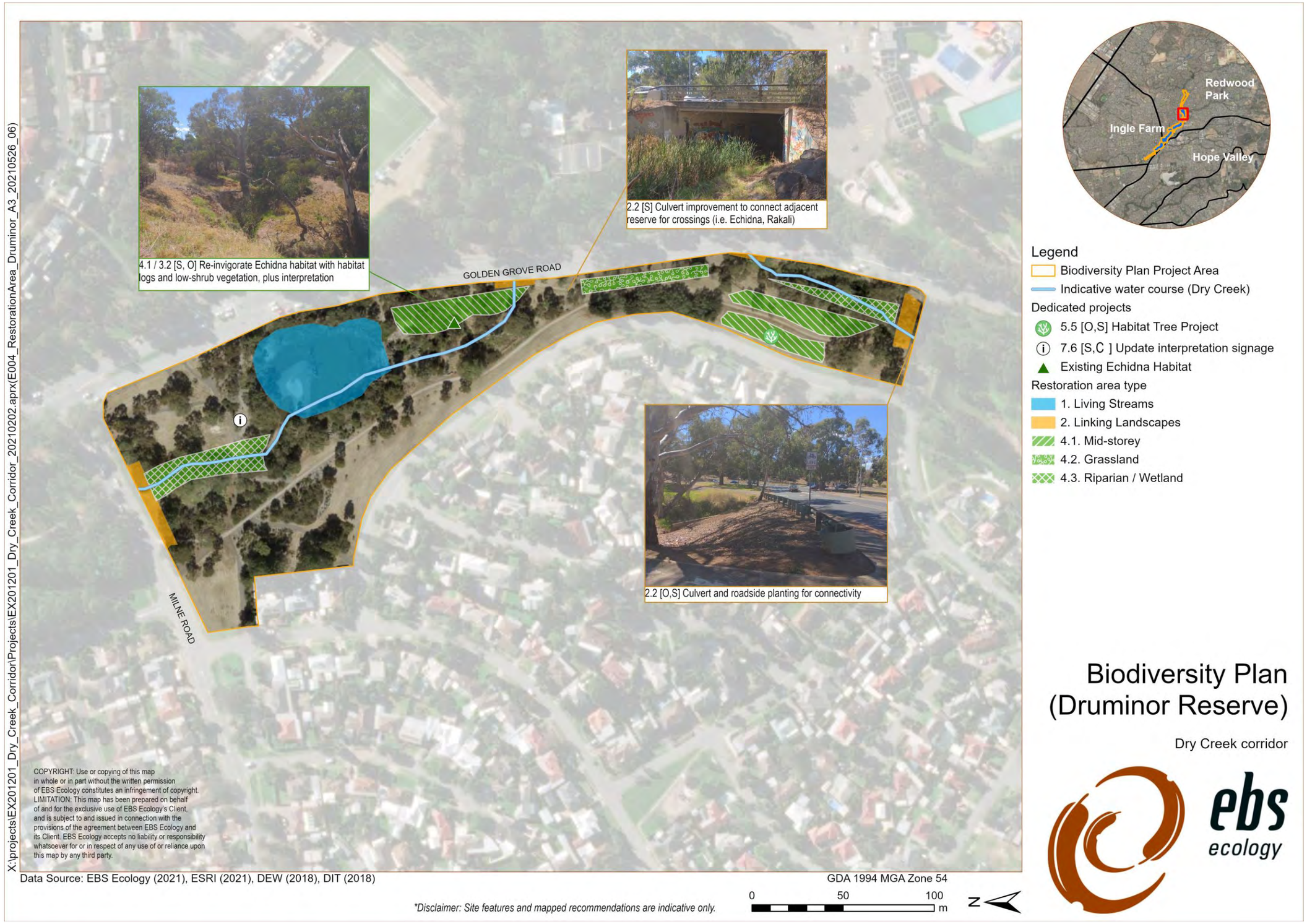
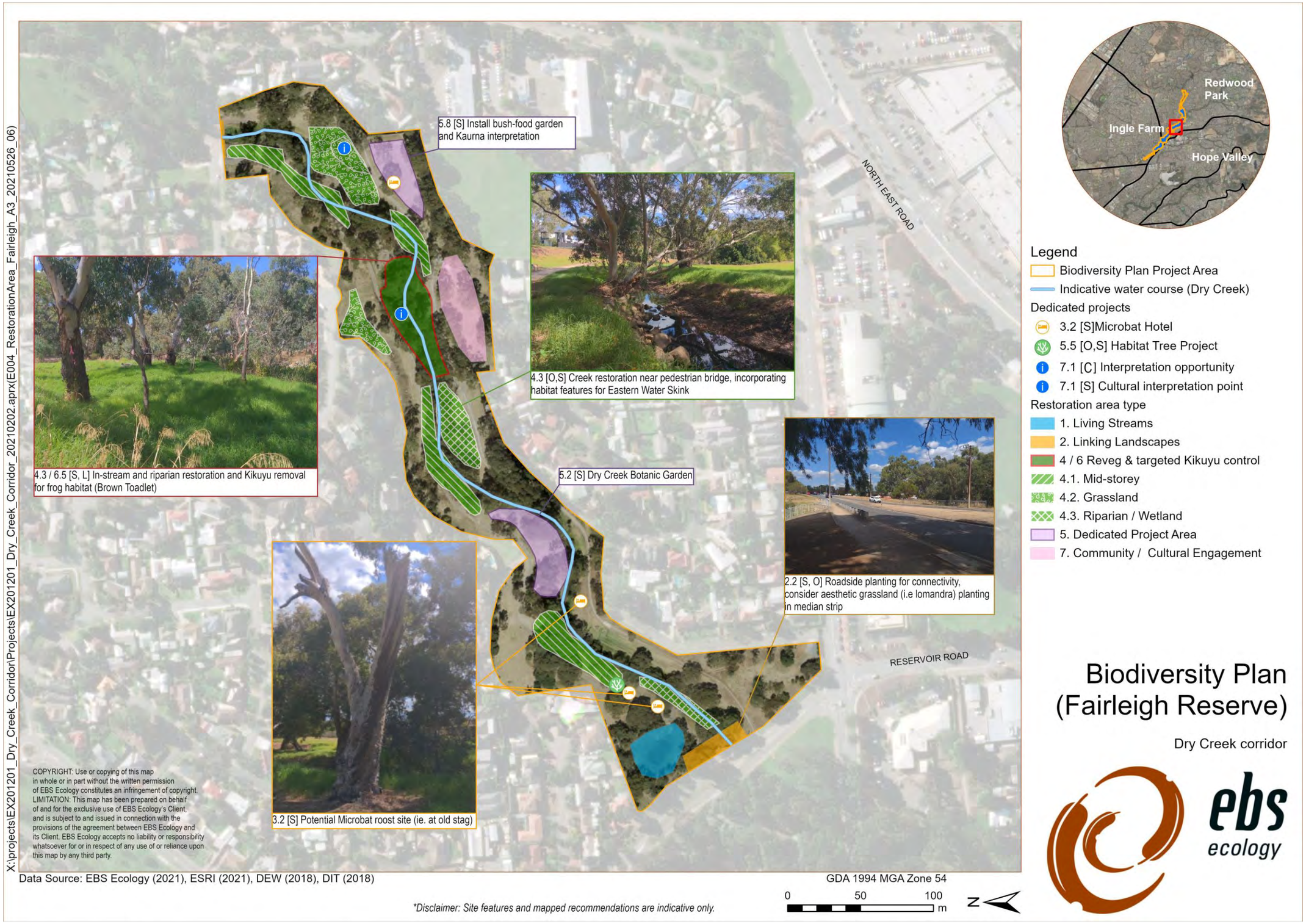
9.1 Kingfisher Reserve

