



Biodiversity Action Plan

City of Charles Sturt

2017-2030

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1 Executive Summary

Biodiversity is recognised by the City of Charles Sturt as being an important consideration in the ongoing strategic development and management of a healthy functioning City. This Biodiversity Action Plan 2017-2030 represents the first biodiversity-focussed plan for the City of Charles Sturt. As such, a key priority is identifying the current status quo of biodiversity within the Council area and generating more informed biodiversity goals, targets and actions. This Plan is intended to have linkages with existing Council plans and strategies, including the: *Community Plan 2016-2027*; *Corporate Plan 2016-2020*; *Environmental Plan 2014-2020*; *Open Space Strategy 2025*; and the *Development Plan 2016*.

OUR BIODIVERSITY

Our Biodiversity is defined as: “...*the variety of different types of plant and animal life in a particular region*” (1); this includes terrestrial, aquatic and marine plants and animals, as well as micro-organisms, insects, species living below the ground, and their ecosystems. A high level of biodiversity, particularly biodiversity native to the region, is considered desirable and an important indicator of well-functioning ecosystems and environmental health.

Biodiversity is often compromised in heavily disturbed environments, such as urban areas and so by understanding the biodiversity of our urban landscape we can inform urban design, development and strategic actions to improve biodiversity and in turn improve environmental health and well-being for the benefit of plants, animals, and our community.

OUR GOALS

Our Biodiversity Action Plan seeks to:

- **Enhance biodiversity** – through benchmarking, pest management, collaborative actions on private and public land, and corridor linkage and enhancement;
- **Create diverse and connected open space** – create biodiverse and structurally diverse open spaces with multiple-use outcomes for community and environmental well-being, and which are connected across the landscape and with people;
- **Promote Education** – the development of collaborative projects between Council, community, government, and organisations to provide educational/social connections and create opportunities for community leadership and civic participation; and
- **Implement strategic drivers** – influence and actively develop strategies to address and facilitate climate change adaptation and biodiversity conservation in built form development.

Through the development of this Plan (Attachment A) six overarching goals for the Plan's lifetime were identified, specifically -

1. Biodiversity is enhanced and diversified across different habitat types;
2. Native plants and animals dominate the Council's biodiversity;
3. Council and community understand and value biodiversity within the Council area;
4. Biodiversity areas support social and cultural connections;
5. Novel solutions support natural systems; and
6. Council has a clear direction and strategy for future-proofing biodiversity.

The development process also identified the following four key Biodiversity Action Areas (BAAs). Specific and measurable actions have been developed accordingly, to develop and enhance our biodiversity whilst both developing and working collaboratively with our community.

- The identified Biodiversity Action Areas are;
- Flora and fauna;
- Urban forests;
- Water quality and aquatic environments; and
- Education and citizen science.

OUR FUTURE

This Plan is intended to guide biodiversity management, as well as resource allocation, over the next 13 years to encompass timings of the City's existing plans and strategies. An integral, parallel to the Plan is a Monitoring and Evaluation Program (MEP) to assess the relative success of actions and ensure the ongoing delivery of biodiversity actions across the Council area. It is expected that the Plan will be evaluated against an MEP each year, with a full revision and update undertaken in the year 2029 to ensure uninterrupted delivery of biodiversity action post-2030.

2 Introduction

The City of Charles Sturt is a progressive local government organisation committed to protecting and enhancing biodiversity and ecological systems. We understand the role, value and importance of biodiversity in the region, this is further highlighted through our leading strategic document, our Community Plan, specifically:

- ***Our Community – A strong and connected community***

Educate and regulate to enable a safe and healthy environment.

- ***Our Liveability - A liveable City of great places***

Enhance the quality and diversity of open and public spaces.

- ***Our Environment - An environmentally responsible & sustainable City***

Continue to implement climate change mitigation and adaptation solutions.

Enhance the state of the City's environment and biodiversity.

Lead and educate to reduce the City's impact on the environment and build resilience.

The development of this Biodiversity Action Plan will form an integral component of Council's strategic-decision making to 2030 and will contribute to creating a more liveable City for people and biodiversity. In doing so, the BAP will have key linkages to the living Green Environmental Plan and the Open Space Strategy (2025) as well as State and Federal legislation and regional NRM objectives. To ensure these links, a range of key documents and resources were reviewed (Table 1).

Council staff, neighbouring Councils, and community members have provided input in the development of the BAP through a collaborative workshop process. This valuable process has enabled the vision and expectations of Council and the community to merge into a powerful biodiversity vision for the City.

The actions identified in this plan are a mix of investigations and data gathering at the high level through to specific actions. Combined, this approach is designed to assist provision of information to guide subsequent development of actions and data that can provide a scientific basis for managing biodiversity in the long-term.

By its very nature, biodiversity is a complex web of life; an ever-changing interaction between the natural and built environments and therefore it cannot be managed within rigid sets of guidelines or actions and flexibility is required.

Table 1. Document and resources reviewed in developing this Biodiversity Action Plan.

