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AILA Biodiversity Positive Design Guide

A Process for Landscape Architects and Allied Professionals

This document is Version 1.0 of the AILA Biodiversity Positive Design Guide, developed by the Australian Institute of Landscape Architects working group on Biodiversity Positive Design in collaboration with key committees and AILA members.

Document Information:
Title: Biodiversity Positive Design Guide: A Process for Landscape Architects and Allied Professionals
Version: 1.0
Date: JULY 2025
Publisher: Australian Institute of Landscape Architects
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Visual communication and information design: Erin Turner
Format: Professional Practice Guide
Pages: 119

Citation:
When crediting this guide please use the following citation:
Hawken, S., de Beaujeu, G., Hahs, A., Dobbie, M., Ignatieva, M., Cabanek, A., Hazelwood, J., Sanders, I. and Secci, M. (2025) Biodiversity Positive Design Guide: A Process for Landscape Architects and Allied Professionals. Version 1.0. Canberra: Australian Institute of Landscape Architects. ISBN 978-1-7641757-2-2, DOI: 10.25909/29573984

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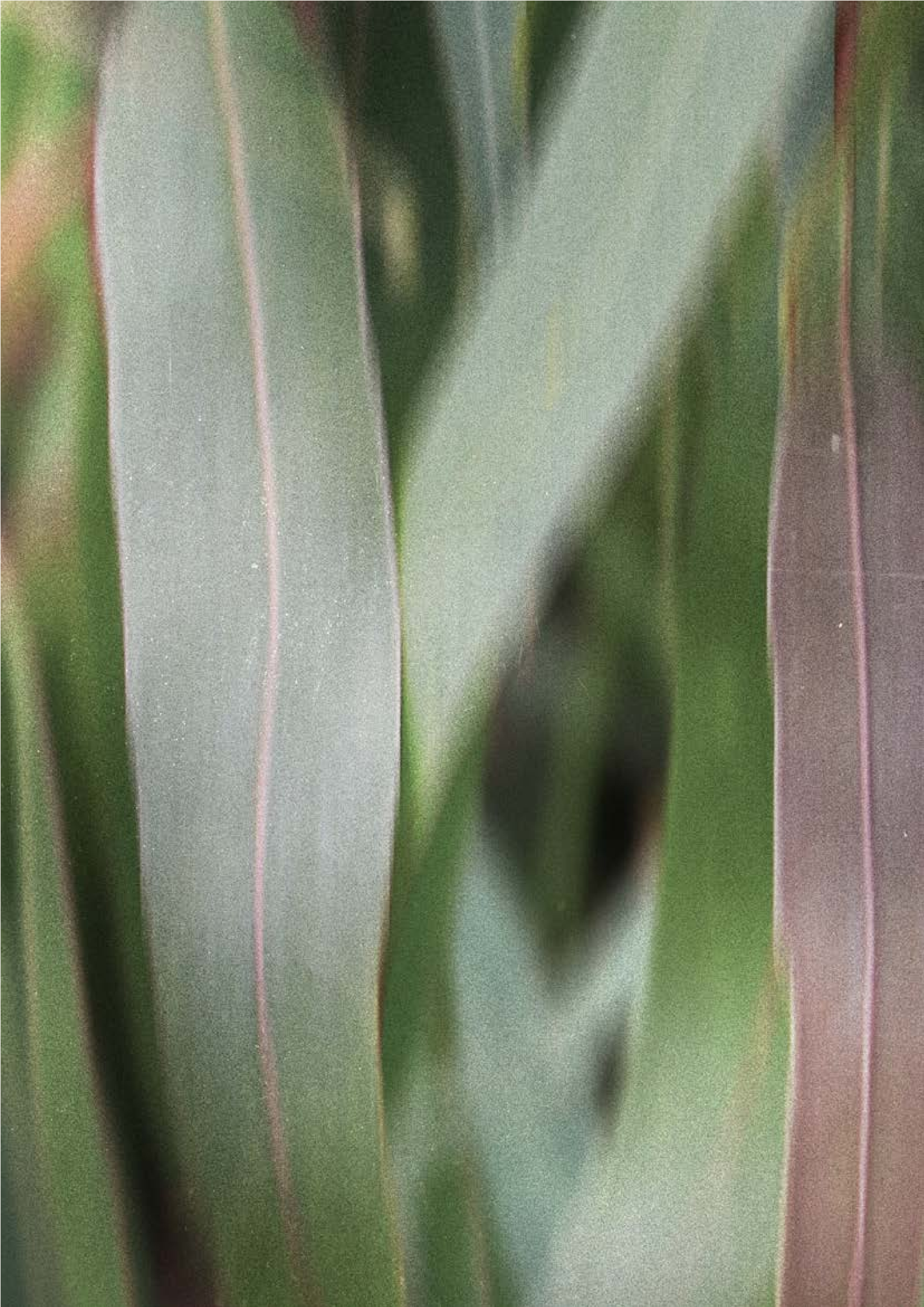
ISBN 978-1-7641757-2-2, DOI: 10.25909/29573984

Acknowledgement of Country

The Australian Institute of Landscape Architects (AILA) acknowledges and respects Aboriginal and Torres Strait Islander Peoples across Australia as the Traditional Custodians of the lands, waters, seas and skies and Country. We recognise that Aboriginal and Torres Strait Islander peoples have been caring for Country for over 65,000 years, developing sophisticated ecological knowledge systems that continue to inform sustainable land management practices today. We pay our respects to Elders past and present and acknowledge their deep spiritual connection to Country.

Contents



Executive Summary

The world faces a biodiversity crisis that poses an existential threat. Biodiversity is deteriorating at catastrophic rates with over one million species threatened with extinction. In Australia, this crisis is particularly acute, with the highest mammal extinction rate globally and extensive native vegetation cleared since European colonisation in 1788. Currently 87 ecological communities are threatened around Australia with many ecosystems at risk of collapse.

This guide presents a process to assist landscape architects and allied professionals address this crisis in their daily work through ensuring that projects are "Biodiversity Positive".

Biodiversity Positive Design (BPD) is the process whereby biodiversity is prioritised, and net positive outcomes are achieved for nature. As the guide explains, biodiversity is multidimensional, so there are many ways to achieve this.

This guide presents a systematic seven-stage process for implementing BPD. This process aligns with standard project delivery phases while embedding biodiversity considerations throughout. The process moves beyond conventional approaches that seek to "do no harm" toward delivering measurable net gains in biodiversity that achieve ecological health.

Credit: Sunshine Coast Ecological Park Master Plan / Hassell / Hassell

The seven stages include:

1. **Community & Stakeholder Engagement**
   Who are the human and non-human inhabitants of the place and what is the shared understanding of it? (Enabling)
2. **Ecological Site Analysis**
   What is the past and present biodiversity potential of the place? (Scoping)
3. **Biodiversity, Climate & Country Goals**
   What biodiversity positive outcome are we aiming for? (Vision setting)
4. **Measurement & Targets**
   What is the current biodiversity baseline and how will we evaluate success? (Measuring)
5. **Design Strategies**
   How do the design concepts and strategies support biodiversity positive actions? (Actioning)
6. **Ongoing Management**
   How are biodiversity positive outcomes supported through procurement, construction, establishment and management? (Enabling)
7. **Handover & Use**
   How will biodiversity positive outcomes be supported in the long-term through stewardship and monitoring? (Empowering)

Each stage includes detailed guidance, practical tools, and quality control measures that ensure successful biodiversity outcomes. Successful BPD implementation requires organisational change that builds capacity, aligns incentives, and embeds biodiversity considerations into standard practice. The guide provides practical tools including assessment checklists, monitoring protocols, plant selection guidelines, and case study templates that enable immediate implementation while building long-term capability.

Landscape architects implementing this approach can expect to deliver measurable biodiversity gains, differentiate their practice, meet growing client expectations, and contribute to addressing Australia's biodiversity crisis through professional practice.

1. The Purpose of this Guide

the living world [is] the most remarkable life-support system imaginable, constructed over billions of years to refresh and renew food supplies, to absorb and reuse waste, to dampen damage and bring balance at the planetary scale. It is no accident that the planet's stability has wavered just as its biodiversity has declined—the two things are bound together. To restore stability to our planet, therefore, we must restore its biodiversity, the very thing we have removed. It is the only way out of this crisis that we ourselves have created.
– Sir David Attenborough,
(Attenborough and Hughes, 2022, p. 115)

This guide is a practical document that aims to support action to address the biodiversity crisis. It presents the steps that Landscape Architects and allied Built Environment Professionals can take to support and rebuild biodiversity. It is closely aligned with professional workflows while providing ways to radically transform what we do to support biodiversity in our landscapes. In essence it aims to help you make more space for nature in every project that you do.

This guide has been published by AILA to accommodate a broad range of projects and practice types, regardless of whether you are a consultant, stakeholder or client. The document has been developed by AILA's working group on Biodiversity Positive Design and has been reviewed by key committees and AILA members including the Climate Positive Committee and the Connecting with Country Committee as well as biodiversity experts from disciplines ranging from ecology to urban development, planning and design.

1.1 How to Use this Guide

This guide can help you act now by:

- Explaining what Biodiversity is and how it relates to Biodiversity Positive Design
- Applying Biodiversity Positive Design in your everyday workflows
- Providing a rationale for adopting Biodiversity Positive Design
- Integrating Biodiversity Positive Design principles and processes into your workplace
- Demonstrating how biodiversity positive design can be applied

This guide represents a response to the biodiversity crisis, providing landscape architects and allied professionals with evidence-based tools and

Credit: Long Reef Surf Club / Tyrrell Studio / Tyrrell Studio

processes for implementing Biodiversity Positive Design (BPD) in their projects. Unlike theoretical frameworks that can be disconnected from practice, this document bridges the gap between ecological science and professional applications, offering a systematic approach that can be integrated into existing project workflows and professional standards.

The primary objective of this guide is to enable practitioners to achieve biodiversity-positive outcomes. While other approaches often seek to minimise harm, biodiversity-positive design aims to deliver net gains in ecological value, contributing to landscape-scale recovery and resilience. This shift in ambition reflects both the urgency of the biodiversity crisis and the growing recognition that incremental improvements are insufficient to address the scale of environmental challenges facing Australia.

The guide is structured around a seven-stage process ensuring that biodiversity considerations are embedded throughout the project lifecycle rather than treated as an add-on or afterthought. This process draws from the Society for Ecological Restoration Australasia National Standards (Standards Reference Group SERA, 2021) and incorporates principles from Biodiversity Sensitive Urban Design research (Kirk *et al.,* 2021) and other approaches such as Microbiome Integrated Green Infrastructure (MIGI) (Watkins *et al.,* 2020), adapting these frameworks for Australian landscape architecture practice.

Central to this approach is the integration of complementary frameworks including Climate Positive Design and Designing with Country. The scope of this guide encompasses projects across all scales and contexts, from small private gardens to large-scale infrastructure developments. This breadth reflects the reality that biodiversity conservation requires action across all scales of intervention, with small projects contributing to landscape-scale outcomes through cumulative effects. The guide recognises that different project types and contexts require tailored approaches while maintaining consistent principles and evaluation criteria

Figure 1.1 (Following page) →
The Biodiversity Positive Design Guide includes five knowledge types or components, and these are distributed throughout the document and linked within a Biodiversity Positive Design Framework. This flow chart of the framework communicates the sequence and links to the specific sections. It forms a “road map” for the guide. The framework synthesises current research and practice into five interconnected knowledge components. Each component builds upon the previous one: a shared definition establishes the foundation; regenerative values provide purpose and direction; actionable principles guide design decisions; proven strategies offer practical methods; and an integrated process embeds all components and prioritises biodiversity throughout the project delivery pipeline. Together, they form a comprehensive approach to biodiversity positive design for landscape architecture practice.

Conceptual foundation (New knowledge: definition)

Inclusive & Multidimensional Definition of Biodiversity

Establishes shared understanding for landscape architects and allied professionals that integrates Country, Climate, Science and Biocultural understanding of Biodiversity. ***See Figure 2.1***

↓

Purpose & direction (New knowledge: values)

Five Regenerative Ecological Values

The five BPD values orient and situate design decisions within ecological regeneration concepts. ***See Figure 3.2***

↓

Design approach (New knowledge: principles)

Eight Principles for BPD Action

Provides actionable guidance and inspiration throughout the design process. ***See Table 3.2***

↓

Practice methods (New knowledge: strategies)

Design Strategies from Australian Practice

Synthesises innovative design methods from landscape architects working in Australia. ***See Section 3.5***

↓

Workflow integration (New knowledge: process)

BPD Process Embedded in Design Project Workflow

Integrates definition, values, principles, and strategies and detailed tools and considerations into every stage of project design, implementation and management. ***See Section 4***

Credit: St Peters Street, Adelaide / Landskap & City of Norwood Payneham and St Peters / Duncan McKenzie

1.2 The Biodiversity Crisis and the Need for Action

Australia faces an existential biodiversity crisis that demands immediate and decisive action from all sectors of society, particularly those involved in shaping our built environment. Despite ongoing efforts, biodiversity is deteriorating worldwide (Biodiversity Council, 2024).

In Australia, the statistics are sobering. The continent has one of the highest rates of species extinction in the world, with over 100 species lost since European colonisation (J.C.Z. Woinarski et al., 2019). The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) has identified urbanisation and land-use change as primary drivers of this decline, making the built environment sector both a significant contributor to the problem and a critical part of the solution (Woinarski, Burbidge and Harrison, 2015; J. C. Z. Woinarski *et al.,* 2019; Dielenberg *et al.,* 2023).

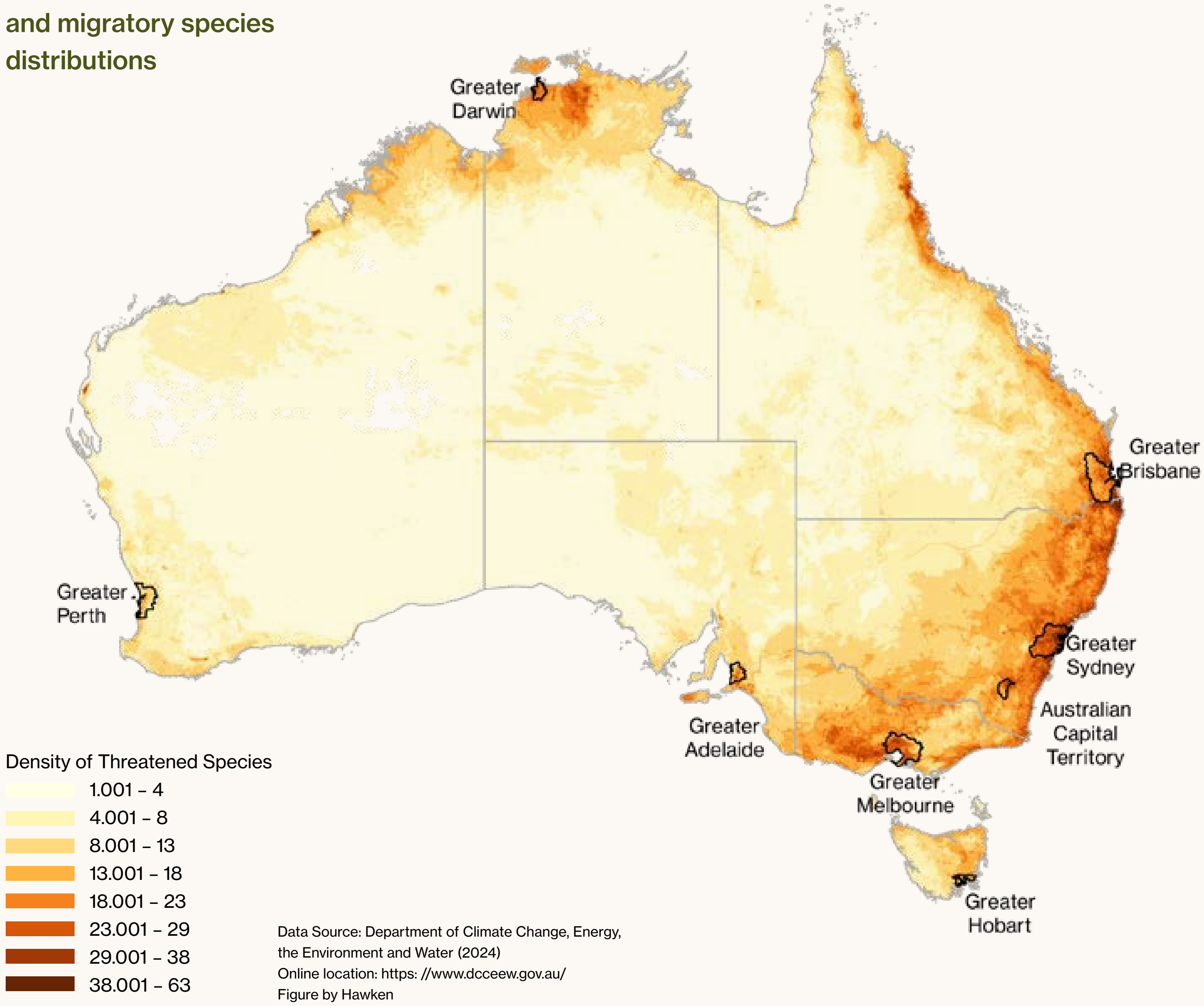
As of June 2021, 87 threatened ecological communities were listed under the Australian Environment Protection and Biodiversity Conservation (EPBC) Act: 41 Critically Endangered, 44 Endangered, and 2 Vulnerable. Since January

Figure 1.1 ↑
St Peters Street, Adelaide/ Landskap & City of Norwood Payneham and St Peters
Landskap & City of Norwood Payneham and St Peters created an innovative streetscape that retained 97 large trees and planted 200 new ones, converting hardscapes to softscapes. The new streetscape includes passive stormwater infrastructure, biodiversity, and pedestrian amenity creating a symbiotic space for nature, pedestrians and cars.