9.2 Druminor Reserve



9.3 Oratanga Reserve

9.4 Fairleigh Reserve

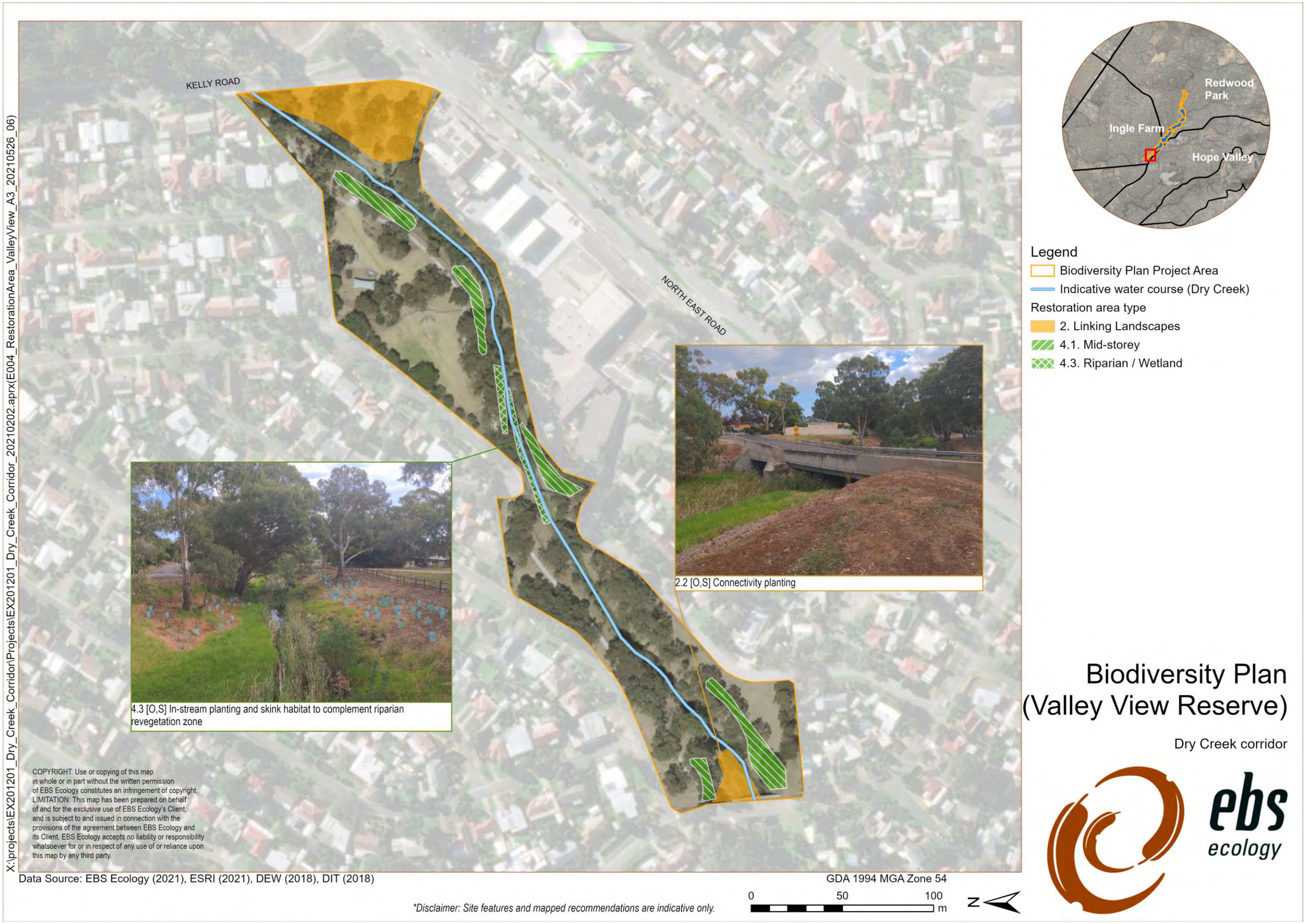


9.5 Solandra Reserve

9.6 Edinburgh Reserve

9.7 Dawson Reserve

9.8 Valley View Reserve



9.9 Vaucluse Reserve

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Appendix 1 – Modbury Precinct Dry Creek corridor map

Appendix 2 – Revegetation species list

Flowering phenology of plants on the existing CTTG revegetation species list, planted in accordance with CTTG Biodiversity Standard Methods (CTTG 2020), with suggestions for additional plant species to fill flowering gaps. particularly in Autumn and Winter, and to provide varied floral structures. Flowering times as advised by *eFlora South Australia*, *It's Blue With Five Petals* (A. Prescott, 1991), *Focus on Flora* (Kersbrook Landcare Group, 2017) and personal communication with R. Taplin.