Information Source
<i>Professional reports</i>
Vegetation Management Plan West Beach Dune Reserve (2)
Vegetation Management Plan Henley South & West Beach Dune Reserve (3)
Vegetation Management Plan Tennyson Dune Reserve, Yaitya Worra (True Indigenous Sand) (4)
Vegetation Management Plan Semaphore Park Coastal Reserve (5)
Breakout Creek Planning for the Future (6)
Tree Canopy Cover in the City of Charles Sturt – Benchmark Assessment (7)
Evaluating the Business Case for Urban Trees (8)
River Torrens Linear Park Management Plan – Hindmarsh Bridge to the River Mouth (9)
Nearshore Marine Aquatic Ecosystem Condition Reports (10)
EPA Water Quality Information Sheet (11)
<i>Local and regional plans and strategies</i>
Living Adelaide, 30-Year Plan for Greater Adelaide (12)
Metropolitan Adelaide and Northern Coastal Action Plan 2009 (volume 1) (13)
AdaptWest, Western Adelaide Region Climate Change Adaptation Plan (14)
City of Charles Sturt, Community Plan 2016-2027 (15)
City of Charles Sturt, Corporate Plan 2016-2020 (16)
City of Charles Sturt, Open Space Strategy 2025 (17)
City of Charles Sturt, Environmental Plan 2014-2020 (18)
City of Charles Sturt, Development Plan May 2016 (19)
City of Charles Sturt, Strategic Urban Animal Management Plan (UAMP) 2016-2020 (20)
City of Charles Sturt, Tree and Streetscape Management Plan (21)
Port Adelaide Enfield, Biodiversity Management Plan 2016-2020 (22)
<i>State and Federal legislation</i>
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (23)
<i>Native Vegetation Act 1991</i> (24)
<i>National Parks and Wildlife Act 1972</i> (25)
<i>Natural Resources Management Act 2004</i> (26)
<i>Development Act 1993</i> (27)
<i>Crown Land Management Act 2009</i> (28)
<i>Dog and Cat Management Act 1995</i> (29)
<i>Other</i>
NatureMaps (30)

3 Biodiversity Action Plan

3.1 How to use this plan

It is intended that this plan help the Council and community to positively manage biodiversity from 2017 to 2030. A revision point in 2029 is proposed to enable the Plan and biodiversity management strategy to seamlessly follow from 2030.

3.2 Overarching goals

The targets and actions contained herein (Section 3.4) have been developed to achieve the following overarching goals of this Biodiversity Action Plan:

- Council and community understand and value biodiversity within the Council area;
- Biodiversity is enhanced and diversified across the BAAs;
- BAAs support social and cultural connections;
- Native plants and animals dominate the Council's biodiversity;
- Novel solutions support natural systems; and
- Council has a clear direction and strategy for future-proofing biodiversity and BAAs.

These goals were set through discussion and collaboration of Council and community in the workshops conducted during the information review and conceptual development of the BAP.

3.3 Biodiversity Action Areas

Four key Biodiversity Action Areas (BAAs) have been developed to provide a framework for the targets and actions outlined herein and to prevent repetition of actions which may need to be applied across multiple habitat associations. The BAAs identify key biodiversity action themes and allow for the provision of specific strategic alignment to other Council documents such as, the Open Space Strategy, Adapt West, and the Living Green Strategy.

3.3.1 BAA 1: Flora and fauna

The protection and enhancement of flora and fauna habitats through ongoing management of new and existing sites will improve urban biodiversity, minimise threats to biodiversity, and provide opportunity for community education and interaction.

3.3.2 BAA 2: Urban forests

Enhancing and maintaining urban forests through urban forestry practices is a critical element in improving the health and well-being of environments and people. Urban forestry can be described as “...*the art, science, and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society*” (31).

3.3.3 BAA 3: Water quality and aquatic environments

These areas include all non-oceanic water bodies (i.e. rivers, lakes, ponds, and wetlands) and associated aquatic and fringing vegetation. Improvements to the quality of water throughout the City are integral to supporting biodiversity.

3.3.4 BAA 4: Education and citizen science

Our community are paramount to the successful implementation of this Action Plan. Education through interaction and citizen science will underpin improvements and ongoing commitment to biodiversity improvements.

For each BAA, an action table has been developed which outlines the: target, relevant strategy/ies, practical actions, and indicators for measuring the success/completion of each action. The targets, actions and indicators may be directly transferred in the development of a Monitoring and Evaluation Plan (MEP) for the BAP (see Section 4).

3.4 Action Table Framework

The Plan is built around a framework of Strategies, Targets, Indicators and Actions, outlined for each key Biodiversity Action Area, and defined (1) as:

- Strategy – direction developed to an overall goal; and
- Targets – a measurable to achieve the goals; and
- Indicators – a short term measurable contributing to the target; and
- Actions – a specific set of steps to achieve goals.

A S.M.A.R.T. approach has been applied to describing targets, meaning that targets are: **S**pecific, **M**easurable, **A**greed upon, **R**ealistic and **T**ime-based. This is a well-used, trusted and demonstrable process for action planning which facilitates the process of monitoring and evaluation (Section 4)

3.4.1 Biodiversity Action Area 1 – Flora & Fauna

Target: By 2022, protection, enhancement and creation of fauna habitats through ongoing management of new and existing sites has improved current urban biodiversity (e.g. diversity, abundance, and/or distribution) and functional landscape connectivity, and reduced current threats to biodiversity.

Strategy/ies: Create connected and biodiverse resilient landscapes

	Actions	Indicator
1	Undertake detailed flora and fauna surveys to determine current species diversity, abundance and distribution across habitat associations, and generate a comprehensive baseline database of flora and fauna species in the Council area.	<ul style="list-style-type: none"> Flora & fauna surveys completed and baseline database active by 2019
2	Review existing planting lists for the City to improve species diversity and climate change adaptability within open spaces and corridors.	<ul style="list-style-type: none"> Review of planting lists completed by 2020
3	Develop management strategies to manage threats to biodiversity, including any biological threats identified in the flora and fauna surveys.	<ul style="list-style-type: none"> Biodiversity threat management strategy completed and active by 2021
4	Develop a Biodiversity Corridors Implementation Plan which details current landscape linkages, on-ground opportunities for additional linkages, and strategies for creating linkages. Linkages should be functional for biodiversity, based on requirements and sensitivities of fauna species occurring in the Council area.	<ul style="list-style-type: none"> Biodiversity Corridors Implementation Plan completed and active by 2022

3.4.2 Biodiversity Action Area 2 – Urban Forests

Target: By 2030, our urban forest will be larger, more resilient to climate change impacts, better understood and appreciated by Council and the community, and strategically managed to ensure no net canopy cover loss in the long-term.