2016, 14 new communities have been added to the list, with 9 classified as Critically Endangered. Most threatened ecological communities are located in areas heavily modified by agriculture or urban development. Of the 14 new listings since 2016, ten occur in New South Wales, south-east Queensland and Victoria, two on Western Australia's Swan Coastal Plain, and one each in South Australia and Tasmania, reflecting the nationwide extent of ecosystem degradation (Murphy HT and van Leeuwen S, 2021a).

Australia's main environmental law, the Environment Protection and Biodiversity Conservation (EPBC) Act, was created in 1999 to protect species by preserving their habitat. Environment Minister Robert Hill stated the simple principle: "the major cause of species loss is habitat loss—if we can preserve and restore habitat then we have a greater chance of preserving species." However, the law has failed dramatically. In just 17 years, 7.7 million hectares of threatened

Density of threatened and migratory species distributions



Data Source: Department of Climate Change, Energy, the Environment and Water (2024)
Online location: https: //www.dcceew.gov.au/
Figure by Hawken

species habitat was destroyed under these very laws – an area larger than Tasmania. Since 2017, over one million additional hectares have been lost, yet governments lack the systems to properly measure this destruction (Australian Conservation Foundation, 2020; Evans, Wintle and Possingham, 2024).

Urban sprawl poses one of the key threats to biodiversity. As cities expand, they create pollution, spread invasive species, alter water flows, and fragment habitats. The more urbanised a species' habitat becomes, the higher its extinction risk. Between 1999 and 2016, urban development alone destroyed 20,212 hectares of threatened species

Figure 1.2 ↑
Density of threatened and migratory species distributions. Australia's densest concentrations of threatened species are found within urban and regional areas with as many as 63 threatened species likely occurring in urban areas. The density of threatened and migratory species distributions grid provides a national summary of likely habitat for terrestrial species that are Matters of National Environmental Significance under the Environment Protection Biodiversity Conservation Act (1999). This raster dataset shows relative concentrations of modelled habitat across mainland Australia and larger islands, derived from the Department's Species of National Environmental Significance distribution data. The grid includes threatened and migratory species modelled using three categories indicating where habitat is known, likely, or may occur. The dataset integrates: 1. EPBC Act listed species (vulnerable, endangered, critically endangered, extinct in the wild, or migratory). 2. Only 'known' and 'likely to occur' habitat categories (excluding 'may occur' only). 3. Terrestrial species and those with terrestrial lifecycle components, including plants, migratory marine species with land-based breeding sites, and animals moving between freshwater, estuarine and marine environments.

habitat – equivalent to 3.4 Manhattan's or for a more local comparison, the obliteration of an area equivalent to 10,000 Melbourne Cricket Grounds. (Australian Conservation Foundation, 2020).

Despite Australia's growing list of threatened species, habitat destruction continues at alarming rates. The laws designed to protect nature have instead made its destruction legal and routine, accelerating the extinction crisis. Without urgent reform, and professional and grass roots activism this systematic habitat loss will drive more species toward extinction. This dire trajectory suggests that without fundamental changes to how we design, construct, and manage our built environments, Australia will continue to lose biodiversity at an accelerating rate. The window for meaningful intervention is closing, with scientists emphasising that the next decade represents a critical period for reversing biodiversity decline or as it has been described: "bending the curve" (Evans, Wintle and Possingham, 2024)(see Figure 1.4). The challenge needs to be considered alongside global climate targets and presents an opportunity for integrated approaches that address both biodiversity loss and climate change simultaneously.

The crisis presents an opportunity for landscape architects and allied professionals to demonstrate leadership in environmental stewardship. The profession's position at the intersection of design, ecology, urban space, and human experience provides a platform for implementing approaches that can deliver measurable and net positive biodiversity gains while meeting human needs and aspirations. The challenge lies in translating ecological knowledge into practical design approaches that can be implemented across diverse project types and scales.

Number of threatened ecological communities over time

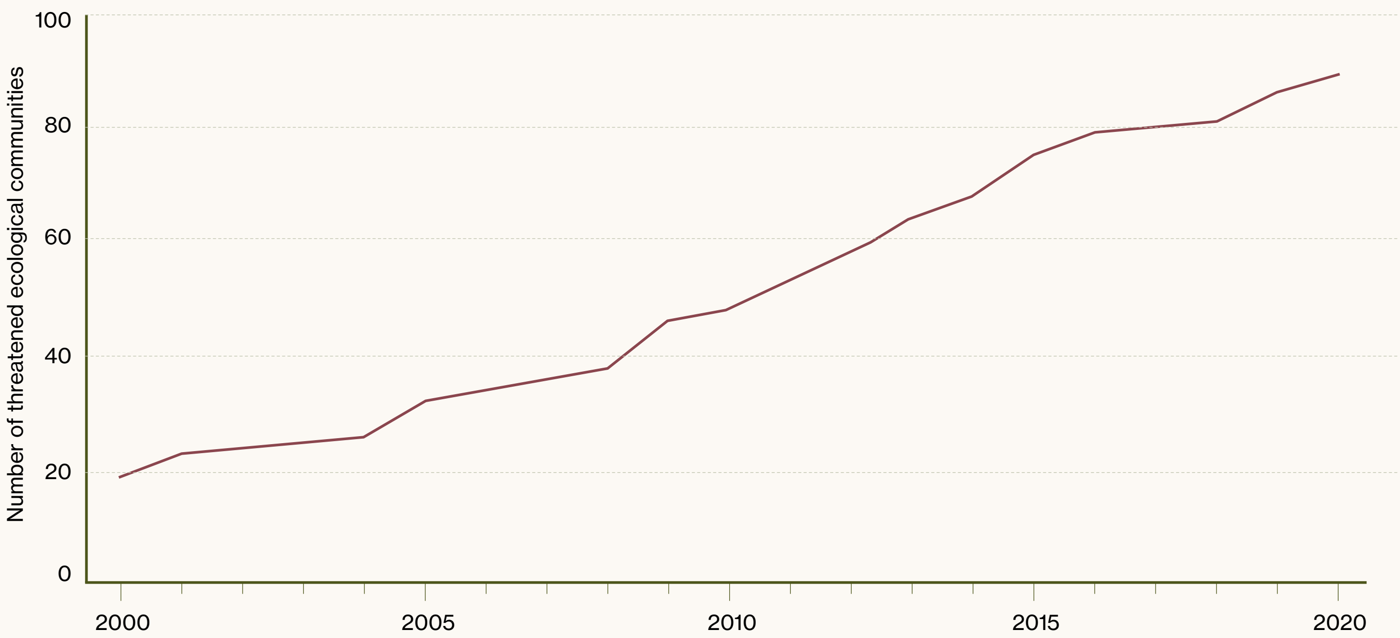
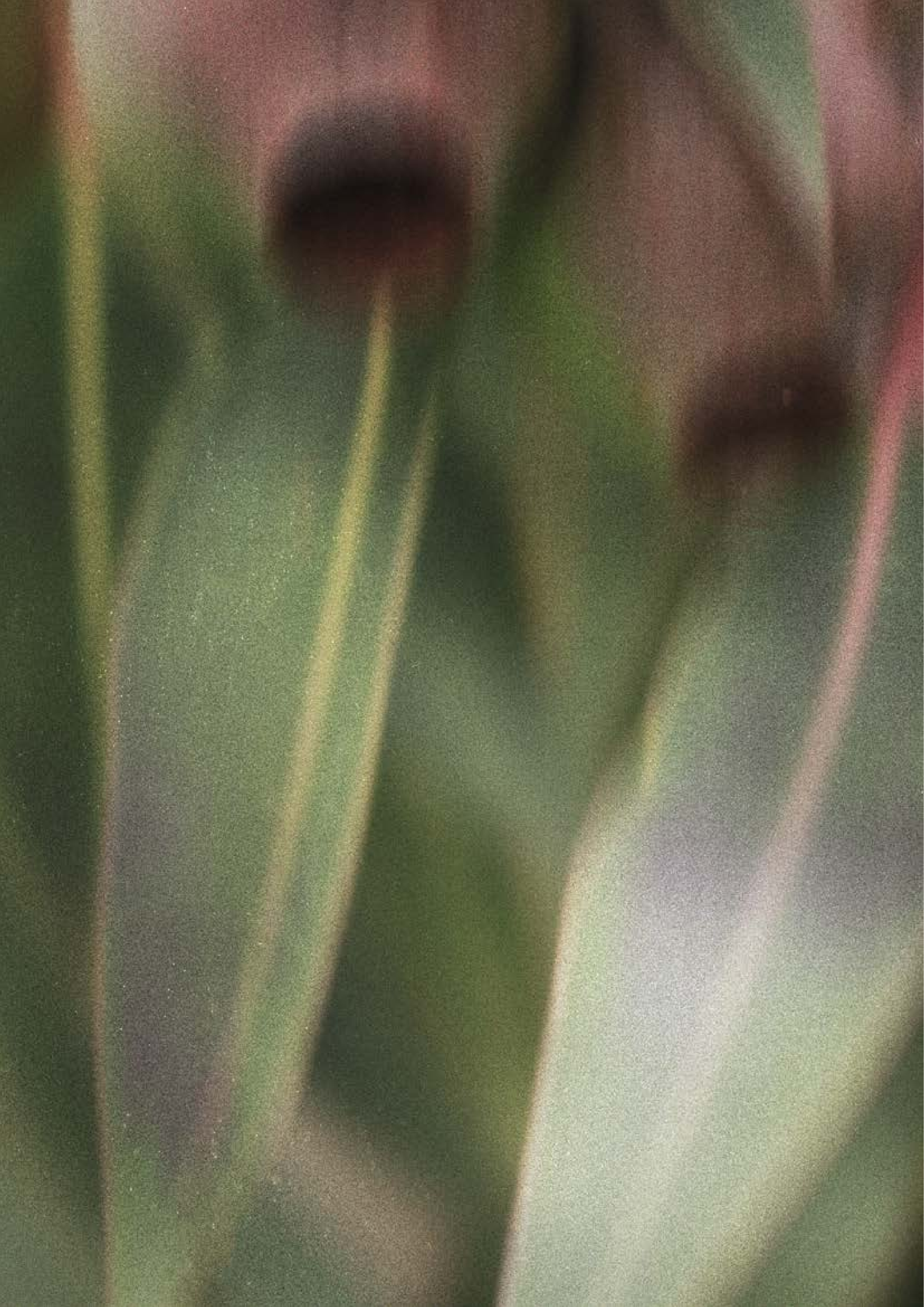


Figure 1.3 ↑
On June 2021, 87 threatened ecological communities were listed by the EPBC Act: 41 as Critically Endangered, 44 as Endangered and 2 as Vulnerable. Over the past ten years, there have been 14 new listings, including 9 in the Critically Endangered category (Murphy HT and van Leeuwen S, 2021b).

Bending the curve

Figure 1.4 ↑

Bending the curve – to "bend the curve" of biodiversity loss radical societal change is necessary. There are multiple ways to do this such as a) developing win-win situations where ecosystem are integrated into all projects, b) harmonising development by turning biodiversity conflicts into drivers of transformation and c) prioritising biodiversity at every opportunity. To illustrate pathways for bending the biodiversity curve, this figure presents Mean Species Abundance (MSA) projections from the GLOBIO model, averaged across four land use models. The comparison of scenarios demonstrates the biodiversity outcomes of different conservation and management approaches. (Leclère *et al* 2020). Redrawn from Leclère et al (2020) and WWF Living Planet Report 2020.



2. What is Biodiversity?

2.1 Biodiversity: A Multidimensional Concept

Biodiversity has been defined by the United Nations Convention on Biological Diversity as encompassing "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Secretariat of the Convention on Biological Diversity, 2011). This definition captures the spectrum of life's complexity, from genetic variation within populations to the intricate relationships between species and their environments.

Biodiversity occurs within sites, landscapes and regions of all scales and includes ecological communities, and ecological processes, whether occurring naturally or through modification, design and management by humans (DeLong Jr, 1996). Novel ecosystems represent an important consideration in our landscapes, acknowledging that many environments globally have been comprehensively altered from their pre-colonisation state and that humans have been shaping ecosystems for millennia (Ellis and Ramankutty, 2008).

2.2 Biodiversity in Australia

In the Australian context, biodiversity takes on particular significance due to the continent's unique evolutionary history and exceptional levels of endemism (Crisp *et al.,* 2001). Australia's geographic isolation has resulted in the evolution of distinctive flora and fauna found nowhere else on Earth, with approximately 87% of mammal species, 93% of reptile species, 94% of frog species, and 85% of flowering plant species being endemic to the continent (Chapman, 2009).This extraordinary biological heritage represents both a global conservation priority and a professional responsibility for landscape architects working within Australian ecosystems.

Native species have evolved to live in unique ecosystems that cannot be replicated and at best approximated. The relationship between native biodiversity is therefore paramount to maintain where at all possible.

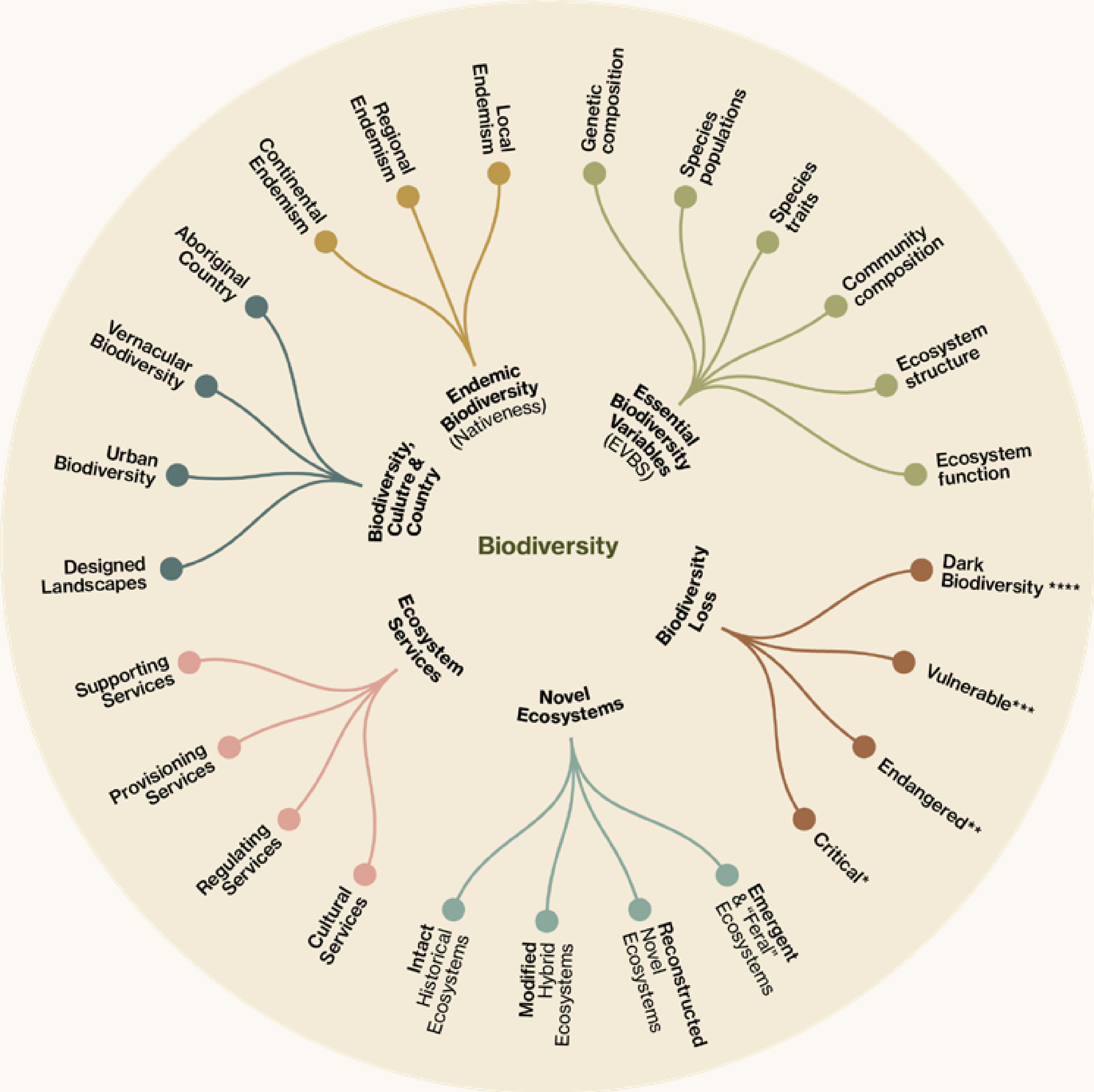
Credit: West Head Lookout / OCULUS, Bruce Mackenzie, NSWPWS / Simon Wood

Credit: Stonehill Gully and Escarpment Regeneration / Thomson Hay Landscape Architects / Thomson Hay Landscape Architects

Figure 2.1 ↑
West Head Lookout / OCULUS, Bruce MacKenzie, NSWPWS
Biodiversity Dimensions — West Head Lookout upgrade in Ku-ring-gai Chase National Park is a collaborative design involving OCULUS and NPWS, with Bruce Mackenzie's input, demonstrating how design and management can integrate with ecological communities. It upholds McKenzie's design intent for the lookout to integrate with the bushland.