	Summer			Autumn			Winter			Spring		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Stage 1 Plants												
Acacia ligulata												
Acacia melanoxylon												
Acacia notabilis												
Acacia paradoxa												
Acacia pycnantha												
Acacia retinodes var. retinodes												
Acacia salicina												
Allocausarina verticillata												
Callistemon rugulosus												
Callitris gracilis												
Dodonaea viscosa subsp. spatulata												
Eucalyptus camaldulensis												
Eucalyptus fasciculosa												
Eucalyptus leucoxylon ssp. Leucoxylon												
Eucalyptus porosa												
Leptospermum lanigerum												
Myoporum viscosum												
Olearia ramulosa												
Pittosporum phylliraeoides var. macrocarpa												
Senna artemisioides ssp. petiolaris												
Stage 2												
Acacia acinacea												
Acacia myrtifolia va. myrtifolia												
Allocasuarina muelleriana												
Atriplex semibaccata												
Banksia marginata (not on clay)												
Billardiera cymosa												
Bursaria spinosa												
Callistemon sieberi (wet areas)												
Calytrix tetragona												
Clematis microphylla												

Cullen australasicum												
Daviesia leptophylla												
Daviesia ulicifolia ssp. Incarnata												
Enchylaena tomentosa var. tomentosa												
Eutaxia microphylla var. diffusa												
Hakea carinata												
Hakea rugosa												
Hardenbergia violacea												
Lavatera (Malva) plebeia												
Leptospermum continentale												
Leptospermum myrsinoides												
Maireana brevifolia												
Melaleuca brevifolia												
Pultenaea largiflorens												
Thomasia petalocaylx												
Stage 3 and 4												
Calocephalus citreus												
Chrysocephalum (Helichrysum) semipapposum												
Chrysocephlaum (Helichrysum) apiculatum												
Convolvulus erubescens												
Convolvulus remotus												
Cymbopogon ambiguus												
Cyperus vaginatus												
Danthonia caespitosa												
Danthonia linkii												
Danthonia setacea												
Dianella revoluta subsp. revoluta												
Dichanthium sericeum												
Einadia nutans												
Enneapogon nigricans												
Eutaxia microphylla subsp. Microphylla												
Goodenia albiflora												
Goodenia amplexans (benthamiana)												
Grevillea lavandulacea ssp. lavandulacea												
Hakea rostrata												
Halgania cyanea												
Helichrysum scorpioides												
Isolepis nodosa												
Juncus krausii												
Kennedia prostrata												
Kunzea pomifera												
Lomandra densiflora												
Lomandra multiflora ssp. dura												

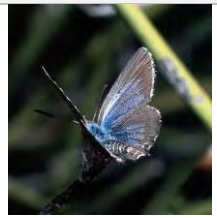
Lotus australia												
Poa labillardieri var. labillardieri												
Pultenaea daphnoides												
Santalum acuminatum												
Scaevola linearis ssp. Confertifolia												
Stipa elegantissima												
Stipa mollis												
Stipa nodosa												
Themeda triandra												
Vittadinia blackii												
Wahlenbergis stricta ssp. Stricta												
Xerochrysum bracteatum												
Arid trial species												
Acacia argyrophylla												
Acacia brachybotrya												
Acacia calamifolia												
Acacia hakeoides												
Acacia halliana												
Acacia lineata												
Acacia montana												
Acacia nyssophylla												
Acacia oswaldii (irregular)												
Acacia sclerophylla												
Acacia victoriae												
Callistemon brachyandrus												
Hakea mitchellii												
Melaleuca lanceolata												
Rhagodia parabolica												
Suggested additions / trial species (further advice required)												
Acrotriche cordata												
Acrotriche patula												
Adenanthos terminalis												
Astroloma conostephioides												
Astroloma humifusum												
Baeckea crassifolia												
Brachyloma ericoides												
Calostemma purpureum												
Cassinia arcuata												
Choretrum glomeratum var. glomeratum												
Correa alba												
Correa calycina var calycina												
Correa decumbens												
Correa eburnea												
Correa glabra												
Correa reflexa												

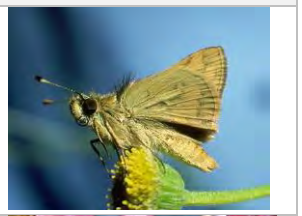
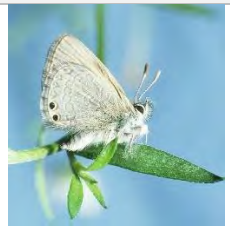
Cryptandra hispidula												
Cullen australasicum												
Daviesia brevifolia												
Epacris impressa												
Eremophila behriana												
Eucalyptus leucoxylon ssp. leucoxylon (provenance e.g. Wadmore Park)												
Exocarpos cupressiformis												
Exocarpos sparteus												
*Gahnia radula**												
Glycine tabicina												
Goodenia varia												
*Helichrysum rutidolepis**												
Ixodia achillaeoides												
Leptomeria aphylla												
Leucopogon cordifolius												
Leucopogon rufus												
Lomandra effusa												
Patersonia occidentalis												
Phyllota pleurandroides												
Spyridium vexilliferum												
Styphelia exarrheana												
*Veronica derwentiana** (ssp. *anisodonta*: R; *homalodonta*: EN)												

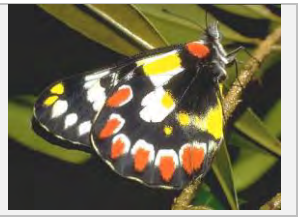
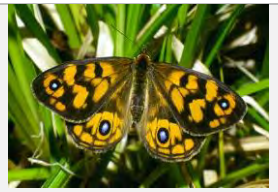
Appendix 3 - Butterfly species requirements

The following list presents butterfly species local to the Adelaide Plains region, that are known to inhabit vegetation communities found within Dry Creek, in particular '*Plant Community No.4'* – woodland dominated by River Red Gum (*E. camaldulensis*) and SA Bluegum (*E. leucoxylon*) with sub-storey of Silky Tea-tree (*Leptospermum lanigerum*), Totem Poles (*Melaleuca decussata*) and River Bottlebrush (*Callistemon sieberi*). Information is collated from *Butterfly Conservation SA website* (2021) and on *South Australian Butterflies and Moths* website (Grund R., 2021), also using images from this website (Grund R., 2021) to provide a guide for construction of butterfly attracting gardens in Dry Creek.