Strategy/ies: Support a thriving urban forest to nurture our trees and incorporate green infrastructure into our City to support biodiversity.

	Actions	Indicator
1	Deliver a tree canopy improvement strategy to explore opportunities and mechanisms for improving tree canopy	<ul style="list-style-type: none"> • Tree Canopy Improvement Strategy completed and active by 2019
2	Develop new, and review existing, guidelines for open space design which identify different management typologies, use appropriate plant species, and specifically aim to improve biodiversity benefits of plantings and design on both public and private land	<ul style="list-style-type: none"> • By 2020, planting lists and Open Space Guidelines have been revised with consideration to biodiversity requirements, landscape connectivity, and resilience to threats (e.g. climate change) • Strategies to improve biodiversity in public and private open spaces and within new development are completed and implemented by 2020
3	Develop an urban forest strategy to underpin tree planting goals and actions for streets, public areas, and private areas	<ul style="list-style-type: none"> • Strategic directions to include in the Urban Forest Strategy are identified and the Strategy completed and active by 2025
4	Increase tree canopy cover to minimise the impact of urban heat island effects and improve habitat and resource availability for certain fauna species	<ul style="list-style-type: none"> • By 2030, total tree canopy cover across the City has increased by at least 10% from the 2014 baseline coverage (assuming implementation commences 2018)
5	Maintain existing large trees, and grow smaller trees to maturity, with a clear understanding of useful life expectancy	<ul style="list-style-type: none"> • By 2030, the number of healthy, mature trees in the City has increased from the current baseline (assuming implementation commences 2018) • By 2030, strategic replacement planting plan developed and implemented to ensure maintenance of mature canopies and a diversity of age classes in the urban forest

3.4.3 Biodiversity Action Area 3 – Water and Aquatic Environments

Target: By 2025, the City has an increased number and distribution of aquatic habitats and the quality of water flowing through the landscape has improved through efforts on public and private land.

Strategy/ies: Develop adaptable and sustaining aquatic environments to support improvements in coastal, aquatic and terrestrial biodiversity.

	Actions	Indicator
1	Develop collaborative relationships with water management bodies and facilitate a cohesive database for water quality monitoring across the city to identify opportunities for improvement	<ul style="list-style-type: none"> Collaborative water quality monitoring database compiled, and areas for improvement identified, by 2025
2	Identify significant contributing factors to decreased water quality and develop priority action plans to address these factors	<ul style="list-style-type: none"> Water quality improvement action plans developed and implemented by 2025
3	Identify opportunities for the development and enhancement of new and existing aquatic environments and implement WSUD and rain gardens/filters in public parks and gardens	<ul style="list-style-type: none"> Opportunities for new or improved aquatic environments are clearly identified and prioritized by 2020 Increased number of WSUD and rain gardens/filters are implemented in public parks and gardens by 2025
4	Engage community and landowners in education programs regarding water quality on private land	<ul style="list-style-type: none"> By 2025, water quality improvement actions on public land (e.g. WSUD and rain gardens) are used as opportunities for demonstration programs for the community and landowners

3.4.4 Biodiversity Action Area 4 – Education and Citizen Science

Target: By 2025, the community better understands and values the City’s natural environment and is actively engaged in helping to enhance and protect habitats and native biodiversity.

Strategy/ies: Collaborate with our community to inspire, educate, monitor and enhance biodiversity.

	Actions	Indicator
1	<p>Develop and undertake community biodiversity education events to inform and inspire community action. Examples of events/topics include:</p> <ul style="list-style-type: none"> • Bioblitz events • Flora and fauna • Water quality • Tree benefits • Biodiversity monitoring 	<ul style="list-style-type: none"> • At least one community biodiversity education event/program is held each spring season, starting in Spring 2018 (if not before).
2	<p>Build our knowledge through monitoring and education to understand how our activities are improving biodiversity and create systems and processes to manage the information</p>	<ul style="list-style-type: none"> • By spring 2018, a biodiversity management system for incorporating citizen science developed and implemented
3	<p>Support the community in actively engaging with the environment, through assisting in the establishment of volunteer groups to work collaboratively with Council to enhance biodiversity across the city</p>	<ul style="list-style-type: none"> • By 2025, the number of community environment groups active across the City has increased from the current number

3.4.5 Biodiversity Action Area 5 – Monitoring and Evaluation

Target: By 2030, the Council has an active monitoring and evaluation plan implemented for the Biodiversity Action Plan

Strategy/ies: Apply best practice approach for environmental monitoring and evaluation.

	Actions	Indicator
1	Undertake ongoing monitoring to ensure biodiversity is being improved through structural complexity, species diversity and threat minimisation.	<ul style="list-style-type: none"> • Biodiversity monitoring sites are established across the City by 2019 • Repeat flora and fauna surveys are conducted in each biodiversity monitoring site every 3-5 years from 2019, and the database is updated as required
2	Develop an adaptive monitoring and evaluation plan for the Biodiversity Action Plan	<ul style="list-style-type: none"> • By 2025, an adaptive monitoring and evaluation plan developed and implemented.

3.5 Action prioritisation

Table 2 has been developed to assist Council in implementing the BAP and has prioritised the actions according to a range of criteria that influence successful uptake of projects.

The criteria used to assist setting priorities include:

- Technically possible;
- Cost;
- Work flow impact (internal);
- Motivation of staff;
- Public engagement; and
- Timeframe for implementation/completion.

Actions were scored 1 to 3 based on the perceived success, difficulty or potential problems of the action, with a score of 3 being the best. A broad costing for actions was also included in the scoring, though it is recognised that the prioritisation of individual projects to address each Action, and the progressions of the Action Plan, will depend on the availability of future funding. The highest aggregate scores were considered to be actions of the highest priority. Further details regarding scoring of actions and broad costings is provided in Attachment C.