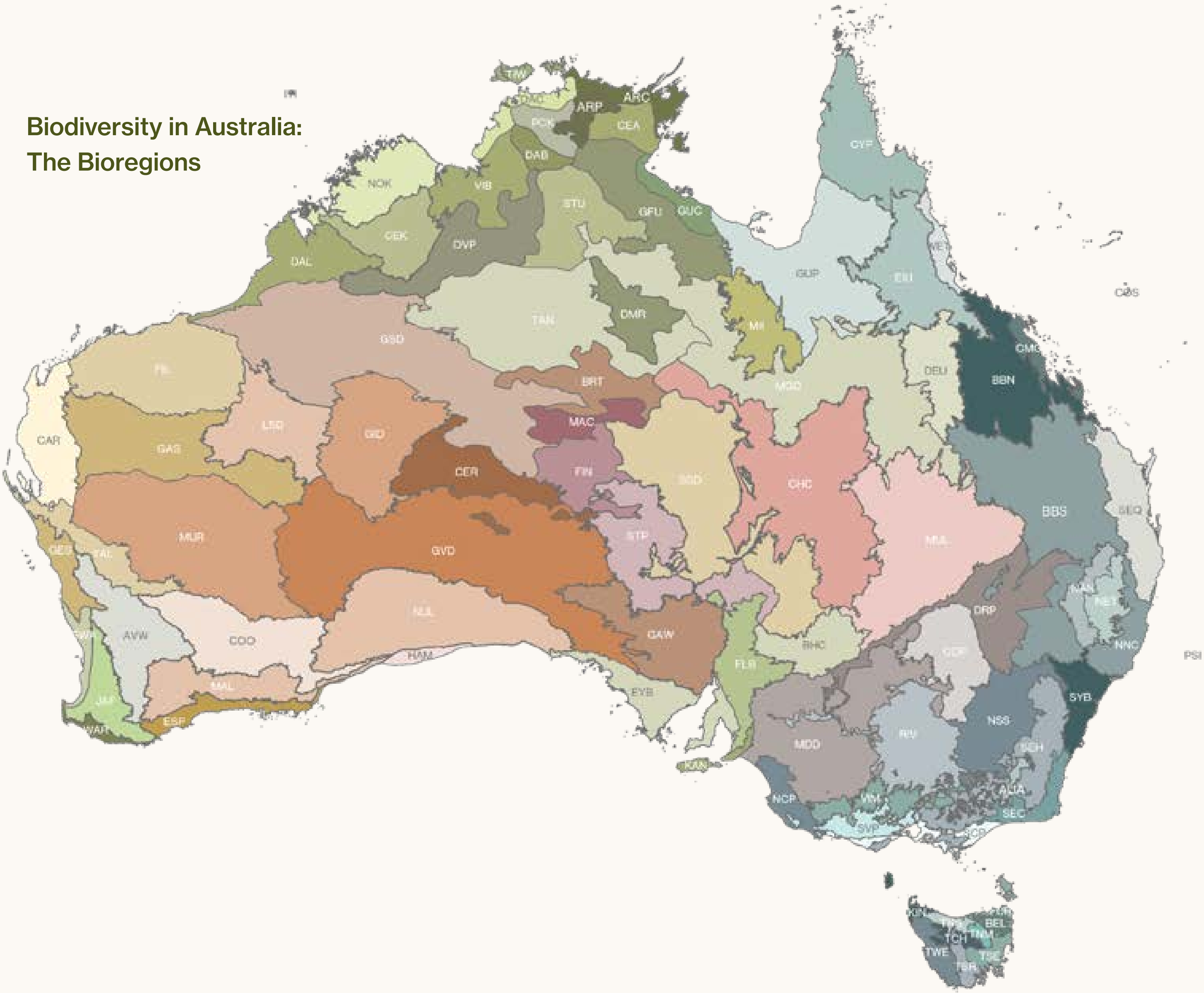
Figure 2.2 (Following page) →
Biodiversity: A Multidimensional Concept
Biodiversity is multidimensional, and official definitions don't always capture the complexity of the concept. It continues to evolve today as we gain a greater appreciation of different forms of knowledge. This figure captures the various aspects of biodiversity that are helpful in guiding landscape architecture and biodiversity positive design. Biodiversity definitions can benefit from including knowledge from the biological sciences and environmental management, simultaneously with traditional ecological knowledge. Concepts such as taxonomic diversity, endemic diversity, cultural diversity and significance, ecosystem services, novel ecosystems and biodiversity loss are important to consider when defining biodiversity from a landscape project perspective.

Biodiversity:
A Multidimensional Concept



* Extreme risk of extinction in the wild in the immediate future
** Very high risk of extinction in the wild in the near future
*** High risk of extinction in the wild in medium-term future
**** Unknown species at risk of extinction

Biodiversity in Australia: The Bioregions



IBRA 7 Regions

- ARC / Arnhem Coast
- ARP / Arnhem Plateau
- AUA / Australian Alps
- AVW / Avon Wheatbelt
- BBN / Brigalow Belt North
- BBS / Brigalow Belt South
- BEL / Ben Lomond
- BHC / Broken Hill Complex
- BRT / Burt Plain
- CYP / Cape York Peninsula
- CAR / Carnarvon
- CEA / Central Arnhem
- CEK / Central Kimberley
- CMC / Central Mackay Coast
- CER / Central Ranges
- CHC / Channel Country
- COP / Cobar Peneplain
- COO / Coolgardie
- COS / Coral Sea
- DAB / Daly Basin
- DAL / Dampierland
- DRP / Darling Riverine Plains
- DAC / Darwin Coastal
- DMR / Davenport Murchison Ranges
- DEU / Desert Uplands
- EIU / Einasleigh Uplands
- ESP / Esperance Plains
- EYB / Eyre Yorke Block
- FIN / Finke
- FLB / Flinders Lofty Block
- FUR / Furneaux
- GAS / Gascoyne
- GAW / Gawler
- GES / Geraldton Sandplains
- GID / Gibson Desert
- GSD / Great Sandy Desert
- GVD / Great Victoria Desert
- GUC / Gulf Coastal
- GFU / Gulf Fall and Uplands
- GUP / Gulf Plains
- HAM / Hampton
- ITI / Indian Tropical Islands
- JAF / Jarrah Forest
- KAN / Kanmantoo
- KIN / King
- LSD / Little Sandy Desert
- MAC / MacDonnell Ranges
- MAL / Mallee
- MGD / Mitchell Grass Downs
- MII / Mount Isa Inlier
- MUL / Mulga Lands
- MUR / Murchison
- MDD / Murray Darling Depression
- NNC / NSW North Coast
- NSS / NSW South Western Slopes
- NAN / Nandewar
- NCP / Naracoorte Coastal Plain
- NET / New England Tablelands
- NOK / Northern Kimberley
- NUL / Nullarbor
- OVP / Ord Victoria Plain
- PSI / Pacific Subtropical Islands
- PIL / Pilbara
- PCK / Pine Creek
- RIV / Riverina
- SSD / Simpson Strzelecki Dunefields
- SCP / South East Coastal Plain
- SEC / South East Corner
- SEH / South Eastern Highlands
- SEQ / South Eastern Queensland
- SVP / Southern Volcanic Plain
- STP / Stony Plains
- STU / Sturt Plateau
- SAI / Subantarctic Islands
- SWA / Swan Coastal Plain
- SYB / Sydney Basin
- TAN / Tanami
- TCH / Tasmanian Central Highlands
- TNM / Tasmanian Northern Midlands
- TNS / Tasmanian Northern Slopes
- TSE / Tasmanian South East
- TSR / Tasmanian Southern Ranges
- TWE / Tasmanian West
- TIW / Tiwi Cobourg
- VIB / Victoria Bonaparte
- VIM / Victorian Midlands
- WAR / Warren
- WET / Wet Tropics
- YAL / Yalgoo


Credit: Wangayarta/ Oxigen / Oxigen

Figure 2.3 (Previous page) ←
Biodiversity in Australia: The Bioregions.
The Interim Biogeographic Regionalisation for Australia (IBRA) represents a scientifically rigorous, nationally accepted classification system that divides Australia's varied landscapes into discrete bioregions and subregions. This framework serves as an essential basis for conservation planning and environmental management throughout Australia (Department of Climate Change, Energy, the Environment and Water, 2025).

Bioregional diversity is relfected in the diversity of Indigenous language groups and their traditional Countries, with areas of high ecological diversity often supporting greater linguistic and cultural diversity (Maffi 2005; Gorenflo et al. 2012). This relationship is evident in Australia, where the continent's varied bioregions relate to over 250 distinct Aboriginal and Torres Strait Islander language groups, each with deep connections to their specific Countries (AIATSIS 2024).

2.3 Biodiversity and Country

The Aboriginal and Torres Strait Islander peoples of Australia have been caretakers of life in Australia for 65,000 years and have shaped Country. Indigenous science is an essential integrated system and world view as Prof Margot Neale (Neale and Kelly, 2020) eloquently narrates, that positions humans as one of many things to care for "on country":

"Everything is part of a continuum, an endless flow of life and ideas emanating from Country, which some refer to as the Dreaming. In the Dreaming, as in Country, there is no separation between the animate and inanimate. Everything is living — people, animals, plants, earth, water and air. We speak of Sea, Land and Sky Country. Creator ancestors created the Country and its interface, the Dreaming. In turn, Dreaming speaks for Country, which holds the law and knowledge. Country has Dreaming. Country is Dreaming. It is this oneness of all things that explains how and why Aboriginal knowledges belong to an integrated system of learning"

Cultural dimensions of biodiversity are paramount in the Australian context, where Aboriginal and Torres Strait Islander peoples have maintained sophisticated ecological knowledge systems for over 65,000 years.


Credit: Gosford Leagues Club / Turf Design / Guy Wilkinson

This cultural biodiversity encompasses traditional ecological knowledge, management practices, and spiritual connections to Country that have shaped Australian landscapes and continue to inform contemporary conservation approaches (Renwick *et al.,* 2017; Pascoe, Gammage and Neale, 2021). Recognising the cultural dimensions of biodiversity acknowledges that human communities are integral components of ecological systems rather than external forces acting upon them.

Of particular importance for landscape architects is the idea of biocultural diversity (BCD) which recognises that biological, cultural, and linguistic diversity are interconnected and dynamic. Developed in the 1990s, BCD acknowledges that humans and their environments have co-evolved as complex socio-ecological systems, where cultural practices and ecological diversity mutually shape each other (Elands et al. 2019, p.29).

Figure 2.4 ↑
Gosford Leagues Club Park / Turf Design
Gosford Leagues Club Park by Turf Design on Australia's Central Coast profoundly connects with its past and future. Situated at a significant "first contact" point for the Darkinjung people, the design emphasises biodiversity and estuarine ecology. By "bringing the bay to the park" and reversing historical land reclamation, the project symbolically unearths "old Country" and restores vital tidal flows. The Old Shoreline Walk interprets the original high tide line, weaving Indigenous cultural heritage with ecological regeneration. This innovative approach fosters a vibrant, nature-positive space, honouring history and enhancing the natural environment.

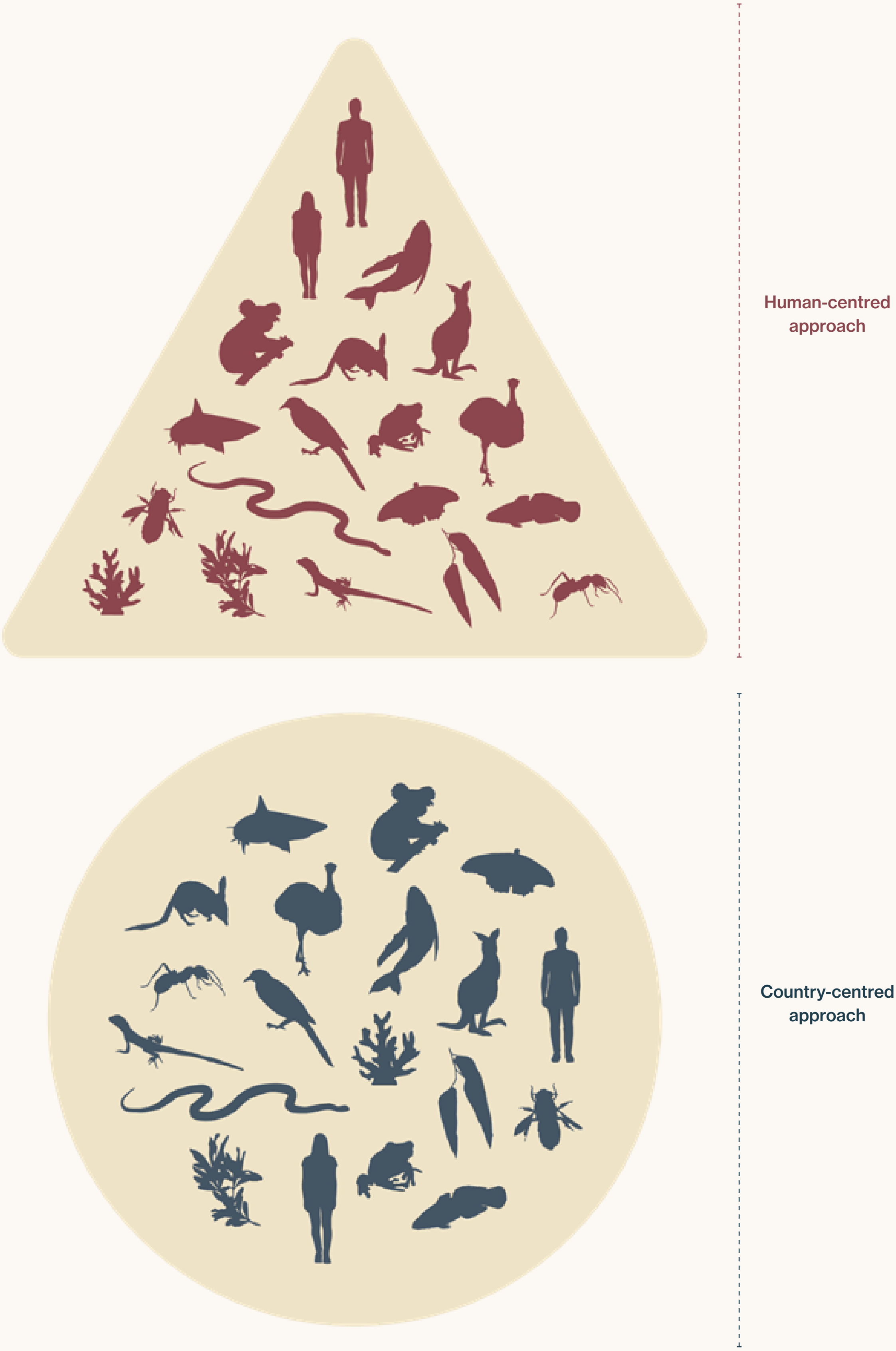


Figure 2.5 ↑

Country Centred Viewpoints decentre humans and acknowledge the interconnectedness of life. Figure adapted from Lehmann's article "Reconnecting with nature: developing urban spaces in the age of climate change" (Lehmann, 2023).

The illustration contrasts two worldviews through their spatial arrangements. In the human-centred approach, a vertical pyramid represents the Western patriarchal hierarchy that places humans above nature. In contrast, the Country-centred approach forms a constellation where humans, non-humans, and Country exist equally as participants within an interconnected web of relationships.

Credit: Bendigo Botanic Gardens Larni Garingilang Central Hub / GHD Design / Trevor Mein

2.4 Ecosystem Services

The concept of biodiversity includes the range of ecological roles and processes performed by different organisms within ecosystems. This functional perspective is particularly relevant for landscape architects, as it emphasises the importance of maintaining ecological processes such as pollination, seed dispersal, nutrient cycling, and invasive pest control that support both ecosystem health and human wellbeing. Designing for functional diversity requires understanding the ecological roles of different species and ensuring that landscapes provide the resources and conditions necessary for these relationships to persist.

The concept of ecosystem services has been popularised through the convention on biodiversity (United Nations 2005). It has limitations and tends to situate humans outside of nature at the top of a notional pyramid. Nonetheless it is useful to break down and understand how ecosystems support our cities and landscapes. In this concept biodiversity can be described as having intrinsic value and instrumental value. Intrinsic value is the value of the biological entity "in itself, for what it is, or as an end". In contrast, instrumental value derives from its

Table 2.1
The Four Groups of Ecosystem Services

Service Type	Description	Examples
Supporting	Basic ecosystem functions that underpin all other services	Nutrient cycling, soil formation, primary production
Provisioning	Products obtained from ecosystems	Food, fresh water, wood and fibre
Regulating	Benefits obtained from ecosystem processes	Climate regulation, flood regulation, disease regulation
Cultural	Non-material benefits from ecosystems	Aesthetic, spiritual, education, recreational

Figure 2.6 ←
Bendigo Botanic Gardens Larni Garingilang Central Hub / GHD Design

desired use. It is the instrumental value of biodiversity that attracts most attention when considering its decline and intrinsic values are not always appropriately considered..

There are four groups of ecosystem services that contribute to human well-being: Supporting services provide the foundation for all other ecosystem services through basic ecological processes. Provisioning services supply the tangible products that humans derive from ecosystems. Regulating services control environmental conditions and processes that affect human welfare. Cultural services provide the intangible benefits that contribute to human well-being and quality of life.

2.5 Novel Ecosystems

The concept of novel ecosystems is a contested concept but one that is necessary to consider in human-modified landscapes—which today span most of the globe. Novel ecosystems are those that have been significantly altered by human activities and contain new combinations of species that did not exist historically (Hobbs, Higgs and Hall, 2013; Hobbs *et al.,* 2014). These systems, which characterise much of Australia's urban and agricultural landscapes, present both challenges and opportunities for biodiversity conservation. While they may not replicate historical conditions, novel ecosystems support significant biodiversity and provide important ecosystem services when appropriately designed and managed.