Common Name	Scientific name	Status	Larval food plant	Other information	Image
Broad-margined Azure	*Ogyris olane*	L	*Amyema miquelii* (box mistletoe), *A. pendula pendula* (drooping mistletoe) (associated with *Eucalyptus* and *Acacia melanoxylon*)	Larval attendant ant (esp. *Podomyrma adelaidae*)	
Common brown	*Heteronympha Merope Merope*	C	*Austrostipa, Imperata cylindrica, Microlaeana stipoides, Poa, Themeda triandra, Gahnia sieberiana*		
Common grass-blue	*Zizena labradus*	C(M)	Native and introduced legumes including *Crotalaria eremaea Strehlowii, Cullen australasicum/pallidum/patens; Daviesia brevifolia, Glycine, Hardenbergia, Indigofera*	Larval attendant ant (*Iridomyrmex)*	
Fringed Heath-blue	*Neolucia agricola agricola*	L	Small bush pea plants including *Aotus, Bossiaea, Daviesia, Dillwynia, Eutaxia, & Pultenaea*	Eggs remain dormant over summer and winter. No necessary obligate ant species.	

Genoveva Azure	*Ogyris genoveva*	R	*Amyema miquelii* (box mistletoe) *A. pendula pendula.* (*Eucalyptus and A. melanoxylon*)	Sugar ants (*Camponotus consobrimnus*) as larval hosts. Require minimum temperatures of between 6 and 12 degrees.	
Long-tailed Pea-blue	*Lampidies boeticus*	L(M)	Numerous native legumes including *Crotalaria, Cullen australasicum/patens, Gompholobium ecostatum, Kennedia prostrata, Indigofera, Lotus australis, Sesbania cannabina, Swainsona*.	Sugar ants sometimes utilised.	
Marbled Xenica	*Geitoneura klugii*	C	Native and introduced grass including *Rytidosperma, Austrostipa flavescens, Poa labillardieri / morrisii / tenera, Themeda triandra*	Rainfall in excess of 300mm and guaranteed autumn rain, prefers cool shady and damp areas	
Meadow Argus	*Junonia villida calybe*	C(M)	Numerous native and introduced herbaceous plants including *Goodenia pinnatifida, Scaevola aemula, Portulaca oleracea, Stemodia florulenta*		
Rayed Blue	*Candalides heathi heathi*	R	*Prostanthera, westringia (rigida) eremophila (deserti, gilesii, longifolia), myoporum acuminatum,* ***Veronica derwentiana****, Stemodia florulenta, Pimelea spp.*	Small black ants (I*ridomyrmex*) (not critical)	
Saltbush blue	*Theclinesthes serpentata*	C	Saltbushes including *A. rhagodioides, paludosa, semibaccata, suberecta.* Also, *einadia nutans, Rhagodia candolleana / crassifolia / eremaea / parabolica / spinescens*	Small black ants (I*ridomyrmex*) (not specialised)	

Satin Azure	*Ogyris amaryllis meridionalis*	C	*Amyema mistletoe sp. including gibberula / linophylla orientale / maidenii maidenii / melaleucae / miquelii / miraculosa boormanii / pendula pendula / preissii / quandang quandang*.		
Southern Grass-dart	*Oxybadistes walkeri*	L Rare outside of Southern Lofty Ranges	Native and introduced grasses, including *Enteropogon acicularis,/ ramosus. Themeda triandra, Cyperus vaginatus*	Prefers damp grassy creek courses	
Tailed Emperor	*Polyura semprionius*	R (not local?)	*Acacia pycnantha*, and other native (interstate) and ornamental trees of legume origin.	Large spectacular butterfly, vagrant from interstate.	
Two-spotted Line-blue *	*Nacaduba biocellata biocellata*	C	*Acacia* species including *iteaphylla / ligulata / longifolia sophorae / melanoxylon / nematophylla / oswaldii / payprocarpa / pycnantha / retinodes / reigens / salicina.*	Small black ants (I*ridomyrmex*) (not specialised)	
Wattle Blue	*Theclinesthes miskini miskini*	L	*Acacia* species including *A. pycnantha / tetragonophylla / victoriae victoriae*	Small black ants (I*ridomyrmex*) (not specialised)	
White-banded Grass-dart	*Taractrocera papyria*	R	Grasses including *Rytidosperma, Austrostipa scabra, Enteropogon acicularis, Microlaeana stipoides,*	Flies in grassy areas above the tops of the grass.	