Table 2. Action prioritisation matrix, showing all BAA actions scored (out of 18) for relative priority: green = first priority, yellow = second priority, orange = third priority, red = fourth priority. The highest score achieved for first priority actions was 16. Also shown are the specific BAA to which each action relates and the timeframes for implementation/completion, as per the indicators shown in Sections 3.3.1 to 3.3.4. Further details and criteria used for scoring are provided in Attachment C.

PRIORITY	ACTION	BAA	Broad Timeframe		
			2020	2025	2030
1	Undertake detailed flora and fauna surveys to determine current species diversity, abundance and distribution across habitat associations, and generate a comprehensive baseline database of flora and fauna species in the Council area.	1. Flora and Fauna	x		
1	Review existing planting lists for the City to improve species diversity and climate change adaptability within open spaces and corridors.	1. Flora and Fauna	x		
1	Deliver a tree canopy improvement strategy to explore opportunities and mechanisms for improving tree canopy	2. Urban forests	x		
1	Maintain existing large trees, and grow smaller trees to maturity, with a clear understanding of useful life expectancy	2. Urban forests	x		x
2	Develop a Biodiversity Corridors Implementation Plan which details current landscape linkages, on-ground opportunities for additional linkages, and strategies for creating linkages. Linkages should be functional for biodiversity, based on requirements and sensitivities of fauna species occurring in the Council area.	1. Flora and Fauna		x	
2	Develop an urban forest strategy to underpin tree planting goals and actions for streets, public areas, and private areas	2. Urban forests		x	
2	Increase tree canopy cover to minimise the impact of urban heat island effects and improve habitat and resource availability for certain fauna species	2. Urban forests	x		x
2	Develop collaborative relationships with water management bodies and facilitate a cohesive database for water quality monitoring across the city to identify opportunities for improvement	3. Water and aquatic environments		x	
2	Engage community and landowners in education programs regarding water quality on private land	3. Water and aquatic environments		x	

PRIORITY	ACTION	BAA	Broad Timeframe		
			2020	2025	2030
2	Develop and undertake community biodiversity education events to inform and inspire community action. Examples of events/topics include: <ul style="list-style-type: none"> • Bioblitz events • Flora and fauna • Water quality • Tree benefits • Biodiversity monitoring 	4. Education and citizen science	x		
2	Build our knowledge through monitoring and education to understand how our activities are improving biodiversity and create systems and processes to manage the information	4. Education and citizen science	x		
3	Develop management strategies to manage threats to biodiversity, including any biological threats identified in the flora and fauna surveys.	1. Flora and Fauna		x	
3	Identify opportunities for the development and enhancement of new and existing aquatic environments and implement WSUD and rain gardens/filters in public parks and gardens	3. Water and aquatic environments	x		
3	Support the community in actively engaging with the environment, through assisting in the establishment of volunteer groups to work collaboratively with Council to enhance biodiversity across the city	4. Education and citizen science		x	
3	Undertake ongoing monitoring to ensure biodiversity is being improved through structural complexity, species diversity and threat minimisation.	5. Monitoring and evaluation	x		
4	Develop new, and review existing, guidelines for open space design which identify different management typologies, use appropriate plant species, and specifically aim to improve biodiversity benefits of plantings and design on both public and private land	2. Urban forests	x		
4	Identify significant contributing factors to decreased water quality and develop priority action plans to address these factors	3. Water and aquatic environments		x	
4	Develop an adaptive monitoring and evaluation plan for the Biodiversity Action Plan	5. Monitoring and evaluation		x	

4 Monitoring and Evaluation Program

Monitoring of biodiversity is not that same as measuring biodiversity. Measuring biodiversity provides a snapshot in time, whereas, monitoring is a long-term, on-going process which identifies temporal trends and allows decisions to be made regarding whether actions are achieving desired biodiversity targets. Accordingly, biodiversity measurements taken over time contribute to biodiversity monitoring.

A Monitoring and Evaluation Program (MEP) is a strategic mechanism for assessing whether the BAP is meeting its goals and targets through the outlined actions. Specifically, an MEP is “...a detailed program of works which defines what monitoring activities will take place, when and by whom, and how that information will feed back into actions and management decisions” (32). In this way, the MEP assumes the BAP is adaptive in nature to allow, if necessary, changes to targets and actions to ensure greater on-going success of the BAP goals (e.g. Figure 1).