One way of working with novel ecosystems is through The Nature Futures Framework (NFF), developed by the IPBES task force. The triangular NFF model captures diverse positive values for human-nature relationships to help develop pluralistic nature focused futures. Its three corners represent different ways of valuing nature: nature for nature (intrinsic value and biodiversity), nature for society (utilitarian benefits to people), and nature as culture (relational values where societies and traditions are intertwined with nature) (Shaik and Hamel 2023).

2.6 Biodiversity Loss

Primary Drivers of Biodiversity Loss

In the 2020 Global Assessment for Biodiversity and Ecosystem Services, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) identified five primary drivers of biodiversity loss (IPBES, 2019). These drivers must be halted and buffered when protecting and designing for biodiversity today.

Table 2.2
Primary Drivers of Biodiversity Loss

Driver	Description	Impact
Land-use and sea-use changes	Deforestation, mining, agriculture and urban development	Lead to habitat loss or fragmentation
Climate change	Rising temperatures, altered precipitation patterns and changing bioclimatic zones	Adversely affects biodiversity through habitat loss and interference with seasonal activity and reproduction synchronisation.
Pollution	Air and water contaminants, physical waste	Noise, vibration and light pollution impact daily activity
Exploitation of natural resources	Logging and minerals extraction	Contribute to biodiversity loss through habitat fragmentation and destruction
Invasive pest and weed species	Introduction of non-native species	Outcompete native species and significantly alter ecosystem structure and function

3. Conceptualising Biodiversity Positive Design

3.1 The Urban Challenge

A fundamental paradox confronts contemporary landscape practice. Cities are the habitat for the majority of humans today, located in some of the most biodiverse places on the planet. They are frequently located in "biodiversity hotspots" with potential for drastic biodiversity loss & conflict. While the built environment depends entirely on biodiversity for its function, it simultaneously undermines the very ecological systems it relies upon. Further the challenge transcends city limits, with urban networks of resource extraction causing biodiversity loss globally.

This paradox presents landscape architects with a profound professional challenge: How can we accommodate humans and their urban habitats while simultaneously protecting, conserving and enhancing biodiversity's intrinsic and instrumental values? This guide proposes that landscape architects can cultivate transformative opportunities for biodiversity stewardship and regeneration across every project scale and context. Current research provides the evidential basis for this (Leclère *et al.,* 2020; Mehring *et al.,* 2024; Cortés-Capano *et al.,* 2025). Biodiversity Positive Design provides the conceptual and methodological framework to realise this transformation.

Recognition of this critical juncture has led to the establishment of the International Network for Urban Biodiversity and Design (Müller and Kamada, 2011) which has provided strategic support for the Convention on Biological Diversity's "Cities and Biodiversity" framework. Nevertheless, many frameworks are playing catchup when it comes to the urban environment where the landscape architects and other built environment professionals complete the majority of their work.

3.2 Defining Biodiversity Positive Design

Biodiversity Positive Design (BPD) represents a paradigm shift from minimising environmental harm to actively enhancing ecological value through landscape architecture interventions. Unlike conventional approaches that seek to "do no harm" or achieve "net zero" impact, BPD aims to deliver measurable net gains in biodiversity that contribute to landscape-scale conservation goals. The first published use of the term was in Landscape Architecture Australia where the concept was first articulated (Ong 2022, p.12). These values reflect current insights on biodiversity positive design from both practice and research (Birkeland 2022, Jay and Plieninger 2025, Li et al 2025, Ong 2022).

Credit: Hanlon Park/ Bur'uda Waterway Rejuvenation /
Brisbane City Council, Tract, Bligh Tanner, Epoca Constructions, and AECOM / Christopher Frederick Jones

Here we define BPD as:

Biodiversity Positive Design is an approach that delivers measurable net gains in ecological value, contributing to the recovery and resilience of biological systems while meeting human and non-human needs as well as project objectives.

This definition encompasses several key values:

- **Measurable outcomes:** Quantifiable improvements in biodiversity indicators
- **Net positive impact:** Gains exceed losses over project lifecycle and beyond
- **Diverse values:** Multiple dimensions including species, habitats, and processes
- **System contribution:** Alignment with broader ecosystems within and beyond the site
- **Human nature relationships:** Recognition of social, cultural and economic requirements

See figure 3.1 for an illustration of the key values of Biodiversity Positive Design, which can be used to frame project design, measurement, and evaluation.

3.3 Approaches to Biodiversity Conservation and Regeneration

Landscape architects occupy a pivotal position in preventing biodiversity loss and contributing to biodiversity net gain. Contemporary biodiversity faces multifaceted threats including habitat degradation, agricultural intensification, pathogen proliferation, invasive species introduction, pollution, and urbanisation pressures. Given the absence of truly secure habitats for any species, transforming human culture—with design as a fundamental cultural expression and action-based method—becomes paramount.

Landscape architects serve as key agents in creating cities and environments that operate as safe and regenerative spaces for species and life-supporting systems. Addressing biodiversity threats represents both an urgent planetary necessity and a fundamental ethical obligation. BPD builds on a range of complementary development and restoration frameworks as set out in the table below.

Key values of Biodiversity Positive Design

Figure 3.1 ↑
Key values of Biodiversity Positive Design

Table 3.1
Complementary Approaches to Biodiversity and Design

Approach	Primary Objective	Expected Outcome	Limitations	Key Reference
Australian Environmental Impact Assessment (EIA)	Minimise environmental harm through impact identification and mitigation	Reduced negative impacts on biodiversity and ecosystems	Reactive approach focused on harm reduction rather than positive outcomes	(DCCEEW 2025)
Biodiversity Sensitive Urban Design (BSUD)	Avoid and mitigate biodiversity impacts while creating habitat benefits	Evidence-based urban development with on-site biodiversity gains	Lack of integration with current urban development processes	(Garrard *et al.,* 2018)
UK Biodiversity Net Gain (BNG)	Ensures a net positive impact on biodiversity	Zero net impact on biodiversity with 10% mandatory improvement	Developers may default to offsite credit purchases	(Department for Environment, Food and Rural Affairs, 2023)
Australian Ecological Restoration Standards	Restore ecosystems to reference conditions based on historical precedents	Functional ecosystem development aligned with pre-disturbance conditions	Relies on historical precedents that may not be suitable for contemporary conditions	(Standards Reference Group SERA, 2021)
Biodiversity Positive Design (BPD)	Achieve net ecological gain through integrated design processes	Net positive biodiversity outcomes with measurable improvements over time	Requires innovation, significant investment, and long-term commitment to monitoring	(AILA et al 2025 – This Guide)

Credit: Hobsons Bay Wetlands Centre / McGregor Coxall / McGregor Coxall

Credit: Wallumburn at Lake Cooroibah / Coco-Dash Landscape Architectual / James Peeters

Credit: Central Precinct Renewal / Tyrrell Studio / Tyrrell Studio

Figure 3.2 ↑
Wallumburn at Lake Cooroibah / Coco-Dash Landscape Architecture
Coco-Dash Landscape Architecture created a garden that fosters biodiversity and climate resilience through plant selection and permeable surfaces. It offers a compelling model for sustainable rural living merging beauty, functionality and environmental stewardship.


Credit: Ngajarli / Department of Biodiversity, Conservation and Attractions / Fuzz Digital

3.4 Biodiversity Positive Design Principles

Eight supporting principles have been devised in the process of putting this guide together and these are based primarily on the seven lamps of planning for biodiversity in the city by Parris et al (2018). These principles have been developed to assist decision-making throughout the design process, integrating knowledge from various frameworks. In particular the principles provide a framework for landscape architects to:

- Take responsibility for biodiversity outcomes at every stage of every project
- Contribute to reversing extinction trends through design
- Transform human-modified landscapes into biodiverse cultural landscapes
- Build an evidence base for biodiversity positive design through practice

These principles work in integration with:

- **Designing with Country:** Embedding Indigenous knowledge and supporting cultural connection
- **Climate Positive Design:** Achieving net positive climate outcomes alongside biodiversity benefits
- **Evidence-based Practice:** Using research through design and collaborative knowledge production with ecologists, scientists and traditional knowledge owners

Table 3.2 (Following pages) →
BPD Principles for Landscape Architects

Credit: Romsey Ecotherapy Park / ACLA Consultants / Michael Black

Principle:

1. Measure and Adapt for Net Positive Outcomes

Description:
Systematic measurement and adaptive management for demonstrating net positive biodiversity outcomes and continuous improvement.

Key Actions:
- Set measurable targets
- Establish baselines
- Monitor progress
- Learn from outcomes
- Adapt strategies

Credit: Wangayarta/ Oxigen / Oxigen

Principle:

2. Design with Country

Description:
Recognise Traditional Owners as primary knowledge holders of ecological processes and cultural landscapes.

Key Actions:
- Engage Traditional Custodians
- Understand cultural landscapes
- Respect sacred sites
- Embed reciprocal relationships
- Integrate Traditional Knowledge

Credit: Sunshine Coast Ecological Park Master Plan / Hassell / Hassell

Principle:

3. Retain Existing Assets & Design for Succession

Description:
Preserve remnant vegetation, mature trees, soil communities, and wildlife populations while planning for succession.

Key Actions:
- Map existing assets
- Preserve soil microbiomes
- Protect wildlife populations
- Plan for succession
- Design around natural assets

Credit: Inveresk Urban Realm / Realm Studios / Aaron Jones

Principle:

4. Maximise Connectivity

Description:
Enable wildlife movement, genetic exchange, and ecosystem resilience across multiple scales.

Key Actions:
- Link habitat patches
- Avoid wildlife strike
- Remove movement barriers
- Design multi-scale connectivity
- Consider functional connectivity


Credit: Baruwei Lookout / CLOUSTON Associates / Shaana McNaught

Principle:

5. Remove or Soften Human Impacts

Description:
Mitigate urban stressors including noise pollution, light pollution, and human disturbance on wildlife.

Key Actions:
- Use local materials
- Wildlife-friendly lighting
- Create acoustic buffers
- Minimise disturbance
- Use pollution-tolerant species
- Manage pollution on-site


Credit: Hanlon Park / Tract Consultants / Christopher Frederick Jones

Principle:

6. Design Systems for Resilience and for Change

Description:
Create adaptive systems for rapidly changing conditions resulting from climate change and anthropogenic environments

Key Actions:
- Select resilient species
- Assess novel ecosystem potential
- Design hybrid ecosystems
- Create functional niches
- Establish adaptive systems
- Cycles that mimic natural flows


Credit: Romsey Ecotherapy Park / ACLA Consultants / Steven Pam — Smartshots

Principle:

7. Foster Human-Nature Connections

Description:
Build social foundation for ecosystem stewardship through direct nature experiences and education

Key Actions:
- Create interaction opportunities
- Design interpretive elements
- Provide citizen science options
- Develop accessible experiences
- Build care networks


Credit: Sydney Modern / McGregor Coxall / McGregor Coxall

Principle:

8. Take Every Opportunity

Description:
Recognise biodiversity potential across all landscape types and scales, from large areas to small patches

Key Actions:
- Identify potential everywhere
- Maximise habitat value
- Integrate with objectives
- Consider cumulative impacts
- Challenge habitat assumptions

Credit: Sydney Modern / McGregor Coxall / McGregor Coxall

3.5 Biodiversity Positive Design Strategies

Strong spatial strategies are necessary to achieve BPD outcomes across diverse landscape contexts. The following evidence-based approaches provide ways for integrating biodiversity considerations into landscape architecture practice. Each strategy builds upon extensive research and practical experience, showing how thoughtful spatial planning can transform landscapes into thriving ecosystems that serve ecological communities. The recommended strategies and approaches form a toolkit for achieving measurable biodiversity gains while meeting the complex demands of contemporary urban development.

Credit: Greater Sydney Green Grid / Tyrrell Studio / Tyrrell Studio

Credit: Sydney Modern / McGregor Coxall / McGregor Coxall

Strategy 1: All Landscape Projects Have Biodiversity Potential

Every landscape project type, regardless of scale or context, presents quantifiable opportunities for biodiversity enhancement when approached systematically. Biodiversity outcomes can be measured and optimised across diverse project types through standardised indicators including habitat area, structural diversity, connectivity, and species composition (Brown, 2013). Research shows that even small urban interventions can support significant biodiversity when designed carefully (Bode and Maciejewski, 2014; Wintle *et al.,* 2019, 2019; Hayes Hursh, Perry and Drake, 2024).

Evidence from multi-taxa research reveals that urban green spaces with native vegetation and appropriate structural complexity can support diverse wildlife communities including bats, birds, bees, beetles, and other fauna (Lepczyk *et al.,* 2017; Threlfall *et al.,* 2017; Lepczyk, Aronson and La Sorte, 2023), and even small sites support biodiversity and contribute to cumulative habitat gain (Mata et al. 2023).

These findings challenge assumptions about the incompatibility of urban development and biodiversity conservation. While currently cities have an overall negative effect on biodiversity the fact remains that many are located in biodiverse locations and so must be a key part of conservation and biodiversity strategy. As Lepczyk and other scientists argue (Aronson *et al.,* 2017; Lepczyk, Aronson and La Sorte, 2023), cities must be reconsidered as biodiversity sanctuaries. The key lies in applying evidence-based design principles that maximise habitat value within development constraints while maintaining ecological considerations across different urban landscapes.

Figure 3.3.1 (Previous page) ←
Sydney Modern / McGregor Coxall
Sydney Modern weaves a network of new biodiverse gardens on and between the architecture of the new gallery. Close to 50,000 plants and 200 trees enhance biodiversity, while initiatives such as wildflower roof gardens and tree canopies will help reduce heat island effect and absorb stormwater. What could have been a hard mono-culture of conventional architecture has instead become a living hybrid system.

Credit: Bungarribee Park / JMD Design / Simon Wood

Strategy 2: Green Infrastructure Networks Amplify Impact

Biodiversity-positive design achieves measurable benefits when individual projects are conceived as connected components of broader green infrastructure networks rather than isolated interventions. Long-term research on landscape connectivity demonstrates that habitat patches linked by corridors support significantly more species than equivalent isolated patches. The landmark 18-year study by Damschen et al. and others (2019; Brudvig et al., 2009) found that connected patches had over 10% more plant species than unconnected patches, with plant extinction likelihood reduced. Earlier work showed patches connected by corridors contained 20% more plant species than unconnected patches after just 5 years (Damschen et al., 2006; Damschen and Brudvig, 2012).

Landscape ecology theory emphasises the idea that habitat value increases when projects contribute to landscape-scale connectivity through strategic placement of corridors, stepping stones, and buffer zones. A systematic review by Cork et al. (2024) examining habitat connectivity along transportation corridors in temperate zones confirmed that well-designed corridors facilitate species movement and genetic exchange across fragmented landscapes. This principle of connectivity forms the foundation of what is known as “green infrastructure planning”. According to the Australian Standards document SA HB 214 - Urban Green Infrastructure - Planning and decision framework, green infrastructure is defined as: “The network of natural and built landscape assets, including green spaces and water systems within and between settlements.” Oke et al (2024) note, that to successfully contribute to nature, green infrastructure must explicitly focus on biodiversity in its design.

This is significant as Australia’s green infrastructure extends beyond traditional parklands to encompass street trees, transport corridors and private gardens. Integrated vegetation systems can create continuous habitat pathways spanning entire metropolitan regions (Lepczyk et al., 2017)). Connectivity consequently provides compounding benefits with value increasing over time (Haddad et al., 2015). Dark corridors are also critical for enabling movement of nocturnal animals which can perceive brightly lit areas as barriers (Haddock et al, 2019).

Figure 3.3.2 (Previous page) ←
Bungarribee Park / JMD Design
Bungarrribee Park repairs and links remnant vegetation patches with surrounding ecological networks and corridors.

Credit: Hedge House / Emergent Studios (Bush Projects) / Rory Gardiner

Strategy 3:
Context-Specific Design Strategies Maximise Biodiversity Outcomes

Different urban contexts require tailored approaches to biodiversity integration, with design strategies calibrated to local ecological conditions, development constraints, and conservation priorities (Berthon, Thomas and Bekessy, 2021; Biella *et al.,* 2025). Research on urban habitat design shows that context-sensitive approaches achieve considerably higher biodiversity outcomes compared to generic green infrastructure interventions (Prendergast *et al.,* 2022; Yang *et al.,* 2024).

High-density urban environments require innovative approaches that integrate living systems with built infrastructure through green walls, intensive green roofs, and integrated habitat structures (Ignatieva et al 2023). A review of green roof biodiversity studies found that while green roofs support fewer species than ground-level habitats, structural diversity significantly enhances species richness (Wooster *et al.,* 2022). All projects, regardless of the degree of anthropogenic transformation can benefit from careful consideration of the bioregion which they sit within (Bastin *et al.,* 2025).

Figure 3.3.3 (Previous page) ←
Hedge House Garden / Emergent Studios (Bush Projects)
Emergent Studios (Bush Projects) created a private garden that extends neighboring bushland through regenerative biodiverse planting and habitat features. This immersive and evolving landscape promotes ecological connection with the bushland context and can inform future approaches to suburban gardens.

Credit: Sydney Park Stormwater Reuse/ Turf Design / Turf Design

Strategy 4:
Multifunctional Design Integration Enhances Project Viability

Multi-habitat, multifunctional landscapes are more diverse and stable with improved function and greater resilience (Hackett *et al.,* 2024). Well-designed green infrastructure can simultaneously provide biodiversity habitat, stormwater management, air quality improvement, carbon sequestration, and human health benefits (Lovell and Taylor, 2013; Hansen and Pauleit, 2014). A range of studies on multifunctional landscape design confirm that integrated habit focused approaches typically delivered more biodiversity benefits than single use landscapes (Connop *et al.,* 2016). This integration is particularly important in urban contexts where land availability is limited.