Wood White	*Delias aganippe*	R (Va)	*Amyema* (Mistletoe) including *linophylla / melaleucae / miquelii / pendula / preissii / quandang var. quandang.* Also, *Exocarpos aphyllus / **cupressiformis** / strictus and. **Santalum acuminatum***	Toxic properties from hostplants. Used to be widespread in Adelaide plains, now vagrant and rarely seen. Slow flight, susceptible to predation.	
Yellowish Sedge-skipper	*Hesperilla donnysa donnysa*	E	*Gahnia clarkei / deusta / filum (brackish) / **radula***/ sieberiana / trifida.*	Normally coastal species.	
Bright-eyed Brown (unlikely – only in the far south east)	*Heteronympha cordace wilsoni*	E	***Carex appressa*** (Tall sedge) / *fascicularis (cyperaceae*). Wetland grasses including *Microleana stipoides*		
Lithochroa Hairstreak	*Jalmenus lithochroa*	E	*Acacia pycnantha / victoriae* *Possible reintroduction project from Mid-north, but on advice given status of populations and lack of guaranteed success.	Only butterfly believed to be endemic to SA. Small black ants (*Iridomyrmex sp.*) Once widespread on Adelaide Plains.	
Fiery Jewel	*Hypochrysops ignites ignitus*	V	*Cassinia, Olearia axillaris, Brachyloma daphnoides, Acacia leiophylla / longifolia/ mearnsii/ **pycnantha**; Eucalyptus, Banksia, Grevillea, Pomaderris, Choretrum glomeratum, Exocarpos aphyllus / cupressiformis, Dodonaea humilis/angustissima*	Small dark brown papyrius group (unlikely to occur – only in pristine habitats, plus dependent on one species of ant)	
Code for species Status: E – Endangered, V – Vulnerable, R – Rare, L – Local (Uncommon), C – Common, M – Migrant, Va – Vagrant, NVa – Northern Vagrant, I – Introduced.					

Appendix 4 – Expert consultation contact list

Below is the list of experts who were contacted in addition to ongoing consultation with the broader Project Team, including CTTG staff and Green Adelaide team.

Contact	Organisation (if applicable)	Expertise	Key messages
David Paton	BioR	Woodland birds / habitat restoration	- Build in self-sustainability to revegetation projects (pollination, climate resilience provenances) - For the best bird response ensure structural and floristic diversity - Importance of planting in clumps of species to enable cross pollination - Many birds require larger territories than Dry Creek - Largest benefits to be had in community engagement when working with biodiversity in urban environments - Understated threats – feral honeybees
Donna Belder	Department of Agriculture, Water and the Environment (DAWE)	Woodland birds / bushland regeneration	- Structural and floral diversity is key to attracting diversity of birds - Focus on connections / linkages from remnant patches to repopulate urban corridors - Reluctance of small birds to cross large open patches of habitat – importance of planting even just grasses to facilitate movement
Hayley Merigot	EBS Ecology	Botany / flowering phenology	- Importance of creating diversity in landscape and having floral resources - ***E. leucoxylon* flowers throughout the year, depending on its provenance. Reduction in habitat on the Adelaide Plains, when autumn flowering used to occur, has reduced flowering at this time. CTTG area is where autumn flowering *E. leucoxylon* currently occurs.**
Jan Forrest	Butterfly Conservation SA	Invertebrates (butterflies)	- Concentrate on caterpillar food plants (missing food plants is the primary threat to butterfly species) - Plant a variety of nectar resources for year-round food - Do not forget about moths – 98% of caterpillars are moth species which typically use Eucalyptus and Acacia species for food plants.
Joanne Ocock	NSW National Parks and Wildlife Service	Aquatic ecology (frogs)	- Variety in stream / creek environments is key. - When restoring habitat, build in variety of depth, width, bends, meanders, backwaters, and vegetation. - Deep pools are key to maintain aquatic fauna in drought - Increase frog habitat to augment the food chain (tadpoles are food for snakes, birds, reptiles etc).
Joel Allan	Hills and Fleurieu Landscape Board	Woodland Birds	- Birds have varying requirements for home range sizes, many birds cannot fulfil their whole lifecycle in an area the size of Dry Creek. - Recognises the loss of habitat trees – large lateral branching trees with grassy understory. Importance for variety of birds to forage.

Nick Whiterod	Aquasave	Aquatic ecology	- What parameters are required in a river for a particular fish? - Likely that Mountain Galaxias and Climbing Galaxias may inhabit Dry Creek. - Recommend baseline surveys to determine aquatic macro-invertebrate population and occurring fish species. - Restoring water flows can have a big impact on fish populations. Stream restoration should focus on flow restoration. - Importance of monitoring before and after restoration implemented. - Happy to be contacted to help with development of flow programs and to put together species lists to guide restoration.
Peter Matejcic	SA Herpetology Group	Reptiles, local knowledge	- Eastern Water Skinks have recently appeared in the Dry Creek corridor – presumably come up through linear park into the reservoir and then entered Dry Creek where they now exist in the mid-section to Mawson Lakes. - Water Rats (*Hydromys chrysogaster*) has been observed in Dry Creek. Interesting focus species – potentially can outcompete feral Black Rats. - Recommend creating more ponding habitat and reducing areas where reeds are choking stream bed.
Rosemary Taplin	NA	Botany	- Importance of community involvement and engagement in works to ensure success - Use of 'pond sludge' as fertiliser - Long term observation of declining bird species in urban environment, and a switch to more aggressive species such as noisy miners and rainbow lorikeets. - Kersbrook Nursery salvages hollows and redistributes them - Tea Tree Gully one of the only areas remaining on the Plains with intact Pink Gum (E. fasciculosa). - Winter and autumn flowering plant species include Correa spp.
Terry Reardon	SA Museum	Bats	- Unclear what reduces bat diversity in urban environments but suggest lack of insect prey, roosting habitat and interference from noise / lights - Anticipate increase in Grey-headed Flying-foxes in Adelaide region - Importance of monitoring to establish baseline and measure change - Experiment with bat roosting furniture and placement and share findings - Importance of community engagement and use of technology (i.e. cameras, bat detectors) to gain interest.