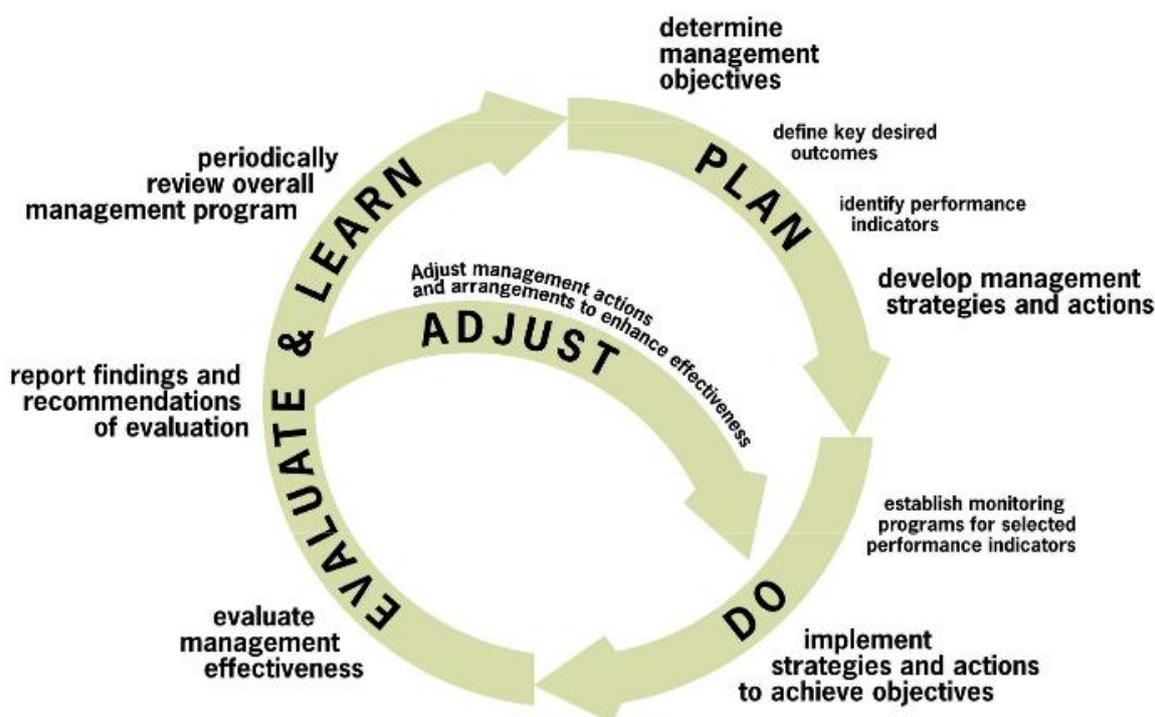


Figure 1. Example of an adaptive management cycle (taken from (33))

4.1 MEP Considerations

The MEP framework presented here has considered State, National and international best practice for developing environmental guidelines and monitoring and evaluation frameworks. Principally the MEP should be developed to be:

- **Fit-for-purpose:** tailored to the design, purpose and objectives of the projects and programs;
- **Credible:** based on scientifically and administratively defensible methods and approaches;
- **Transparent:** clearly demonstrates how public money has been spent, the resulting outputs, and where possible, outcomes; and
- **Cost effective:** costs within allowable limits, and where possible draw on and link with existing processes and information.

Further, in developing the MEP, the following should also be considered:

- **Temporal scale:** the monitoring framework should be established to exceed the lifetime of the BAP, given that biodiversity concerns ecological processes and species populations which tend to respond over long periods, rather than instantaneously after implementation of an action.

For example, monitoring the impacts of fox control on native fauna populations may require monitoring time-frames equivalent to multiple generations of native fauna to identify the response of populations to the fox control action.

- **Spatial scale:** the appropriate scale for monitoring will vary depending on the action/s and target/s being monitored.

For example, monitoring the effectiveness of landscape connectivity actions will require focus at a broader, landscape-scale, whereas monitoring structural vegetation complexity along the River Torrens will occur at a more localised scale.

- **Socio-economics and stakeholder participation:** particularly in urban areas, the success or failure of many biodiversity management actions will be influenced by social and economic factors. Where possible, communities and stakeholders likely to be affected by BAP actions, either positively or negatively, should be considered and monitored.

4.2 MEP framework

This Section provides the framework for developing an MEP for the BAP. Whilst this framework should be considered in the initial implementation stages of the BAP, there is not yet sufficient data available to prepare a detailed MEP, as is often the case at the commencement of biodiversity projects (32). It is nonetheless important that the MEP outline is developed in the initial BAP implementation stages, with further development and

refinement undertaken during implementation of the BAP, by drawing on a combination of the data, observations and learnings of the actions (32). In many cases actions will set a benchmark on which success (achievement of plan targets) and re-evaluation of the direction of the BAP in 2029 will be made.

4.2.1 Key elements of an MEP framework

The MEP framework (Figure 2) contains the following nine elements:

1. **Target:** the desired outcome for a biodiversity element. Targets have been developed to be SMART (Specific, Measurable, Agreed-upon, Realistic, Time-based). Targets for each BAA of the BAP are shown in Section 3.4.
2. **Baseline:** the “current” condition for a Target, that is, it’s condition prior to or in the early stages of implementation of actions. The baseline measurement provides a benchmark for assessing progress towards achieving the Target.
3. **Action:** activities proposed to achieve the desired Target. Some actions in this BAP apply to multiple Targets and/or multiple BAAs. Actions have been prioritised in Section 3.5.
4. **Indicator:** what needs to be measured to assess whether an action is achieving the desired Target. Indicators may be qualitative or quantitative variables but must be able to be measured or described and when observed periodically, must be able to demonstrate trends in biodiversity characteristics over time.
5. **Data collection method:** specific detail about how data will be collected for each indicator.
6. **Data source:** identifies where data will be measured (i.e. data collected).
7. **Frequency:** how often indicators will be measured.
8. **Responsible:** who will be responsible for measuring indicators and collating data.
9. **Reporting:** identifies where records of indicators measurements will be reported.

Figure 2. MEP template with a hypothetical example application.

Target What is trying to be achieved? S.M.A.R.T.	Baseline Value What is the current value?	Action How will target be achieved?	Indicator How will actions be assessed?	Data Collection Method e.g. online, questionnaire, focus group?	Data Source What sources can data be derived from?	Frequency How often will data collection occur?	Responsible Who will collect the data?	Reporting Where will data be reported?
<i>T9. By 2025 at least 50% of residents have participated in a Council-run biodiversity event</i>	<i>0%</i>	<i>T9.1 Run quarterly biodiversity events</i>	<i>T4.1a Number of biodiversity events run each year</i>	<i>Tracking spreadsheet</i>	<i>Events database</i>	<i>4 times per year</i>	<i>Community engagement department</i>	<i>Annual Community Engagement Report;</i> <i>Biodiversity Action Plan Review</i>
			<i>T4.1b Number of residents attending events relative to number of residents</i>	<i>Direct count; attendees survey; tracking spreadsheet</i>	<i>Event direct count; attendee survey</i>	<i>Conducted and collected at each event</i>		
				<i>Online review of database for resident numbers</i>	<i>Census database</i>			
<i>T4.1c Number of first-time attendees at each event relative to T4.1b</i>	<i>Tracking spreadsheet</i>	<i>Attendee survey</i>	<i>Conducted and collected at each event</i>					

5 Abbreviations

BAA	Biodiversity Action Area
BAP	Biodiversity Action Plan
CBSM	Community Based Social Marketing
MEP	Monitoring and Evaluation Program
WSUD	Water sensitive urban design

6 Glossary

Abundance – the quantity or amount of something. When used in relation to species (i.e. species abundance), it refers to the number of individuals of a particular species.