Through the strategic integration of habitat provision into urban green infrastructure (UGI) design, biodiversity conservation and ecosystem service delivery can be simultaneously provided. As recreating historical urban habitats presents challenges, some researchers advocate for novel ecosystems that support native species adapted to urban conditions (Lundholm and Richardson, 2010). Approaches can be complementary rather than conflicting. Regional ecological context can and should inform UGI policy and planning at both local and landscape scales, enabling designs that balance historical habitat restoration with contemporary urban ecological realities (Connop *et al.,* 2016).

Figure 3.3.4 (Previous page) ←
Sydney Park / Turf Design
Sydney Park by Turf is a landmark project linking blue and green infrastructure on a former landfill site. The reconstructed biodiversity celebrates the original ecologies and repairs cultural and ecological systems within the site while treating stormwater through a new innovative water harvesting system.

Credit: Pakapakanthi / South Parklands Wetland / TCL / Jackie Gu

Strategy 5: Systematic Measurement Enables Continuous Improvement

Quantitative measurement and monitoring systems are essential for demonstrating biodiversity outcomes, optimising design strategies, and building support for expanded implementation of biodiversity-positive design and should be developed based on resources available. Measurement systems can be community based or in collaboration with professional ecologists.

An important consideration is adaptive monitoring (Lindenmayer and Likens, 2009, McCord & Pilliod 2022). This is a systematic approach to environmental monitoring that evolves and improves over time based on what is learned from the data collected. Unlike traditional "fixed" monitoring programs that follow rigid protocols indefinitely, adaptive monitoring is meant to be flexible and responsive. Key features of adaptive monitoring include:

- **Learning-focused:** The monitoring program is structured to test hypotheses and answer specific management questions, not just collect data
- **Iterative improvement:** As new information is gathered, the monitoring methods, indicators, or sampling protocols can be adjusted to better meet objectives
- **Management integration:** Monitoring is directly linked to decision-making, with results feeding back into management actions
- **Cost-effective:** Resources can be redirected as knowledge accumulates—intensifying monitoring where uncertainty is high and reducing it where patterns are well-established
- **Question-driven:** Rather than measuring everything possible, it focuses on indicators that answer specific conservation or management questions

A range of measurement approaches are possible. For instance AECOM's (Brown, 2013) Landscape Biodiversity Index provides a framework for measuring and comparing biodiversity performance across different design alternatives, enabling evidence-based decision-making and continuous improvement of design approaches. There are now a variety of ways for evaluating biodiversity targets. Systematic monitoring across multiple dimensions of urban biodiversity, is necessary to capture the multiple dimensions of biodiverse systems. These can be captured through Essential Biodiversity Variables (EBVs) which are now the global standard. There are a range of other dimensions to biodiversity that can also be measured and these aspects should be considered to deliver on the five AILA BPD values (see section 3.2). Diverse ecological metrics, can be recorded through a range of biodiversity indices now available for tracking temporal changes in urban ecosystems and measuring progress toward conservation objectives (Keinath *et al.,* 2025). Measurement-is particularly important for building confidence among developers, planners, and communities and demonstrating the viability and benefits of biodiversity-positive design. More information on approaches to measurement are provided in stage four of the process section of the guide.

Spatial Considerations for Implementation

Building on these insights, biodiversity-positive design can be applied through complementary spatial strategies:

- **Making Multifunctional Space for Nature:** Configure landscape projects to create spaces that serve both ecological and human functions, maximising biodiversity outcomes within development constraints through strategic design integration
- **Integrating Nature into Non-Living Environments:** Design structures and landscape technologies to support ecological functions across scales, from building-integrated habitat systems to infrastructure corridors that provide wildlife movement pathways
- **Inviting Nature into Newly Developed Environments:** Connect with existing ecological networks and biodiversity resources through strategic corridor design, habitat restoration, and removal of barriers to wildlife movement
- **Introducing Nature Strategically:** Establish new habitat and ecological functions through evidence-based species selection, habitat creation, and ecosystem development that responds to local ecological conditions and conservation priorities

Figure 3.3.5 (page 46) ←
Pakapakanthi / South Parklands Wetland / TCL
TCL transformed 3 hectares of degraded parkland into an exemplar of green infrastructure balancing recreation with ecosystem enhancement. The project demonstrates expert planning and engineering, transforming underutilised parkland with sensitivity toward environmental protection. This project shows respect and care in its protection of stands of existing Eucalyptus trees, native butterfly habitat creation and a skilful crafting of earthworks to form passive recreation areas that are seamlessly woven throughout the site. The designers collaborated with First Nations people throughout all phases of the project, from initial cultural mapping, collaborations with Kaurna artists and monitoring of onsite construction works. The wetlands sets a benchmark for large-scale integrated civil, stormwater engineering and landscape architectural design, contributing to the improvement of natural ecosystems and biodiversity in the city.

4. Biodiversity Positive Design Process

4.1 Process Overview

The biodiversity positive design process has been designed to be integrated into each stage of the landscape project lifecycle, ensuring that biodiversity can be considered for every stage of the project. The process is designed to be universal and scalable. Landscape architects can adapt it to suit different size projects, with different levels of resourcing.

4.2 Process Philosophy

The BPD process is grounded in systems thinking that recognises biodiversity conservation as an emergent property of complex ecological and social interactions (Reed and Lister, 2020; Robinson, 2021). Rather than treating biodiversity as an add-on consideration, the process embeds ecological thinking throughout project development, creating opportunities for innovation and integration that deliver superior outcomes for both nature and people.

The process emphasises temporal thinking, recognising that biodiversity outcomes unfold over multiple timescales from immediate installation through decades of ecosystem development. This temporal perspective requires patience, commitment, and adaptive management approaches that can respond to changing conditions while maintaining focus on long-term conservation goals.

Collaborative engagement represents a core process value, recognising that successful biodiversity outcomes require diverse expertise, stakeholder support, and community stewardship. The process creates multiple opportunities for engagement and knowledge sharing that build both technical capacity and social support for biodiversity conservation. The process is set out in seven stages in the following pages and designed with the following considerations.

The process:

- Embeds Climate Positive Design and Designing with Country principles alongside biodiversity considerations in the process to ensure these three areas are considered together
- Draws on other approaches that consider how to improve biodiversity in place and design for co-existence such as Biodiversity Sensitive Urban Design and functional connectivity analysis, as well as nature based solutions and biophilic design
- Is appropriate for any project scale and type, whether a private garden or a public regional park
- Considers the roles different stakeholders (site owner/manager versus consultants) need to take at each stage of the process

Credit: 477 Pitt Street—Native Food Garden / Yarrabingin / Blossom and Finch Photography

- Is iterative, with each stage successively refined by the project consultant, or project champion. who ultimately guides the process

4.3 The Biodiversity Positive Design Process

The Biodiversity Positive Design process provides a systematic framework for embedding biodiversity considerations throughout the project lifecycle. This seven-stage process recognises that successful biodiversity outcomes require more than technical solutions—they demand inclusive engagement, deep ecological understanding, and long-term commitment to stewardship. Each stage builds upon the previous, creating a cumulative approach that transforms conventional practice into regenerative design.

The process adopts an expanded understanding of stakeholders that includes non-human communities as legitimate participants whose needs must be considered alongside human requirements. This post-growth perspective challenges conventional development assumptions and creates space for innovative approaches that prioritise ecological and social wellbeing over narrow economic metrics.

Credit: St Peters Street, Adelaide / Landskap & City of Norwood Payneham and St Peters / Duncan McKenzie

The Biodiversity Postive Design Workflow

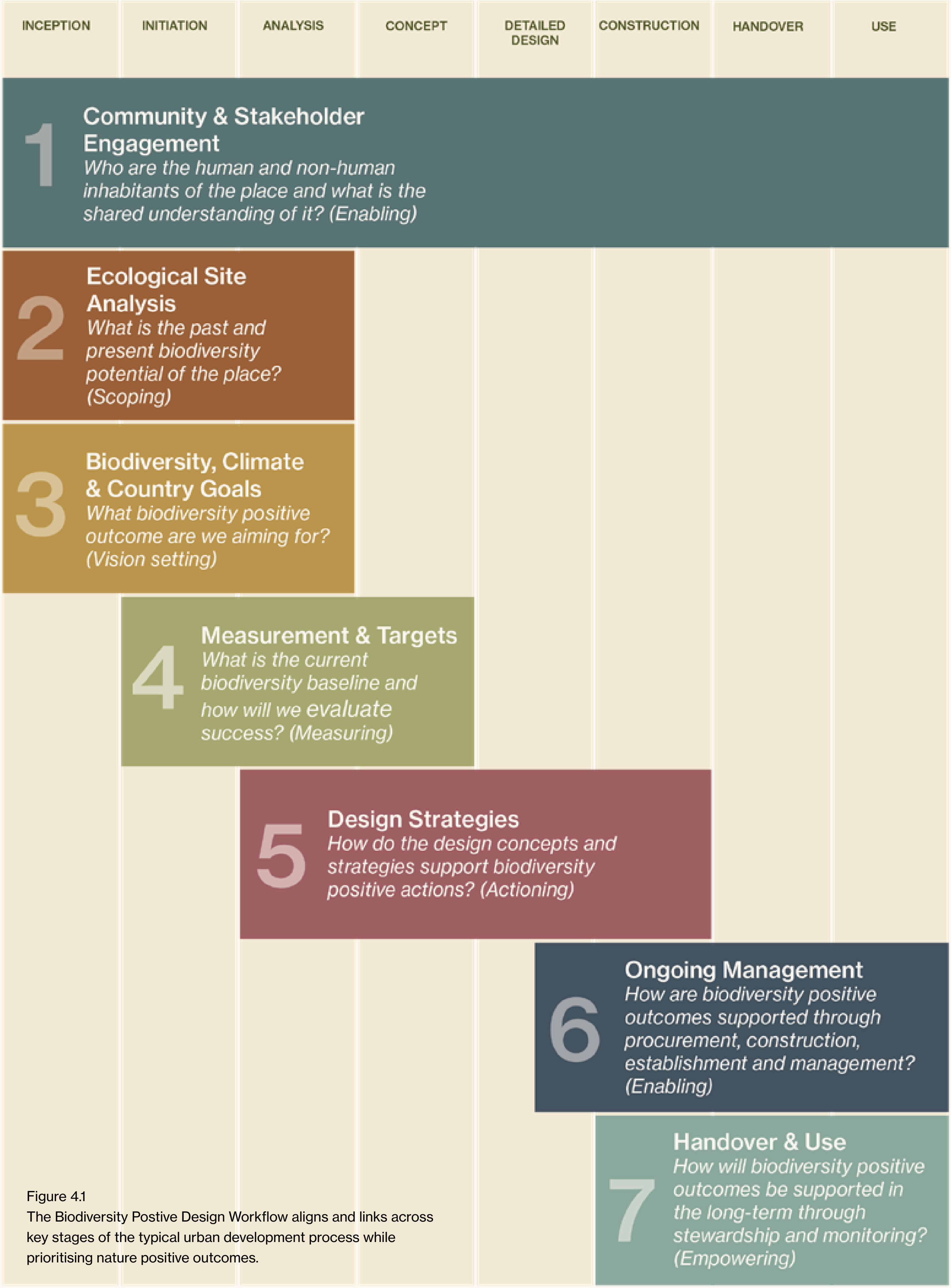


Figure 4.1
The Biodiversity Postive Design Workflow aligns and links across key stages of the typical urban development process while prioritising nature positive outcomes.

Stage 1:
Community & Stakeholder Engagement

Credit: Glenthorne National Park Native Grassland / Dept of Environment and Water SA and Max McQuillan / Scott Hawken

Overview

Community and stakeholder engagement forms the foundation that underpins every stage of the BPD process. This stage establishes relationships, builds shared understanding, and creates the collaborative framework necessary for achieving and caring for biodiversity positive outcomes. Engagement extends beyond conventional human stakeholders to recognise non-human communities as essential participants whose needs and relationships must be understood and respected.

The engagement process acknowledges that biodiversity conservation ultimately cannot succeed without broad support and active participation across diverse groups including citizen scientists, Traditional Owners and grass roots actors. Different stakeholders provide essential knowledge and contributions. For example: Traditional Owners hold unique knowledge and responsibility for Country that spans millennia; local communities possess intimate understanding of place-based ecological patterns and environmental specialists bring technical expertise and advocacy capacity. Most significantly non-human communities – from soil microbiomes to apex predators – represent the ultimate beneficiaries whose thriving indicates project success.

Actions and Tools

Stakeholder Mapping and Analysis

- Identify all human stakeholders including Traditional Owners, local communities, government agencies, environmental groups and adjacent landowners
- Map non-human stakeholders by ecological role or other means. For instance: pollinators, seed dispersers, predators, decomposers and habitat specialists
- Analyse stakeholder interests, influence, and potential contributions
- Document relationships between stakeholders and identify potential conflicts or synergies

Traditional Owner Engagement

- Initiate early contact following appropriate cultural protocols
- Establish free, prior, and informed consent processes
- Create frameworks for ongoing collaboration beyond transactional consultation
- Ensure equitable remuneration and recognition
- Protect cultural intellectual property and knowledge sovereignty
- Consider long term opportunities and benefits to Traditional Owner communities

Table 4.1
Stakeholder Mapping and Engagement

Stakeholder Group	Interests	Engagement Methods	Ongoing Role
Traditional Owners	Cultural values, Country care	Cultural protocols, ongoing consultation	Collaborative management
Local community	Amenity, access, environmental quality	Community meetings, surveys	Stewardship, monitoring
Environmental groups	Conservation outcomes, habitat protection	Technical briefings, site visits	Advocacy, expertise
Government agencies	Regulatory compliance, policy alignment	Formal consultation, technical review	Approval, ongoing oversight
Technical specialists	Scientific accuracy, best practice	Expert panels, peer review	Design input, monitoring
Non-human communities	Habitat, resources, connectivity	Species surveys, habitat assessment	Ultimate beneficiaries

Post-Growth Dialogue Facilitation

- Create safe spaces for questioning development assumptions
- Explore alternative scenarios prioritising ecological and social outcomes
- Facilitate visioning exercises imagining thriving multi-species communities
- Challenge conventional urban development growth imperatives through evidence-based discussion

Deliverables

- Comprehensive stakeholder register including non-human communities
- Engagement strategy and implementation plan
- Traditional Owner collaboration agreement
- Community participation framework
- Non-human stakeholder needs assessment
- Shared vision statement
- Communication protocols

Table 4.2
Traditional Owner Engagement Protocols

Protocols	Aims	Approach	Outcomes
Free, prior, informed consent	Voluntary participation in project development	Early contact, clear communication	Ongoing consultation rights
Cultural protocols	Respectful engagement processes	Protocol training, appropriate venues	Cultural sensitivity maintenance
Reciprocal benefits	Mutual learning and outcomes	Employment, training, recognition, equitable remuneration	Long-term partnership development
Knowledge sovereignty	Respect for intellectual property	Appropriate attribution, consent	Ongoing protection of cultural knowledge

Reflective Questions

- Have we genuinely engaged Traditional Owners as partners rather than consultees, respecting their knowledge sovereignty and ensuring ongoing benefits?
- How have we made space to consider non-human voices in our engagement process, and what would the project look like from their perspective?
- What development assumptions have we challenged, and how might alternative approaches better serve both human and ecological communities?
- Have we created authentic opportunities for community stewardship that will sustain biodiversity outcomes beyond project completion?
- How will our engagement process continue throughout the project lifecycle to maintain relationships and adapt to emerging understanding?

Stage 2:
Ecological Site Analysis

Overview

Ecological site analysis provides the foundational understanding necessary for achieving biodiversity positive outcomes. This stage moves beyond conventional site assessment to develop comprehensive knowledge of ecological patterns, processes, and potential across multiple spatial and temporal scales. The analysis integrates scientific investigation with Traditional Ecological Knowledge and community observations to create a rich, multidimensional understanding of place.

Actions and Tools

Understand the past, present and future ecology, climate and Country considerations at multiple scales (site, precinct and region). Use this knowledge to measure and document the site's ecological baseline and potential for improvement.