Appendix 5 – Threatened flora species list and likelihood assessment

Species	Common name	Status		Date of last record	Habitat	Likelihood of occurrence within Project Area
		EPBC	NPW			
EPBC Listed Species (PMST Identified)						
Callistemon teretifolius	Needle Bottlebrush	-	-	-	AMLR (Vulnerable). Rocky slops and near creeklines, typically Northern Lofty and Flinders Ranges. Grows with *Bursaria spinosa, Acacia paradoxa, prostanthera behriana and Myoporum viscosum*. Flowers Oct-Dec.	**Possible –** suitable habitat may exist. Drier adapted species may be suitable for introduction in riparian planting. Advice required.
Euphrasia collina ssp. osobornii	Osborn's Eyebright	E		May occur	Endemic to SA, from YP, mid-north, southern Lofty and KI. Mallee scrub, forests, woodlands and coastal heath. Moist, open habitats, thrives after fire. (Greening Australia 2010).	**Possible –** suitable habitat may exist, but weed (Kikuyu) invasion would pose significant threat to reintroduction.
Glycine latrobeana	Clover Glycine	V		Likely	Low lying seasonally inundated grassy woodlands dominated by *E. viminalis subsp. Cygnetensis* and/ or *E. leucoxylon.* Can co-occur with *Pterostylis cucullata*) (Carter and Sutter 2010)	**Possible –** suitable habitat may exist, but weed (Kikuyu) invasion would pose significant threat to reintroduction.
Glycine tabacina	Variable Glycine		V	-	AMLR: Endangered. Perennial twining herb occurring in woodland habitats including *E. camaldulensis* over sparse *Bursaria spinosa*.	**Possible –** suitable habitat may exist, but weed (Kikuyu) invasion would pose significant threat to reintroduction.
Prasophyllum pallidum	Pale Leek-orchid	V		Likely	Fertile soils of woodland and well-grassed open forests. Associated with *E. leucoxylon* open forest and others. Records from Anstey Hill. Traditional food source for aboriginal people (DEH 2008).	**Possible –** suitable habitat may exist, but weed invasion, and management would pose significant threat to reintroduction.
Prasophyllum pruinosum	Plum Leek-orchid	EN	E	Known 2000	The Plum Leek-orchid is endemic to SA, where it has been recorded in the Adelaide and MLR region from eight geographically isolated and distinct locations, which extend from the Barossa Valley to Belair NP. Preferred habitat includes open woodland and grassy forest, in the open or in the shelter of broom-like shrub growing in fertile loams, usually with other leek-orchids (Bates, 2009).	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Pterostylis cucullata	Leafy Greenhood	V		Likely	All remaining populations in E. leucoxylon Open Forest with E. viminalis and E. camaldulensis. Sparse A. pycnantha, Bursaria spinose and Acrotriche fasciculiflora understorey. Diverse groundcover (Quarmby 2010)	**Possible –** historical records from Tea Tree Gully. Possibility of habitat management for protected reintroduced population.
Veronica derwentiana ssp. homalodonta	Mt Lofty Speedwell	CE	E	-	Beside streams and waterfalls, in moist sites in gullies or near creeks in high rainfall areas,	**Possible –** suitable habitat may exist.

					typically south of Mount Lofty. Fragmented populations exist. Woodland, wetland and heathy open forest (DEH 2008)	Sympatric butterfly species Rayed Blue.
NPWS (state) and AMLR (regional) threatened species						
Austrostipa gibbosa	Swollen Spear-grass		R	2004	Grows in rich loamy soils along creeks and in other seasonally wet places. Also prefers open forests and woodlands or grasslands with *Eucalyptus odorata, Acacia pycnantha, Allocasuarina verticillata and Rhytidosperma setaceum*.	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Austrostipa multispiculis	Many-flowered Spear-grass		R	2014	Grows in open grassland with *Austrostipa nodosa, A. eremophila and Rhytidosperma setaceum and Aristida sp.*	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Cladium procerum	Leafy Twig-rush		R	1995	In the MLR, a few recent records from in and around Sturt Gorge RP. Grows in largely aquatic environs including coastal swamps and margins of lakes (DENR, 2012)	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Crassula siberiana			E	-	In Para Wirra RP is found in *E. camaldulensis var. camaldulensis* woodland over *Callistemon sieberi, Avena barbata, Dodonaea viscosa ssp. spatulata* and *Acacia paradoxa*.	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve. Consider for re-introduction.
Cullen parvum	Small Scurf-pea		V	2014	Generally associated with alluvial plains, creeks, ephemeral pools and river channels. It grows in grassy woodland or open forest vegetation dominated by species of Eucalyptus, or in grasslands. Considered almost extinct in this region. Sucessful ex-situ cultivation programs (DAWE 2005).	**Possible –** suitable habitat exists, recent records within 5 km. Possible for reintroduction.
Dianella longifolia var. grandis	Pale Flax-lily		R	2002	Grassy woodland specialist living under a variety of Eucalypt species including *E. leucoxylon* (DEH 2008)	**Possible –** some preferred habitat may exist. Possibility for reintroduction or planting list.
Eucalyptus fasciculosa	Pink Gum		R	2017	Often in poorer sandy soils, in woodland or as an emergent in low shrublands. Commonly associated with *E. baxteri, E. cosmophylla, E. diversifolia, E. leptophylla and E. leucoxylon* (Nicolle, 2013)	**Likely –** known from Tea Tree Gully as one of last strongholds (Taplin. *pers comms*). Can be included into revegetation species list.
Eucalyptus viminalis ssp. viminalis	Manna Gum		R	2018	Woodlands in Lofty Ranges, from wetter regions, mountain valleys, alluvium on streams. Flowering in spring, summer and autumn (Euclid, 2021)	**Possible –** suitable habitat may exist, no recent records within 5 km.
Eucalyptus viminalis ssp.cygnetensis	Rough Barked Manna Gum			-	Woodlands in Lofty Ranges, from wetter regions, mountain valleys, alluvium on streams. Flowering in spring, summer and autumn. (Euclid, 2021)	**Possible –** suitable habitat may exist, no recent records within 5 km.
Gahnia radula	Thatch Saw-sedge		R	-	Riparian and Heathy woodland, typically in creeks and swampy areas. Forms a clonal patch, to 1m high. Flowers March, July-Aug, Oct-Nov (DEH 2008). Larval food plant of Skipper	**Possible –** suitable habitat exists, no records in 5km. Possible for reintroduction for in-stream and wetland planting.