Action – used here to describe a specific set of steps to achieve goals.

Adapt – a term used to describe animals, plants, or habitats/ecosystems that are able to change or adjust to suit new/altered conditions.

Baseline – describes the condition of target biodiversity prior to, or in the early stages of, project implementation. It is a benchmark against which management-induced changes can be identified and measured (32).

Bioblitz – an intense period of biological surveying (e.g. 24-36 hours) undertaken in an attempt to record all living species within a designated area. Commonly conducted as a collaborative activity between scientists, naturalists, organisations and community volunteers.

Biodiverse – used in relation to a habitat or region having a high level of biodiversity.

Biodiversity – an umbrella term encompassing all species of plants, animals, and micro-organisms, and the variation in ecosystems and ecological processes of which they are part. It is a multi-dimensional concept, difficult to define in an operational sense and difficult to measure (32).

Citizen science – scientific research conducted in whole or in part by amateur (i.e. non-professional) scientists and/or community volunteers. Typically conducted in collaboration with professional scientists. A bioblitz event is an example of citizen science.

Distribution – the spread of something over an area. When used in relation to species (i.e. species distribution) it tends to indicate where areas of suitable environmental and habitat conditions occur for a species. For this BAP, it may be used to indicate if a species is found across the whole Council area, or restricted to certain localities or habitat types/associations.

Diversity – the amount of variation in something. When used in relation to species (i.e. species diversity) it relates to the number of different species (e.g. to measure species diversity is to quantify the number of different species; to increase species diversity is to increase the number of different species).

Ecosystem – refers to the complex network of living organisms and their interactions with each other and their environment.

Environment – the natural surroundings or conditions in which an animal or plant lives or operates. Can be used to describe the whole of the natural world, or a particular area.

Functional landscape connectivity – the degree to which the landscape facilitates or impedes movements of animals/plants between suitable habitat areas. Generally used for

species that are either unable or unwilling to move within habitats different to its own (e.g. a frog may be unable or unwilling to move between water bodies without a suitable aquatic link providing a functional connection).

Habitat – the type of place (i.e. environment) that a particular animal or plant usually lives. Noting that animals may utilise different habitats for different purposes (e.g. foraging, breeding, dispersal). Multiple habitats for different species may be found within broad habitat associations.

Habitat association – a broad description of similar habitat types based on broad environmental conditions, for example: coastal, aquatic, terrestrial. Different animals and plants may utilise various habitats within one or more habitat associations.

Fauna – includes all vertebrate and invertebrate species occurring in terrestrial, marine and aquatic environments.

Flora – includes all vegetation species occurring in terrestrial, marine and aquatic environments.

Measuring [biodiversity] – data collected about a snap-shot in time of a specific biodiversity value (e.g. number of species). Measurements are useful for comparing relative biodiversity values (e.g. whether one area is more species-rich than another area) (32)

Monitoring [biodiversity] – comparing multiple measurements taken over time of the same biodiversity value so as trends in changes can be identified and decisions made regarding whether a management action is having the desired result or whether the action needs to be changed.

Resilient – relates here to animal and plant species and/or habitats, environments or ecosystems being able to withstand, recover quickly from, or adapt to threats and difficult conditions.

Strategy – used here to refer to the direction developed to an overall goal.

Structural complexity – used here in relation to vegetation and habitats to describe the amount of variation in vegetation cover layers (i.e. ground cover, shrub/understorey layer, mid-storey, and canopy/over-storey layers). May also encapsulate elements such as fallen logs. Generally, areas that are more structurally complex tend to provide habitat and resources for more species.

Target – used here to describe a quantifiable element that may be measured to gauge progress towards achieving goals.

Threat – anything that has a negative impact on animals, plants, habitats, environments and ecosystems. For example, cats and dogs chasing/predating native animals, vegetation clearing/land use change, climate change.

Indicator – a short-term measurable aspect contributing to the target.

Goal – what is trying to be broadly achieved through implementation of the targets and actions.

7 Cover Photo Credits

1. <http://www.charlessturt.sa.gov.au/page.aspx?u=178> 2017
2. West Lakes, 2017, Photo by J. Garden
3. Painted dragon (*Ctenophorous pictus*), Tennyson Dunes, Source: <http://www.tennyson.org.au/assets/wildlife.html>
4. Tennyson dunes, 2017, Source: Seed Consulting Services
5. Bee on eucalypt bloom, Semaphore Park, Source: Seed Consulting Services
6. Roadside plantings, 2017, West Lakes Shore, Source: Seed Consulting Services
7. Red-capped Plover (*Charadrius ruficapillus*), Semaphore beach, Source: Seed Consulting Services
8. River Torrens, 2017, Source: Seed Consulting Services
9. Black-shouldered kites, 2016, Source: Seed Consulting Services
10. Semaphore Beach dunes, 2017, Source: Seed Consulting Services
11. Musk lorikeet (*Glossopsitta concinna*), 2016, Semaphore Park, Source: Seed Consulting Services
12. Children with waterbirds, Delfin Island Duck Pond, 2016, Source: Seed Consulting Services
13. Bream species, West Lakes, Source: <https://naturallysouthaustralia.com/2015/03/14/a-walk-around-west-lakes/>
14. Tennyson dunes, black-shouldered kite (*Elanus axillaris*). Source: <http://www.tennyson.org.au/assets/wildlife.html>