Assess current conditions and constraints:

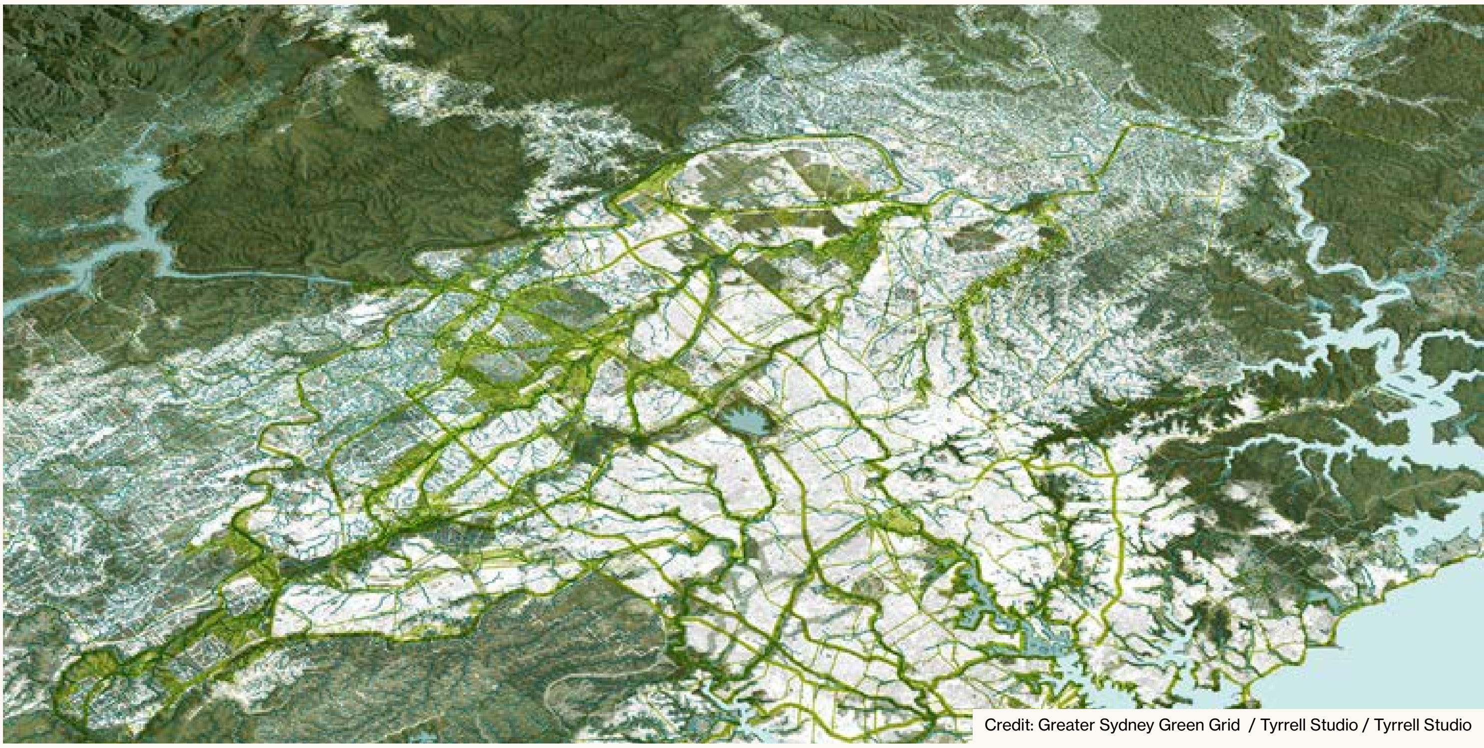
- Evaluate your site's current ecological state and disturbance level and "baseline"
- Identify opportunities and limitations for biodiversity enhancement
- Determine appropriate reference conditions:
  - Pre-colonisation reference states for sites adjoining protected areas
  - Novel ecosystem approaches for highly modified urban environments
  - Hybrid approaches for transitional landscapes

Data Sources:

- Biodiversity studies from ecologists, Council, State Government
- Academic papers on species or threatened species
- Consultant soil and hydrology reports
- Geospatial biodiversity data from government repositories (e.g., Atlas of Living Australia)
- Structural or functional connectivity mapping
- First Nations and community knowledge, including citizen science projects
- Site visits with community to validate secondary data

Deliverables

- Multi-scale ecological assessment report
- Species occurrence database
- Habitat quality mapping
- Connectivity analysis
- Soil and hydrology assessment
- Traditional Ecological Knowledge documentation
- Baseline measurement data
- Opportunities and constraints mapping



Credit: Greater Sydney Green Grid / Tyrrell Studio / Tyrrell Studio

Table 4.3
Scale-Specific Analysis Questions

Scale	Example Questions
Regional	What bioregion is the site in? What water catchment and its extent? What is the extent and distribution of high-value habitat patches? Are there critically endangered, endangered, or vulnerable species or ecological communities? How do Songlines and Aboriginal Stories describe the past ecology?
Precinct	What is the hydrology of the area and location of waterways? What is the extent and distribution of plant community types of pre-colonisation and now? What is the condition of remnant vegetation? What is the pattern of vegetation patches and links? What barriers to movement exist (day-time and night-time)?
Site	What is the condition of vegetation and waterways now? Where are tree-canopy cover, shrubs, and understorey? What is the vertical structural diversity? What species have been sighted within 1, 3 and 5km? What safety risks exist? How intact are current soil landscapes?
Habitat	What is the hydrology and location of waterways? What is the extent and distribution of plant community types? What is the condition of remnant vegetation and other vegetation? What is the vertical structural diversity of understorey? What ecological communities are present? What risks exist? How disturbed are soil landscapes?

Reflective Questions

- What stories does this place hold across time, and how do scientific data, traditional ecological knowledge, and community observations combine to reveal its ecological potential?
- How does the site function within broader landscape networks, and what role could it play in regional biodiversity conservation?
- What non-human communities currently inhabit this place, and what are their specific habitat requirements and movement patterns?
- How have historical processes shaped current conditions, and what trajectories of change must we consider for future resilience?
- What ecological processes and interactions are critical to maintain or restore for this ecosystem to thrive?

Stage 3:
Biodiversity, Climate & Country Goals


Credit: Glenthorne National Park Native Grassland / Dept of Environment and Water SA / Scott Hawken

Overview

Goal setting translates ecological understanding into clear, objectives that guide all subsequent design decisions. A goal is a broad, aspirational statement that describes the desired outcome or vision. Goals are directional rather than specific and define the project vision.

This critical stage establishes the foundation for integrating biodiversity conservation, climate action, and Indigenous Connecting to Country priorities through collaborative processes that balance these multiple outcomes. Research demonstrates that effective goal setting for biodiversity must address the interconnected nature of biodiversity and climate crises. Addressing biodiversity loss generally co-benefits climate mitigation (Shin et al., 2022). Equally climate actions can synergistically support biodiversity conservation (Smith *et al.,* 2022). Translating global targets into actionable local implementation remains challenging, particularly in urban contexts where novel ecosystems require innovative approaches (Perino *et al.,* 2022; Xie & Bulkeley, 2020).

Successful goal setting requires frameworks that integrate Indigenous knowledge systems alongside Western science, recognising that traditional land management practices have sustained biodiversity for millennia while maintaining cultural continuity (Pettorelli et al., 2021). Goals must be scientifically grounded while respecting Traditional Ecological Knowledge and ensuring multi-generational access to Country (Maron et al., 2021). This integrated approach is complex and requires multifunctional design interventions. The process demands careful consideration of site-specific conditions—from highly modified urban environments to areas adjoining protected landscapes—while contributing to broader landscape-scale connectivity and ecosystem function. Ultimately, effective goal setting creates a shared vision that guides design decisions, measurement frameworks, and adaptive management strategies throughout the project lifecycle.

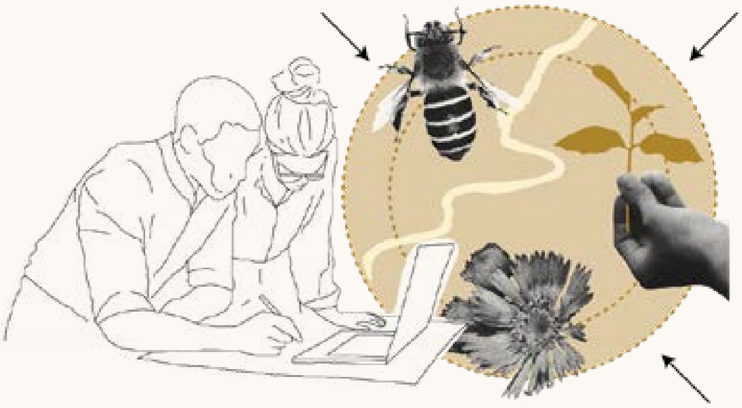


Table 4.4
Example Goals by Category

Goal Category	Example Goals
Habitat Protection	Protect existing habitat for target species; Minimise impacts on existing habitat
Habitat Expansion	Increase habitat area for target species; Convert hardscape to habitat
Habitat Quality	Improve habitat value/quality relative to reference state; Provide habitat features for target species
Connectivity	Improve structural or functional habitat connectivity; Remove barriers to fauna and flora movement
Climate Integration	Improve climate mitigation and adaptation; Maximise carbon sequestration
Species Support	Encourage select species back into site; Reintroduce locally extinct species
Ecosystem Function	Improve habitat diversity and interactions; Improve system resilience
Human Connection	Foster safe nature interaction and education; Create indigenous seed production areas
Stewardship	Foster citizen science and community stewardship; Support Traditional Owner management

Actions and Tools

Define primary approach based on site and defined vision:

- **Protection:** Preserve existing high-value biodiversity
- **Enhancement:** Improve habitat quality for current and nearby species of interest.
- **Regeneration:** Re-establish / establish ecosystem functions
- **Creation:** Develop new habitat values in degraded areas
- **Connection:** Link fragmented habitats through corridors

Validation Questions:

Test goal appropriateness and feasibility:

- Are goals responsive to both current site conditions and future climate scenarios?
- Do targets balance ecological integrity with social and cultural values?
- Can progress be measured using available resources and methods?
- Are Indigenous knowledge holders engaged in goal setting?
- Do goals contribute to landscape-scale connectivity?
- Are adaptive management pathways clearly defined?

Goal Setting Considerations

- Goals must respond to site's current and future use, opportunities and constraints
- Consider whether a reference site is being used, and if so, define how
- Urban environments with higher disturbance may require accommodation of site “novelty”
- Revegetation projects adjoining national parks may target pre-colonisation reference states
- Take a species or taxa specific approach where possible to enable more refined design decisions and guidance. Consider appropriate target species to refine vision

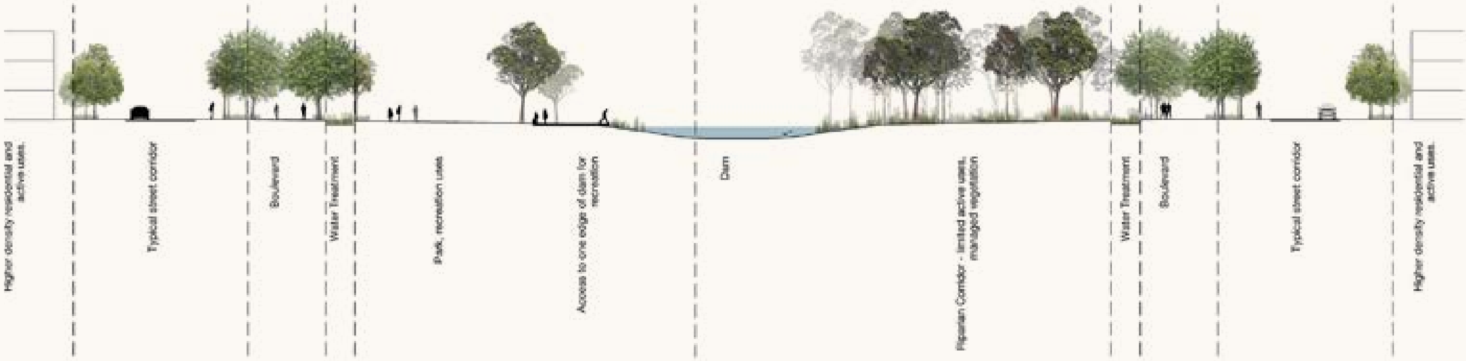


Figure 1: Section diagram showing linear park situated around creek, with recreation spaces adjacent to riparian area.

Credit: Western Parkland City / Tyrrell Studio / Tyrrell Studio

Key Questions for Goal Refinement

- Do we need to protect nature, conserve, preserve or minimise impacts on existing nature?
- Do we need to add space for nature or for specific species/taxa groups?
- Do we need to invite surrounding nature in to connect existing corridors?
- Do we need to reimagine the biodiversity opportunities for this site?
- What is the biodiversity we seek to enable here through our project?
- Do we need to provide better habitat for existing species?
- Do we need to re-introduce flora or fauna species?
- Do we need to reinstate healthy ecosystem function?
- Do we need to connect people safely to nature?
- Do we need to support First Nations or community stewardship?

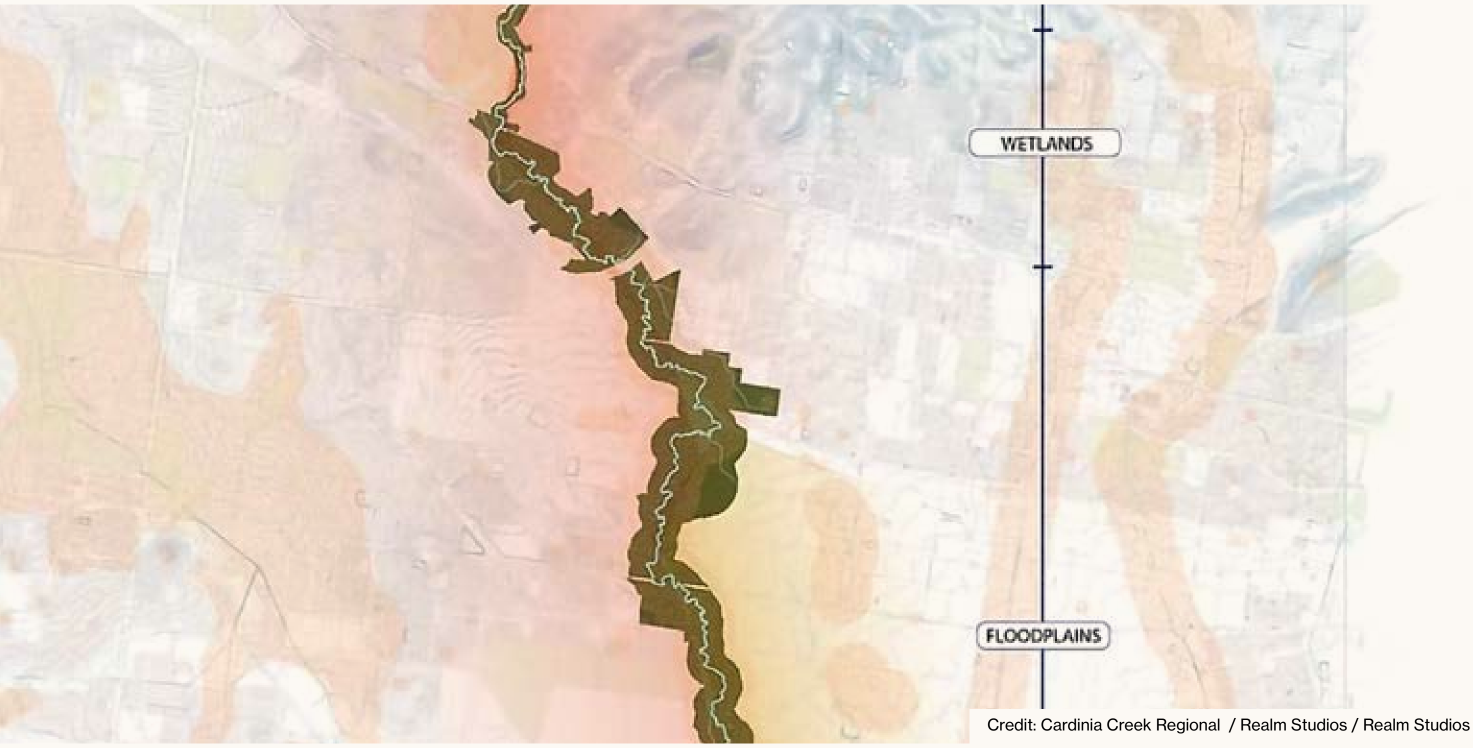
Deliverables

- Biodiversity vision
- Climate positive objectives
- Country care objectives
- Integrated goals framework
- Success criteria for vision
- Stakeholder agreement

Reflective Questions

- How do our goals reflect the aspirations of all stakeholders, including non-human communities whose thriving indicates success?
- Are our goals ambitious enough to contribute meaningfully to reversing biodiversity decline while remaining achievable?
- How do biodiversity, climate, and Country goals reinforce each other to create synergistic outcomes?
- What would success look like from multiple perspectives – ecological, cultural, and community?
- Has the Nature Futures Framework been considered (Shaik et al 2023)?
- How will our goals evolve as understanding deepens through implementation and monitoring?

Stage 4:
Measurement & Targets



Credit: Cardinia Creek Regional / Realm Studios / Realm Studios

Overview

Measurement transforms aspirational goals into quantifiable targets that enable evidence-based design and adaptive management. This stage establishes baseline conditions, selects appropriate indicators, and sets specific targets that will demonstrate biodiversity positive outcomes. The measurement framework must balance scientific rigor with practical implementation, ensuring that monitoring can be sustained throughout the project lifecycle and beyond.

Actions and Tools

Target Setting Framework

To establish a biodiversity positive outcome, measuring whether design decisions have delivered on goals is critical. The establishment of an ecological baseline against which future biodiversity gains or declines can be assessed is necessary. AILA recommends the Pathfinder tool for measuring carbon. The pathfinder Version 3 includes high level biodiversity goals. There are also a range of other specialised methods that can be adapted for use, and these are listed in the following paragraphs. Tools can be selected to suit the nature of the specific objectives as outlined below.