					butterfly species. (AMLR, Endangered)	
Helichrysum rutidolepis	Pale Everlasting		E	-	Perennial of woodland along watercourses in grassy understory of *E. camaldulensis.* Flowers January to March or July (DEH 2008). AMLR Endangered.	**Possible –** suitable habitat exists, no records in 5km. Possible for reintroduction for riparian planting.
Juncus australis	Austral Rush		R	2004	Grows in wet or seasonally wet grassland often in the shade (eFloraSA, 2021e)	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Juncus radula	Hoary Rush		V	1998	Grows in seasonally wet places in climatically dry regions. Grassy woodland and Riparian habitats. (eFloraSA, 2021f)	**Possible –** suitable habitat exists, recent records within 5 km, none within the Dry Creek reserve.
Potamogeton ochreatus	Blunt Pondweed		R	2009	Freshwater aquatic plant, which floats in mats, and is rooted in mud. Occurs in still or flowing water to 4.5 m deep in reivers, channels, lakes and damns on deep silt or gravel. Co-occurs with Juncus pallidus, J. sarophorus, Eleocharis sp. (AMLR Threatened).	**Possible–**some suitable deep-water habitat may exist in Project Area. Possible consideration for wetland introduction. Advice required.
Pultenaea dentata	Clustered Bush-pea		R	-	Occurs in swamps or along the edge of streams. Associated with mixed leptospermum shrubland with emergent *Viminaria juncea,,* or *Acacia retinodes* and sedge udnerstorey. Also mixed sedgeland (AMLR, Endangered) (DEH 2008)	**Possible –** suitable habitat around wetland areas exists, no records in 5km. Possible for introduction for wetland planting.
Ranunculus papulentus	Large River Buttercup		V	-	Perennial herb, occurring in wet freshwater environments on moud or in pools (AMLR: Endangered) (DEH 2008)	**Possible –** suitable habitat around wetland areas exists, no records in 5km. Possible for introduction for wetland planting.
Wurmbea latifolia ssp. latifolia	Broad-leaf Nancy		V	2016	Habitat poorly known, apparently grows in heavy soils (eFloraSA, 2021h).	**Possible –** suitable habitat may exist, recent records within 5 km, none within the Dry Creek reserve.

Appendix 6 – Threatened fauna species list and likelihood assessment

Scientific name	Common name	Status		PMST category/NatureMaps Sighting Date	Habitat	Likelihood of occurrence within Project Area
		EPBC	NPW			
Birds						
Anhinga novaehollandiae novaehollandiae	Australasian Darter		R	2 2009	Estuaries, wetlands with trees, logs and well vegetated banks (Morcombe 2021)	**Likely –** suitable wetland habitat exists in Project Area, recent records within 5 km.
Botaurus poiciloptilus	Australasian Bittern	E N	E	1,2 Known, 1991	Freshwater wetland, occasionally estuarine. Prefers heavy vegetation, flooded shrubbery, reedbeds and sedges. (Morcombe 2021)	**Possible –** suitable wetland habitat may exist in Project Area, and riparian revegetation will improve habitat for this species.
Chalcites basalis	Horsfield's Bronze-cuckoo			3	In almost all habitats except dense vegetation, including forest, woodland, roadside trees. Perches to hawk insects from the ground. (Morcombe 2021)	**Possible –** suitable habitat may exist in Project Area, and shrub and grassland restoration may improve resource availability for this species
Falcunculus frontatus frontatus	Eastern Shrike-tit		R	2 2008	Open forest, woodland, mallee, riverside and watercourse trees, cypress pines, banksia woodland. (Morcombe 2021)	**Possible –** suitable habitat exists in Project Area, and riparian and verge revegetation will improve habitat for this species.
Gratiella picta	Painted Honeyeater	V		1 Likely	Forest, woodland, dry scrub often with abundant mistletoe. (Morcombe 2021)	**Possible –** suitable habitat exists in Project Area, and consideration of floral resources and structural diversity will benefit this species.
Hirundapus caudacutus	White-throated needletail	V		1 Known	Uses high open air spaces above almost any habitat. (Morcombe 2021)	**Likely** – not considered likely to be impacted by restoration works.
Lophoictinia isura	Square-tailed Kite		E	2 2015	Eucalypt woodland, open forest and heath woodland. In drier regions, usually breeds near a watercourse. (Morcombe 2021)	**Possible –** suitable riparian and woodland habitat may exist in Project Area, and riparian revegetation may improve resource availability for this species
Melithreptus gularis gularis	Black-chinned Honeyeater		V	3	AMLR: Vulnerable. Occupy Eucalypt woodland with annual rainfall of 400-700mm, incorporating mature and regenerating eucalypts. Eats insects, nectar and lerps. Range has contracted (DEW 2008)	**Possible –** suitable habitat may exist in Project Area, and mid-storey revegetation may improve resource availability for this species.
Microeca fascinans fascinans	Jacky Winter		R	3	AMLR: Vulnerable. Open woodland with open shrub layer and bare ground. Using bare branches and perches to hawk insects (DEW 2008).	**Possible –** suitable habitat may exist in Project Area, and shrub and grassland restoration may improve resource