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9 Attachments

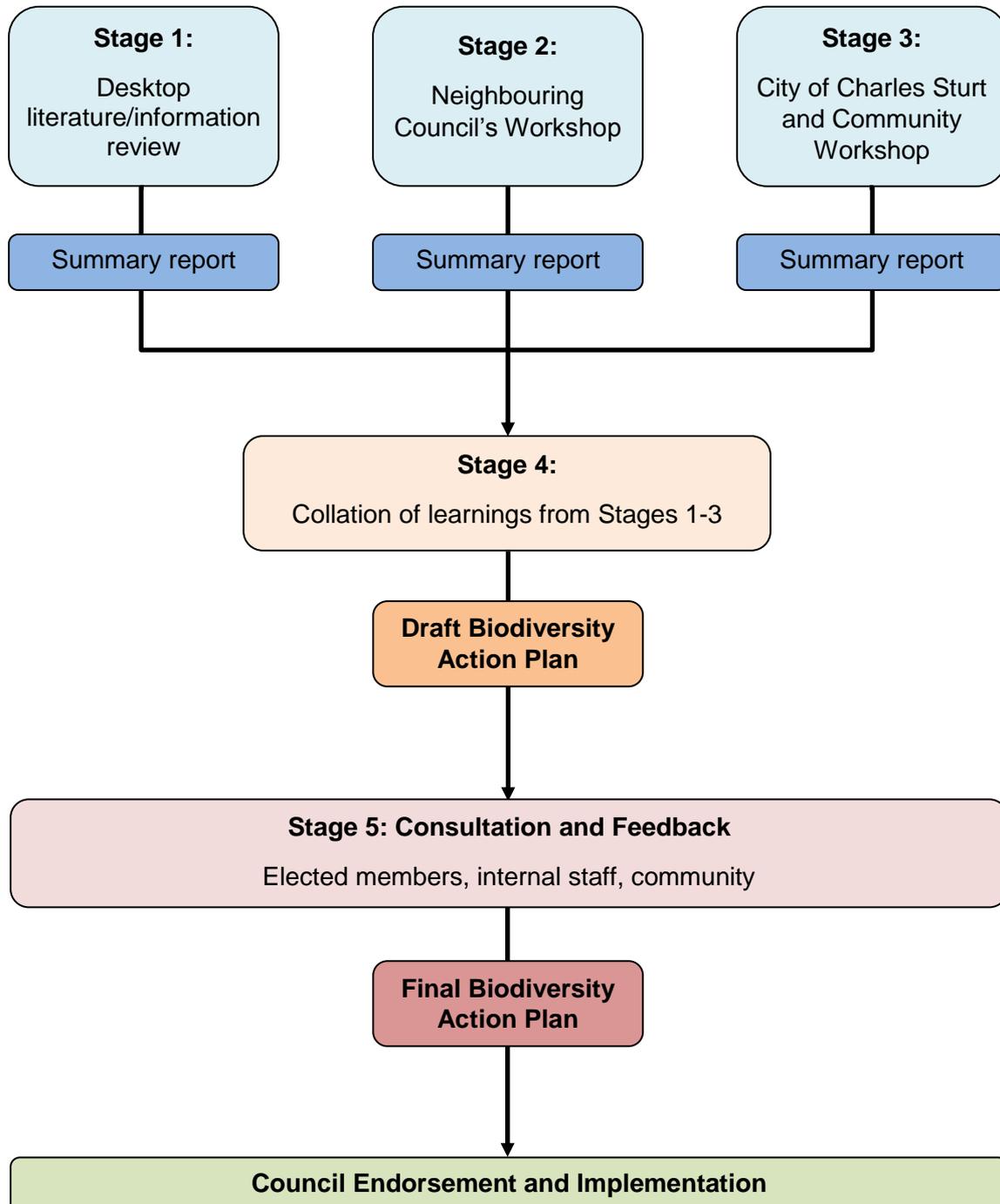
Attachment A. Process flowchart

Attachment B. Primary habitat associations

Attachment C. Action prioritisation scoring details

9.1 Attachment A. Process flowchart

Process flowchart indicating key stages and outcomes in developing this Biodiversity Action Plan.



9.2 Attachment B. Primary habitat associations

Through the review process, three primary habitat associations were identified occurring within the City of Charles Sturt: coastal, aquatic, and terrestrial. Whilst there may be some overlap in species diversity, ecosystem function, threats and actions among the habitat associations, each will also contain species, ecosystem functions and threats not found in the other associations. These habitat associations are therefore important independent elements, but also form critical components of an overall healthy and connected functioning ecosystem. Being able to maintain and maximise biodiversity within each habitat association and promote connectivity across the associations will greatly facilitate the improvement of biodiversity and health ecosystem functioning across the City area.

Coastal habitat association

These areas are coastal in nature, extending from the low tide mark up to and including coastal dune and dune vegetation systems. Examples within the City include: Tennyson dunes (Plate 1a) and Semaphore beach (Plate 1b).



Plate 1. Coastal BAA examples: (a) Tennyson dunes; (b) Semaphore beach.

Photo sources: Seed Consulting Services (a-b)

Aquatic habitat association

These areas include all non-oceanic water bodies (i.e. rivers, lakes, ponds and wetlands) and associated aquatic and fringing vegetation. Examples within the City include: West Lakes Boating Lake (Plate 2a), River Torrens (Plate 2b), Old Port Road Wetlands (Plate 2c), Delfin Island duck pond and associated ponds (Plate 2d), Cheltenham wetlands, and water bodies associated with golf courses and managed aquifer recharge schemes.



Plate 2. Aquatic BAA examples: (a) River Torrens; (b) Delfin Island duck pond; (c) Old Port Road wetlands; (d) West Lakes boating lake.

Photo sources: Seed Consulting Services (a, b, d); City of Charles Sturt (c).

Terrestrial habitat association

These areas encompass all land-based green (vegetated) spaces not included in the Coastal or Aquatic BAAs. Examples within the City include: roadside plantings (Plate 3a), parklands and Council reserves (Plate 3b), sporting fields and golf courses, all trees (including isolated trees) located on public and private land (Plate 3c), planted gardens on public and private land (Plate 3d), and vegetated vacant lots.