Establish specific, measurement systems and protocols linked to targets and project:

- **Species-level targets:** Focus on specific taxa including threatened or endangered species
- **Community-level targets:** Address vegetation structure and composition
- **Ecosystem function targets:** Restore ecological processes
- **Cultural targets:** Support Indigenous management values and Country
- **Social targets:** Enable community stewardship and access
- **Conduct measurement**s linked to goals, both pre- and post-construction
- **Select survey methods** that suit team capacity and project needs

Tool Based Considerations

- Consider expert methods such as the five-star system developed by the Society for Ecological Restoration Australasia
- For teams without expert ecology measurement capacity, consider metrics from the Singapore Biodiversity Index and other non-specialist systems
- Use aerial images and CAD/GIS to calculate landscape indicators
- Deploy citizen science approaches to record species observations

Table 4.5
Potential Measurement Methods and Targets

Goal	Baseline Measure	Target at Completion	Target Post Occupancy (1 year)
Protect existing habitat	• Area (ha) of existing vegetation • Vegetation condition score[1] • List of current threats	• 100% existing vegetation retained • No decline in condition score • Active threat management in place	• 100% vegetation intact • 10% improvement in condition score • No new threats established
Increase habitat area	• Area (ha) of plantable space • Current % hard surfaces • Existing habitat patches mapped	• Plant 80% of available areas • Convert 30% of hard surfaces • Connect isolated patches	• 90% plant survival • New habitat establishing well • Wildlife using corridors
Increase total species	• Species count (plants & animals) • List of missing habitat types • Current species list	• No species lost • 50% of target species planted • All habitat layers[2] present	• 20% more species recorded • Natural recruitment visible • Establishment of complex food webs • Wildlife observed in corridors and habitats
Prioritise native species	• % native vs exotic species • % native plant cover • Weed mapping	• Native species >70% of total • Native plant cover >80% • Major weeds removed	• Native species >75% of total • Weeds <5% cover • Native species spreading
Support ecosystem health	• Soil test results • Insect/bird activity levels • Water quality baseline	• Soil health improving • Pollinators present • Water capture functioning	• Nutrient cycling active • Breeding fauna recorded • Measurable water improvement
Connect to surrounding landscape	• Distance to nearest habitat • Movement barriers identified • Regional species pool	• Physical connections created • Barriers removed/mitigated • Regional species included	• Wildlife movement documented • Site contributes to corridor • Regional species establishing

Key Terms:

[1] Vegetation condition score:
Simple rating (1-5) based on plant health, structure, and weed presence. See SERA standards for guidance

[2] Habitat layers:
Ground cover, shrubs, small trees, canopy trees

[3] Regional species pool:
Native species found within 5km that could naturally colonise the site

Measurement Tips:

- Use photo points for visual comparison over time
- Partner with local ecological consultants for species surveys
- Engage community groups for ongoing monitoring
- Consider iNaturalist or similar apps for species recording potentially linked to events such as Bioblitz and the City Nature Challenge
- Integrate measurement and survey with Atlas of Living Australia

Table 4.6
Measurement Indexes and Survey Types

Method	Scale	Capacity Required	Description
Singapore Biodiversity Index	Site to City	Low to Medium	Standardised indicators including vegetation expansion, species richness, habitat connectivity (CBI, 2009)
Landscape Performance Series	Site	Medium	Evidence-based performance measurement protocols for landscape architecture projects (Landscape Architecture Foundation, 2025)
Species Surveys	Site	Medium to High	Professional ecological surveys for baseline and monitoring of species abundance and richness (Belbin *et al.*, 2021)
Vegetation Cover Analysis	Site	Low	Aerial image analysis using CAD/GIS/ Photoshop to calculate vegetation cover changes (Farinha-Marques *et al.*, 2017)
Citizen Science Monitoring	Site	Medium	Community-based monitoring using tools like iNaturalist, Atlas of Living Australia Bio collect (CSIRO, 2024)
Habitat Quality Assessment	Site	Medium	Structured assessment of habitat features and condition using standardised protocols (Standards Reference Group SERA, 2021)
Connectivity Modelling	Landscape	High	GIS-based analysis of structural and functional connectivity for target species (EcoCommons 2025, Sahraoui *et al.*, 2021)

Credit: Bradfield Central Park / Hassell / Hassell

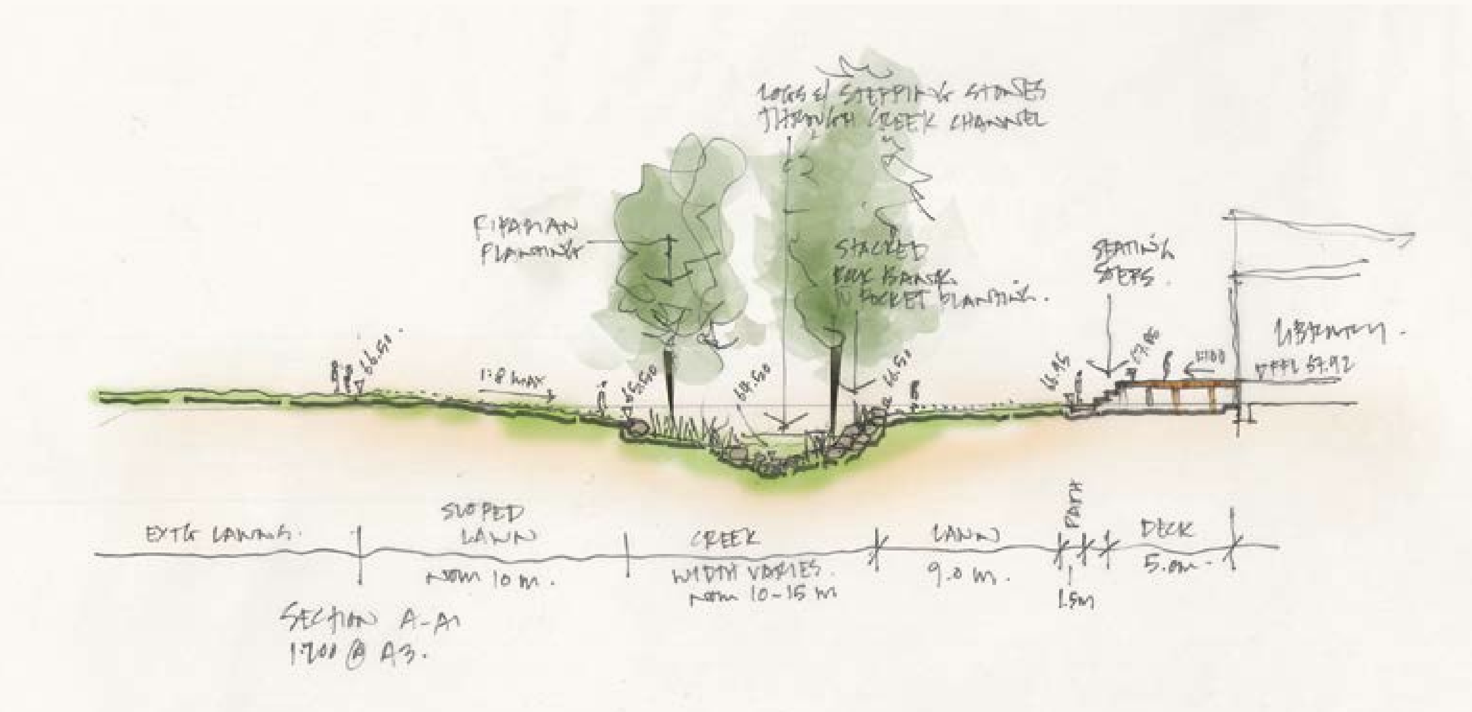
Deliverables

- Baseline assessment report
- Measurement methodology
- Target specifications
- Monitoring protocols
- Data management plan
- Reporting templates

Reflective Questions

- Do our measurement approaches capture the complexity of biodiversity while remaining practical to implement?
- How will we ensure measurement continues beyond project completion to verify long-term outcomes?
- Are our targets ambitious enough to demonstrate genuine biodiversity gains rather than simply reducing harm?
- How can citizen science and community monitoring complement professional assessment to build stewardship?
- What adaptive management triggers have we established to respond when targets aren't being met?

Stage 5:
Design Strategies



Credit: Mitcham Library and Hawthorn Reserve Upgrade / ASPECT Studios / ASPECT Studios

Overview

Design strategies translate goals and targets into specific interventions that create conditions for biodiversity to thrive. This stage encompasses project stages ranging from analysis, to concept development, to detailed design and construction, ensuring biodiversity considerations inform every decision from spatial arrangement to material selection. Successful strategies drive outcomes that support ecological function, climate resilience, and human connection to nature.

Actions and Tools

Design strategies emerge from the synthesis of project goals, site opportunities, and identified constraints. Strategy selection must balance biodiversity gains against potential losses while anticipating and mitigating risks that could undermine ecological outcomes. Effective design requires iterative testing and refinement to ensure interventions work synergistically across scales.

Key Design Considerations:

Spatial Design

- Optimise habitat arrangement for maximum edge-to-area ratios and connectivity
- Create diverse microhabitats through topographic variation and structural complexity
- Design buffer zones that mediate between high-impact areas and sensitive habitats
- Configure plantings to facilitate natural succession and ecosystem development

Soil and Hydrology

- Design soil profiles that support target vegetation communities (minimum depths: 100mm grasses, 300mm shrubs, 600mm small trees, 1000mm canopy trees)
- Integrate Water Sensitive Urban Design (WSUD) to reinstate natural hydrological processes

- Create soil moisture gradients to support diverse plant communities
- Incorporate organic matter and beneficial microbiomes into soil specifications
- Consider including areas of exposed soil for ground nesting bees

Climate Resilience

- Apply the 70-20-10 planting rule (70% proven adaptable species, 20% experimental, 10% aspirational)
- Design for multiple climate scenarios using species distribution modeling tool such as EcoCommons
- Create climate refugia through strategic shade, water retention, and wind protection
- Maximise carbon sequestration through soil management and biomass accumulation

Technical Integration

- Test connectivity outcomes using circuit theory modeling or similar tools
- Verify climate performance through microclimate analysis software such as Forma
- Document Crime Prevention Through Environmental Design (CPTED) compliance while maintaining habitat values
- Specify wildlife-friendly lighting that meets AS 4282-2019 standards

Materials and Specifications

Material Selection Criteria:

- Prioritise verifiable materials with Environmental Product Declarations (EPDs)
- Source recycled, reclaimed, or rapidly renewable materials
- Minimise embodied energy and transportation distances
- Ensure end-of-life recyclability or biodegradability
- Avoid materials with persistent environmental toxins

Soil Specifications:

- Conduct soil testing (chemistry, biology, structure) on site and of nearby intact habitat areas for biomimicry
- Specify amelioration based on target plant community requirements
- Include mycorrhizal inoculants and organic amendments
- Design for long-term soil carbon accumulation
- Ensure appropriate drainage while maintaining moisture retention

Planting Specifications:

- Prioritise local indigenous species of known provenance
- Apply climate analogue modelling for future resilience
- Design plant communities with similar ecosystem needs rather than individual species placement
- Consider all vegetation strata from groundcovers to canopy
- Include known host plants or plants with habitat attributes
- Specify establishment care protocols for three-year period
- Understand and provide species requirements across life stages and daily and seasonal cycles

Deliverables

- Concept designs integrating biodiversity strategies across scales
- Detailed documentation with habitat creation specifications
- Plant schedules including provenance, size, and establishment requirements
- Soil management plans with testing and amelioration protocols
- Materials schedule with sustainability metrics and EPDs
- Lighting design demonstrating ecological impact minimisation
- Construction environmental management plan (CEMP)
- Habitat establishment and maintenance specifications

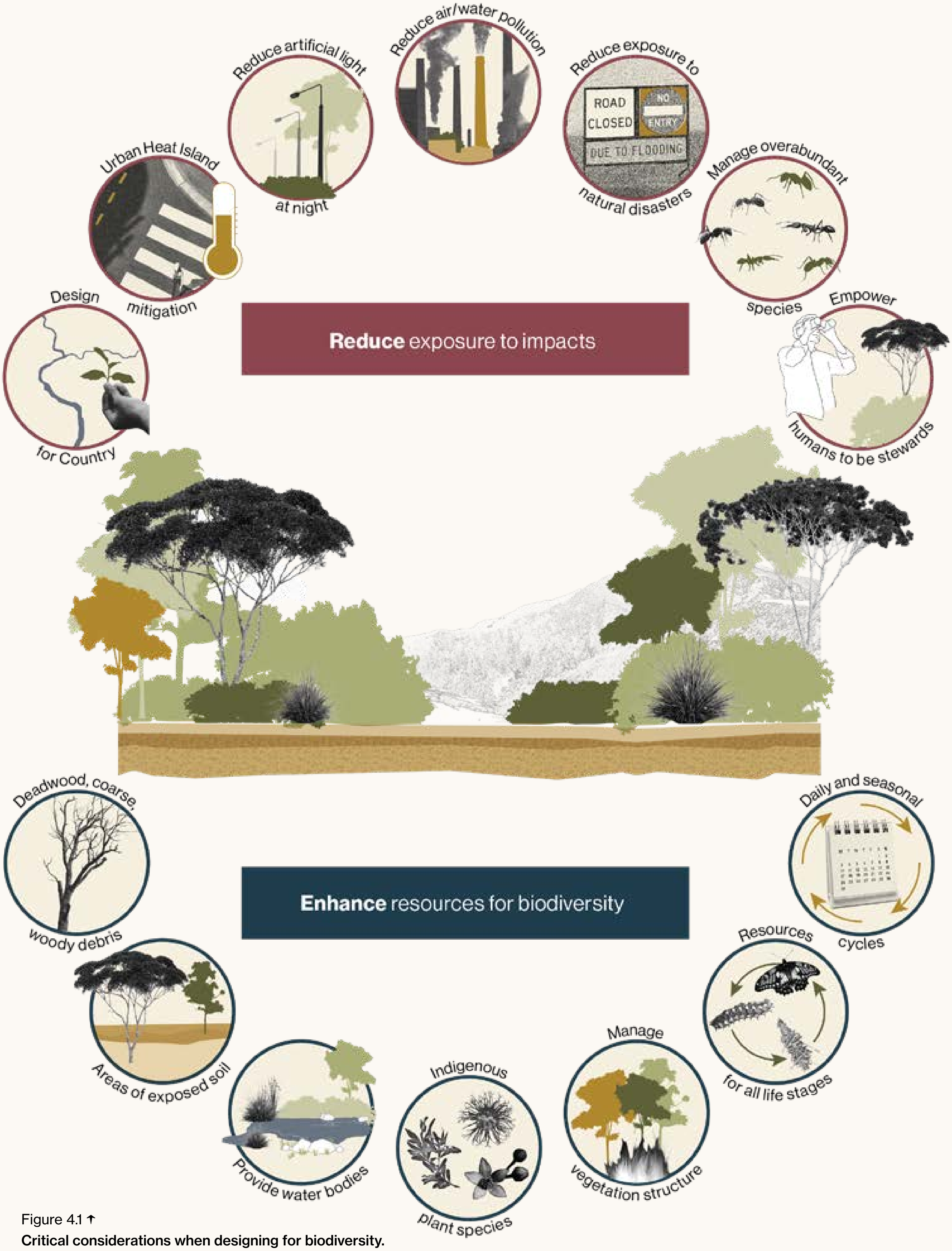


Figure 4.1 ↑
Critical considerations when designing for biodiversity.
Adapted from Kotze et al. (2022)

Table 4.7↑
Possible Design Strategies by Goal Category

Goal Category	Design Strategies	Performance Metrics
Protect Existing Habitat	• Establish construction exclusion zones with rigid barriers • Design adequate tree protection zones (12x DBH radius minimum - Diameter at Breast Height) • Create transition buffers between development and habitat • Implement biosecurity protocols for pathogen prevention	• Zero loss of protected vegetation • Maintained soil structure in protection zones • No invasive species establishment • Tree health scores maintained
Increase Habitat Area	• Convert underutilised hardscapes to biodiverse plantings • Design multi-functional green infrastructure (bioswales, rain gardens) • Implement green roofs/walls with habitat value • Daylight piped waterways where feasible	• M² of new habitat created • Connectivity index improvement • Functional habitat established • Water quality improvements
Improve Habitat Quality	• Ameliorate degraded soils through decompaction and amendment • Establish all vegetation strata (ground/shrub/tree layers) • Remove pollution sources and remediate contamination • Design lighting to minimise ecological disruption	• Soil health indicators improved • Structural complexity index • Pollution levels reduced • Dark sky compliance progressed
Enhance Connectivity	• Design continuous corridors minimum 30m width • Create stepping stone habitats (<100m apart) • Install fauna movement infrastructure (tunnels, bridges, rope ladders) • Remove or mitigate movement barriers including nocturnal "light" barriers	• Functional connectivity demonstrated • Fauna movement documented • Barrier permeability improved • Gene flow indicators
Support Target Species	• Provide species-specific habitat features (hollows, rocks, logs) • Select host and food plants for target fauna • Design breeding habitat with appropriate hydrology • Create foraging resource sequences across seasons	• Target species presence/ abundance • Breeding success recorded • Year-round resource availability • Population stability
Restore Ecosystem Function	• Reinstate natural fire regimes where possible • Design for nutrient cycling and soil biological activity • Create pollinator networks with seasonal flowering • Restore hydrological patterns and water retention	• Ecosystem process indicators • Pollinator service levels • Water balance restored • Nutrient cycling evidence

Reflective Questions

- How do our design strategies create self-sustaining ecological systems that require minimal long-term intervention?
- Have we designed for ecological succession and system maturation over 10, 25, and 50-year timeframes?
- Do our specifications support establishment success while building long-term resilience?
- How does our design accommodate both human use and ecological function without compromise?
- What monitoring and adaptive management triggers have we embedded in the design?
- How does the design contribute to effective monitoring and management?

Stage 6: Ongoing Management


Credit: Glenthorne National Park Native Grassland / Dept of Environment and Water SA / Scott Hawken

Overview

Ongoing management transforms design intent into living reality through careful implementation, establishment, and long-term stewardship. This stage recognises that biodiversity outcomes unfold over time and require adaptive management approaches that respond to changing conditions while maintaining focus on conservation goals. Success depends on clear documentation, adequate resourcing, and genuine commitment to biodiversity-positive maintenance practices.