Scientific name	Common name	Status		PMST category/NatureMaps Sighting Date	Habitat	Likelihood of occurrence within Project Area
		EPBC	NPW			
						availability for this species.
Myiagra inquieta	Restless Flycatcher		R	2 1993	Open forest, woodland, farmland, inland scrub. Aerial insectivore, hovering over foliage and grass. (Morcombe 2021)	**Possible –** suitable riparian and woodland habitat may exist in Project Area, and riparian revegetation will improve habitat for this species.
Petroica boodang boodang	Scarlet Robin		R	2 1993	Woodlands, forest, and suburban. Heavier forests when breeding in spring and summer. (Morcombe 2021)	**Possible –** suitable woodland habitat may exist in Project Area, revegetation and addition of habitat features will improve resources for this species.
Petroica phoenicea	Flame Robin		V	2 1992	Rainforest, wet eucalypt forest, woodland. Perches conspicuously on stumps and boulders, where it hawks insects from the ground. (Morcombe 2021)	**Possible –** suitable woodland habitat may exist in Project Area, revegetation and addition of habitat features will improve resources for this species.
Porzana pusilla	Ballion's Crake		-	3	AMLR Rare. Migratory breeder in the AMLR region. Closest known population north of Adelaide parklands, and Kersbrook. Favours freshwater swamps with aquatic plants including *Triglochin procerum., Vallisneria spp. Potomageton spp. Baumea spp. and Bolboschoenus caldwellii.* (DEH 2008).	**Possible –** suitable wetland habitat exists, and will be improved by revegetation projects.
Rostratula australis	Australian Painted Snipe	EN	E	1,2 Known 1992	Dense vegetation of swamps, preferring habitat in the surrounds and shallows of well vegetated wetlands. (Morcombe 2021)	**Possible –** suitable wetland habitat may exist in Project Area, and riparian revegetation will improve habitat for this species.
Zanda funerea whiteae	Yellow-tailed Black Cockatoo		V	2 2020	Diverse habitat including eucalypt forest, woodland and rainforest. Feeding on seeds of native E*ucalypt, Banksia, Hakea, Xanthorrhea* and plantation pines. (Morcombe 2021)	**Possible –** some suitable habitat exists in Project Area. Planting of food species, and feral bee control in large hollows may benefit this species.
Amphibians						
Pseudophryne bibronii	Brown Toadlet		R	2 1998	Damp areas with cover provided by logs and stones. Living in forest, heath and grasslands. Typically found under rocks and locks and in grassy areas near creeks, particularly small ephemeral creeks and depressions with accumulated litter and grassy debris. Requires winter grassland flooding (DEW 2008).	**Possible –** suitable wetland habitat may exist in Project Area, and wetland revegetation coupled with flow regime changes will improve / create habitat for this species.

Scientific name	Common name	Status		PMST category/NatureMaps Sighting Date	Habitat	Likelihood of occurrence within Project Area
		EPBC	NPW			
Reptiles						
Aprasia pseudopulchella	Flinders Ranges Worm-lizard	V		1 May occur	Found only in Mount Lofty and Flinders Ranges block in southern extreme of its range in the foothills north of Adelaide, including records from Cobbler Creek RP (1992). Open woodland and native grassland, riparian habitats and rocky areas. Burrowing species which eats ants (DEW 2008).	**Possible –** suitable habitat may exist in Project Area, habitat features and grassland planting will improve habitat for this species. Consider possibility of introduction when suitable habitat exists.
Eulamprus quoyii	Eastern Water Skink			3	AMLR: Vulnerable. Rainforest, wet and dry sclerophyll forest, riverine vegetation along larger inland rivers. Requires boulders and logs for perching and shelter. Does not exist where manicured grasslands abut riparian habitat (DEW 2008)	**Present -** (Peter Matejcic *pers comms*.) – riparian habitat improvements including rockeries and vegetation will improve habitat and resource availability for this species.
Pseudemoia entrecasteauxii	Southern Grass Skink			3	AMLR: Vulnerable. Patchy distribution. Grassland around fallen timber or leaf-litter. On Adelaide Plains found along coast, reedbeds and samphire (DEW 2008).	**Possible –** suitable habitat may exist in Project Area, habitat features and grassland planting will improve habitat for this species. Consider possibility of introduction when suitable habitat exists.
Mammals						
Pteropus poliocephalus	Grey-headed Flying Fox	V U	R	1, 2 Likely 2020	Bat camp at Adelaide Botanic Gardens. Known to forage around the city in search of nectar and fruit.	**Present –** suitable foraging habitat exists. Floral resource availability will impact the presence of this species.
Trichosurus vulpecula	Common Brushtail Possum		R	2 2020	Urban adapted species, requires hollows for sheltering.	**Present –** suitable habitat, known presence in Dry Creek. Likely to benefit from reduction in feral bee populations, predator control and revegetation.
Fish						
Galaxias brevipinnis	Climbing Galaxias			3	AMLR: Vulnerable. Mid to upper catchments in deep cool pools with a high level of instream cover from rocks and riparian vegetation. Require riffle habitat, winter flushing and spring slow flows for diadromous lifecycle. Occurs in South-Para, Torrens and Onkaparinga Rivers (Hammer et al. 2009)	**Possible –** (Nick Whiterod *pers comms.)* Suitable habitat exists, but water quality improvements, flow regime alterations and riparian planting will improve habitat for this species. Requires research to determine occurrence.
Galaxius olidus	Mountain Galaxias			3	AMLR: Vulnerable. Requires cool, well oxygenated water with minimised stagnation during dry periods. Also riffle	**Likely –** (Nick Whiterod *pers comms.)* Suitable habitat exists, but water quality improvements,

Scientific name	Common name	Status		PMST category/NatureMaps Sighting Date	Habitat	Likelihood of occurrence within Project Area
		EPBC	NPW			
					habitat, moderate instream covers, and rocks for spawning. Spring flows required for genetic mixing opportunities. Occurs in South-Para, Torrens and Onkaparinga Rivers. (Hammer et al. 2009)	flow regime alterations and riparian planting will improve habitat for this species. Requires research to determine occurrence.
Geotria australis	Pouched Lamprey		E	3	Largely unknown distribution. Spawn in freshwater using instream structure such as rocks and snags. Require ocean connectivity during winter and spring. (Hammer et al. 2009)	**Possible –**Suitable habitat exists, but water quality improvements, flow regime alterations and instream cover will improve habitat for this species. Requires research to determine occurrence.
Pseudaphritis uryillii				4	AMLR: Vulnerable. Marine habitat and mid-sections of lowland streams. Requires soft silt or sand, instream cover (rocks and snags), riparian vegetation. Susceptible to instream dispersal barriers. Occurs in South-Para, Torrens and Onkaparinga Rivers. (Hammer et al. 2009)	**Possible –** (Nick Whiterod *pers comms.)* Suitable habitat may exist, flow regime alterations and riparian planting will improve habitat for this species. Requires research to determine occurrence.

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