Plate 3. Terrestrial BAA examples: (a) Roadside plantings; (b) Council reserve; (c) Street trees; (d) Private garden.

Photo sources: Seed Consulting Services (a-d)

9.3 Attachment C. Action prioritisation scoring details

The following criteria scores were used to scoring relative prioritisation of BAA actions. Scoring was informed through consultation with Council:

Criteria	Score
Technically possible	<ol style="list-style-type: none"> 3. Action is easy to implement 2. Action causes some problems 1. Action is not possible
Cost	<ol style="list-style-type: none"> 3. Implementation is affordable within budgets 2. Action is affordable but may require further budgeting 1. Action is expensive. Difficult to fund in the action timeframe
Work flow impact (internal)	<ol style="list-style-type: none"> 3. Achievable within current resources 2. May require additional resources 1. Additional resources required
Motivation of staff	<ol style="list-style-type: none"> 3. Staff are likely to take up the action willingly 2. Staff may take up the action 1. Staff are unwilling to take up the action
Public engagement	<ol style="list-style-type: none"> 3. Direct public engagement (on-ground/volunteering) 2. Indirect public engagement (education/awareness raising) 1. Public engagement not required
Timeframe	<ol style="list-style-type: none"> 3. earliest completion 2020 (or requires implementation by) 2. earliest completion 2025 (or requires implementation by) 1. earliest completion 2030 (or requires implementation by)

The following table shows the scoring of the six criteria for each of the BAA actions. For each action the score allocated for each criteria and the sum total of scores (out of a possible 18) are shown. The sum total of scores was used to determine the relative priority rank for each action: 16 = first priority (green); 15 = second priority (yellow); 14 = third priority (orange); and, 13 = fourth priority (red).

Priority Rank	Action Required	Biodiversity Action Area (BAA)	Scoring Criteria						TOTAL
			Technically Possible	Cost	Work Flow	Staff Motivation	Public Engagement	Timeframe	
1	Undertake detailed flora and fauna surveys to determine current species diversity, abundance and distribution across habitat associations, and generate a comprehensive baseline database of flora and fauna species in the Council area.	1. Flora and Fauna	3	3	2	2	3	3	16
1	Review existing planting lists for the City to improve species diversity and climate change adaptability within open spaces and corridors.	1. Flora and Fauna	3	3	3	3	1	3	16
1	Deliver a tree canopy improvement strategy to explore opportunities and mechanisms for improving tree canopy	2. Urban forests	3	3	3	2	2	3	16
1	Maintain existing large trees, and grow smaller trees to maturity, with a clear understanding of useful life expectancy	2. Urban forests	3	3	3	2	2	3	16
2	Develop a Biodiversity Corridors Implementation Plan which details current landscape linkages, on-ground opportunities for additional linkages, and strategies for creating linkages. Linkages should be functional for biodiversity, based on requirements and sensitivities of fauna species occurring in the Council area.	1. Flora and Fauna	3	3	2	3	2	2	15
2	Develop an urban forest strategy to underpin tree planting goals and actions for streets, public areas, and private areas	2. Urban forests	3	3	3	2	2	2	15
2	Increase tree canopy cover to minimise the impact of urban heat island effects and improve habitat and resource availability for certain fauna species	2. Urban forests	3	2	2	2	3	3	15

Priority Rank	Action Required	Biodiversity Action Area (BAA)	Scoring Criteria						TOTAL
			Technically Possible	Cost	Work Flow	Staff Motivation	Public Engagement	Timeframe	
2	Develop collaborative relationships with water management bodies and facilitate a cohesive database for water quality monitoring across the city to identify opportunities for improvement	3. Water and aquatic environments	3	3	3	3	1	2	15
2	Engage community and landowners in education programs regarding water quality on private land	3. Water and aquatic environments	3	2	3	2	3	2	15
2	Develop and undertake community biodiversity education events to inform and inspire community action. Examples of events/topics include: • Bioblitz events • Flora and fauna • Water quality • Tree benefits • Biodiversity monitoring	4. Education and citizen science	3	2	2	2	3	3	15
2	Build our knowledge through monitoring and education to understand how our activities are improving biodiversity and create systems and processes to manage the information	4. Education and citizen science	3	2	2	2	3	3	15
3	Develop management strategies to manage threats to biodiversity, including any biological threats identified in the flora and fauna surveys.	1. Flora and Fauna	3	2	2	2	3	2	14
3	Identify opportunities for the development and enhancement of new and existing aquatic environments and implement WSUD and rain gardens/filters in public parks and gardens	3. Water and aquatic environments	3	2	2	2	2	3	14

Priority Rank	Action Required	Biodiversity Action Area (BAA)	Scoring Criteria						TOTAL
			Technically Possible	Cost	Work Flow	Staff Motivation	Public Engagement	Timeframe	
3	Support the community in actively engaging with the environment, through assisting in the establishment of volunteer groups to work collaboratively with Council to enhance biodiversity across the city	4. Education and citizen science	3	2	2	2	3	2	14
3	Undertake ongoing monitoring to ensure biodiversity is being improved through structural complexity, species diversity and threat minimisation.	5. Monitoring and evaluation	3	2	2	2	2	3	14
4	Develop new, and review existing, guidelines for open space design which identify different management typologies, use appropriate plant species, and specifically aim to improve biodiversity benefits of plantings and design on both public and private land	2. Urban forests	3	2	2	2	1	3	13
4	Identify significant contributing factors to decreased water quality and develop priority action plans to address these factors	3. Water and aquatic environments	3	2	2	2	2	2	13
4	Develop an adaptive monitoring and evaluation plan for the Biodiversity Action Plan	5. Monitoring and evaluation	3	2	2	2	2	2	13