Actions and Tools

Management and Maintenance Plan

A management plan must focus on promoting biodiversity positive management practices:

Key Elements:

- Regular mulching schedules using locally sourced organic mulch for establishment
- Consideration of on-site green waste recycling to provide habitat
- Timing of herbicide and pesticide applications to avoid critical life stages of sensitive species (e.g. frogs, larvae). No herbicide beyond establishment period
- Low to no pesticide use with preference for organic treatments
- Appropriate watering regime during establishment, phased out post- establishment
- Organic fertilisation for establishment only if required
- Limit use of two-stroke machines and replace with electric maintenance equipment where possible
- Low to no-mow regime for greater grass heights
- Define target planting densities and ensure all replacement plantings use locally native species
- Reference state photos at various growth stages linked to analysis from stage 2 of BPD process
- Tree management schedules protecting health and form
- Habitat tree creation from dead/dying trees
- Management of challenging human behaviour
- Aboriginal cool-burning practices if required
- Water quality testing and monitoring
- Habitat nesting box maintenance
- Appropriate maintenance budget

Construction Management

- Ensure habitat and tree-protection zones and no excavation zones are implemented and enforced
- Consider clean construction methods in sensitive sites
- Ensure sub-base for hardscapes hasn’t been applied beyond minimum distance

- Ensure tree pits and planting sites aren't used as dumping grounds
- Schedule planting towards end of construction
- Schedule site works to respond to natural systems and cycles
- Plan construction program that minimises site impacts
- Invite First Nations and community groups to walk site

Deliverables

- Biodiversity-positive maintenance specifications
- Establishment timeline and milestones
- Adaptive management protocols
- Community stewardship plan
- Monitoring schedule
- Budget allocations for biodiversity outcomes
- Contractor training materials

Reflective Questions

- How does our management approach differ from conventional maintenance to actively support biodiversity?
- Have we adequately resourced the establishment period to ensure successful biodiversity outcomes?
- What adaptive management triggers will prompt changes to maintenance practices?
- How are we building capacity among maintenance teams to understand and support biodiversity goals?
- What role will community stewardship play in long-term site management
- How does the design facilitate management for long-term success?

76

Stage 7:
Handover & Use

Credit: Glenthorne National Park-Ityamaiitpinna Yarta Nature Playground / TCL / Jackie Gu

Overview

Handover and use represents both a culmination and a beginning – the transition from active construction to living landscape where biodiversity outcomes are manifested. This stage involves systematic evaluation of achievements against targets, knowledge transfer to ensure continuity of care, and establishment of monitoring systems that track long-term success. Most importantly, it creates a foundation for continuous learning.

Actions and Tools

Re-measure and Report

The project must be re-measured at completion and handover. Present information as a report about BPD goals to all stakeholders. If measurements suggest actions haven't met goals, discuss and agree on remediation action plan with client and stakeholders.

First Nations and/or Community Stewardship

Discuss capacity of site owner and/or community groups to monitor site biodiversity in future. This may entail citizen science roles. Document stakeholder roles, monitoring frequency and reporting. Include management and maintenance plan discussions about group interest, capacity and preferred involvement.

Conduct Lessons Learned

Conduct lessons-learned activity at project completion involving client organisations and external stakeholders. Use short anonymous survey asking:

- How well did we deliver on our design goals?
- What went well?
- What could have gone better?
- What must we do differently next time?

Hold lessons-learned meeting to share feedback, seek additional reflections and produce recommendations for future projects.

Ongoing Monitoring

Alongside agreed metrics and tools in the Management, Maintenance and Stewardship Plan, use photos of suitable contemporary urban or pre-colonisation reference state at various growth stages. Land use change assessment could compare aerial imagery over time using Google Maps or Nearmap.

Re-assessment of the site will be required at multi-year intervals to determine whether the design achieved desired goals. Document required interval time for monitoring and agreed monitoring actions based on project scale.

Credit: Breakout Creek / Purruna Pari Stage 3 / TCL / Jackie Gu

Deliverables

- Handover report documenting achievements against targets
- Remediation plan for unmet targets
- Stewardship agreement with community groups
- Long-term monitoring protocols
- Lessons learned report
- Knowledge transfer documentation
- Celebration and recognition events

Reflective Questions

- Have we honestly assessed our achievements and shortfalls against biodiversity targets?
- What knowledge must be transferred to ensure continuity of biodiversity-positive management?
- How are we celebrating successes while learning from challenges to improve future practice?
- What monitoring systems will track biodiversity outcomes over ecologically meaningful timeframes?
- How does this project contribute to building evidence for biodiversity positive design across the profession?

5. Driving Change in Your Organisation

5.1 Overview

To ensure biodiversity is a non-negotiable consideration in every project, just as Universal Design and Designing with Country is, your organisation will need to support staff to integrate this approach into their practice. Despite decades of scientific warnings that biodiversity loss represents our most critical planetary crisis, research on biodiversity in relation to business management and organisational change remains underdeveloped. To mobilise corporate action for biodiversity protection and amplify research impact, we must bridge the gap between natural sciences and the fields of management and accounting (Bajger, Ali and Mousa, 2025).

Below are a range of ways that can help your organisation adopt Biodiversity Positive Design. These activities can be scaled to accommodate different types of organisations.

5.2 Organisational Development Strategies

Strategy 1: Start a Biodiversity Positive and Climate working group

Bring together champions and experts to think about what needs to change in your organisation to become biodiversity and climate positive and integrate that with climate and designing with Country considerations.

Develop terms of reference to guide the group, regular meetings and set up periodic communications to the organisation about the work underway and how they can get involved.

Strategy 2: Understand the organisational risks and opportunities for climate and biodiversity

The LEAP approach from the Taskforce for Nature Based Financial Disclosures offers a process that mid to large sized organisations can apply to define the impacts, dependencies, risks and opportunities for nature that result from organisational activities. Use this knowledge to develop an action plan to address key issue areas or harness opportunities.

Credit: South Parklands Wetland / TCL / Jackie Gu

Strategy 3: Understand the organisation's current Biodiversity and Climate Positive Design capability
The working group needs to determine current organisational capacity.. How deep and widespread is ecological knowledge? How are people currently considering the ecology of a place in their projects? Ask yourselves, if your organisation was leading in biodiversity positive design what would look different? An anonymous survey may assist in obtaining this understanding.

5.3. Integrating BPD into the Professional Workflow: Stage-by-Stage Integration

This section provides practical checklists for clients, consultants, and community stakeholders to integrate Biodiversity Positive Design into standard professional workflows. The seven-stage approach aligns with standard project delivery phases, ensuring BPD considerations are embedded at each project stage rather than treated as add-on requirements.

Inception Stage

Client Responsibilities

- [ ] Identify biodiversity champions within your organisation
- [ ] Allocate budget for biodiversity assessment and outcomes
- [ ] Consider biodiversity in site selection and project visioning
- [ ] Engage Traditional Owners early with appropriate protocols
- [ ] Review organisational biodiversity policies and commitments

Consultant Responsibilities

- [ ] Assess client biodiversity awareness and ambitions
- [ ] Identify biodiversity opportunities in project visioning
- [ ] Recommend ecological expertise for project team
- [ ] Highlight biodiversity regulatory requirements
- [ ] Propose biodiversity-positive approaches in fee proposals

Community & Stakeholder Responsibilities

- [ ] Share local ecological knowledge and observations
- [ ] Identify biodiversity priorities for community and stakeholders

- [ ] Propose stewardship and monitoring roles
- [ ] Connect project team with local environmental groups
- [ ] Advocate for biodiversity outcomes

Initiation Stage

Client Responsibilities

- [ ] Define biodiversity requirements in project brief
- [ ] Set preliminary biodiversity goals and targets
- [ ] Identify biodiversity risks and opportunities
- [ ] Allocate resources for ecological assessments
- [ ] Establish biodiversity performance criteria

Consultant Responsibilities

- [ ] Include ecologist in project team formation
- [ ] Develop biodiversity-focused return brief
- [ ] Cost biodiversity assessments and interventions
- [ ] Propose measurement and monitoring approaches
- [ ] Identify early win biodiversity opportunities

Community & Stakeholder Responsibilities

- [ ] Participate in project briefing sessions
- [ ] Share aspirations for biodiversity outcomes
- [ ] Identify local biodiversity assets to protect
- [ ] Propose community engagement methods
- [ ] Offer ongoing participation commitments

Analysis Stage

Client Responsibilities

- [ ] Provide access to previous ecological studies
- [ ] Fund comprehensive site ecological assessment
- [ ] Facilitate Traditional Owner site walks
- [ ] Support multi-scale ecological analysis
- [ ] Review and approve biodiversity targets

Consultant Responsibilities

- [ ] Conduct multi-scale ecological analysis
- [ ] Integrate Traditional Ecological Knowledge
- [ ] Map biodiversity opportunities and constraints
- [ ] Establish ecological baseline measurements
- [ ] Develop biodiversity-specific design criteria

Community & Stakeholder Responsibilities

- [ ] Participate in site walks and assessments
- [ ] Share species sightings and ecological observations
- [ ] Identify culturally significant species and places
- [ ] Review and validate ecological findings
- [ ] Propose citizen science monitoring approaches

Concept Stage

Client Responsibilities

- [ ] Prioritise biodiversity in design reviews
- [ ] Support innovative biodiversity solutions
- [ ] Approve biodiversity-focused design strategies
- [ ] Consider lifecycle costs of biodiversity features
- [ ] Communicate biodiversity goals to stakeholders

Consultant Responsibilities

- [ ] Integrate biodiversity strategies in concept design
- [ ] Test designs against biodiversity targets
- [ ] Visualise biodiversity outcomes for stakeholders
- [ ] Identify climate-biodiversity-health co-benefits
- [ ] Develop preliminary management requirements
- [ ] Develop initial biodiversity-specific design criteria

Community & Stakeholder Responsibilities

- [ ] Review concept designs for biodiversity outcomes
- [ ] Provide feedback on habitat arrangements
- [ ] Identify potential management challenges
- [ ] Suggest locally appropriate species
- [ ] Confirm stewardship interest and capacity
- [ ] Select locally appropriate targets and species

Detailed Design Stage

Client Responsibilities

- [ ] Maintain biodiversity targets through value engineering
- [ ] Approve biodiversity-positive material selections
- [ ] Support extended establishment periods
- [ ] Fund specialised biodiversity features
- [ ] Approve adaptive management provisions

Consultant Responsibilities

- [ ] Specify local indigenous plant species
- [ ] Detail wildlife-friendly design elements
- [ ] Develop biodiversity-positive maintenance specifications
- [ ] Design for climate resilience and adaptation
- [ ] Document biodiversity protection measures

Community & Stakeholder Responsibilities

- [ ] Review plant species selections
- [ ] Advise on local growing conditions
- [ ] Identify maintenance capability and constraints
- [ ] Suggest community engagement features
- [ ] Confirm long-term monitoring commitment

Construction Stage

Client Responsibilities

- [ ] Brief contractors on biodiversity importance
- [ ] Enforce habitat protection zones
- [ ] Monitor compliance with biodiversity specifications
- [ ] Support adaptive responses to site discoveries
- [ ] Maintain stakeholder communication

Consultant Responsibilities

- [ ] Provide biodiversity-focused site inductions
- [ ] Monitor habitat protection implementation
- [ ] Respond to biodiversity-related site issues
- [ ] Verify biodiversity feature installation
- [ ] Document biodiversity outcomes progressively

Community & Stakeholder Responsibilities

- [ ] Report biodiversity protection breaches
- [ ] Participate in construction phase site walks
- [ ] Prepare for stewardship roles
- [ ] Begin baseline monitoring if appropriate
- [ ] Celebrate biodiversity milestones

Handover Stage

Client Responsibilities

- [ ] Commission biodiversity outcome assessment
- [ ] Fund remediation of unmet targets
- [ ] Establish maintenance contracts with biodiversity requirements
- [ ] Transfer biodiversity documentation
- [ ] Celebrate biodiversity achievements

Consultant Responsibilities

- [ ] Measure outcomes against biodiversity targets
- [ ] Prepare biodiversity handover report
- [ ] Conduct biodiversity-focused maintenance training
- [ ] Establish monitoring protocols
- [ ] Document lessons learned

Community & Stakeholder Responsibilities

- [ ] Accept stewardship responsibilities
- [ ] Establish monitoring schedules
- [ ] Create community care groups
- [ ] Plan biodiversity education programs
- [ ] Share success stories

Use Stage

Client Responsibilities

- [ ] Implement biodiversity-positive maintenance
- [ ] Fund ongoing monitoring programs
- [ ] Support adaptive management
- [ ] Report biodiversity outcomes
- [ ] Share lessons with industry

Consultant Responsibilities

- [ ] Provide ongoing biodiversity advice
- [ ] Review monitoring data
- [ ] Recommend management adjustments
- [ ] Document long-term outcomes
- [ ] Publish case studies

Community & Stakeholder Responsibilities

- [ ] Conduct citizen science monitoring
- [ ] Lead stewardship activities
- [ ] Report biodiversity observations
- [ ] Educate new community members
- [ ] Advocate for biodiversity protection

Credit: Bendigo Botanic Gardens—Garden for the Future/T.L.C /AILA Awards Archive

5.4 Critical Success Factors

Organisational Readiness

- Leadership commitment to biodiversity outcomes
- Adequate resourcing throughout project lifecycle
- Integration with existing sustainability frameworks
- Staff capacity building and training
- Recognition and reward systems

Technical Excellence

- Early ecological expertise engagement
- Evidence-based target setting
- Innovative design solutions
- Quality control through construction
- Adaptive management protocols

Stakeholder Collaboration

- Genuine Traditional Owner partnership
- Inclusive community engagement
- Multi-disciplinary team integration
- Clear communication protocols
- Shared outcome ownership

Long-term Thinking

- Lifecycle costing approaches
- Succession planning for landscapes
- Climate adaptation integration
- Knowledge management systems
- Continuous improvement culture

Integrating Biodiversity Positive Design into professional workflows requires commitment, collaboration, and creativity from all parties. These checklists provide a starting framework that can be adapted to specific project contexts while maintaining focus on meaningful biodiversity outcomes. Success will not come from the perfect adherence to such checklists but rather from a genuine and critical commitment to creating landscapes where both human and non-human communities can thrive together.

6. Conclusion

This Biodiversity Positive Design Guide has presented an emerging approach to landscape architecture practice in Australia, offering a pathway for practitioners to move toward regenerative design that actively enhances biodiversity. Through the integration of interconnected and innovative knowledge components including definition, values, principles, strategies, and process, and their incorporation into project workflows, this guide provides the theoretical foundation and practical approach necessary to embed biodiversity considerations into every aspect of landscape architecture practice.

The guide's various knowledge components, presented in the preceding pages serve as starting points for further innovation within the industry. One significant strength worth emphasising is in the multidimensional definition of biodiversity itself as a synthesis of multiple ways of knowing. By establishing this inclusive definition of biodiversity that integrates Country, climate, science, and biocultural understanding, the guide acknowledges that biodiversity must be an open and evolving concept that encompasses ecological communities, processes, and the profound relationships within nature and between people and nature. This holistic way of seeing and communicating establishes a shared language for landscape architects and allied professionals working across Australia's diverse ecological, economic and cultural contexts.

The five regenerative ecological values developed as part of the guide including measurable outcomes, net positive impact, diverse values, system contribution, and human-nature relationships, orient design decisions. These values are operationalised through actionable principles and strategies that guide practitioners to design, measure and adapt for net positive outcomes, Together, these values, principles and strategies provide both the ethical framework and practical guidance necessary for the development of biodiversity positive design projects. The guide synthesises global research and industry best practice demonstrating that biodiversity positive design is not an abstract ideal but an achievable goal. Through presenting current projects, the guide acknowledges the design and practice work already being done within organisations around Australia. The various illustrations and case studies contained within the guide indicate that experimental BPD is being initiated across diverse project types and contexts and that change towards a biodiversity positive future is within reach even if the current negative biodiversity trends present a formidable challenge to overcome. The idea that all landscape projects have biodiversity potential, regardless of scale or location, challenges practitioners to reconsider even

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the smallest urban interventions as opportunities for biodiversity enhancement.

Perhaps most critically, the framework's process component ensures that biodiversity considerations are not relegated to a single project phase or add-on but are embedded throughout the entire design workflow. This systematic integration – from inception through implementation to long-term management – represents a fundamental and radical shift in how landscape architecture projects can be conceived, developed, and evaluated. By breaking down and reflecting on project workflows, and through providing detailed tools and considerations for each project stage, the guide supports practitioners in making biodiversity outcomes central to their practice.

For the profession as a whole, this guide makes a significant step in positioning landscape architecture as a leading discipline in biodiversity conservation and regeneration. The framework's flexibility in addressing diverse practice contexts and projects demonstrates its broad applicability. This adaptability is vital for a profession that operates across vastly different ecological, regulatory, and social contexts, yet must contribute to coherent landscape-scale biodiversity goals.

The implications of widespread adoption of biodiversity positive design extend far beyond individual projects. As practitioners integrate these approaches into standard practice, the cumulative effect has the potential to regenerate urban and regional landscapes into interconnected living landscapes that support biodiversity at multiple scales. Small-scale projects, when designed with biodiversity in mind, become critical nodes in the biodiversity positive challenge.

Unlike traditional "do no harm" approaches, BPD seeks net gains in biodiversity value, transforming urban and regional development from a conservation threat into a biodiversity positive opportunity. This position while seemingly radical and at odds with current practice and wisdom is at once pragmatic - we are already living in an Anthropogenic reality and with every project designing new ecosystems. Rather than these novel environments being pale copies of an original "nature" they need to integrate the best of current science, with brilliant design creativity and the wisdom of Aboriginal and Torres Strait Islander peoples. For this to happen a collective intelligence and care is our common responsibility. This guide therefore provides Australian landscape architects with a way to navigate ecological complexity, in order to deliver real results, positioning the profession as a catalyst for biodiversity recovery.

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Appendices

Case Studies and Templates

Biodiversity Positive Design represents a dynamic and evolving concept that builds upon the established expertise of landscape architects who have successfully integrated these principles into innovative projects over the previous decades. This comprehensive guide showcases proven strategies along with new innovative methodologies through carefully selected case studies, featuring award-winning projects from the Australian Institute of Landscape Architects' prestigious annual awards program. These exemplary works demonstrate excellence in landscape architecture practice at both state and national levels, illustrating the tangible outcomes that can be achieved through biodiversity-focused design approaches.

Four case studies are presented here to critically examine and reflect upon the BPD methodology. To advance the BPD initiative, additional case studies must be cultivated across all sectors, serving as essential instruments for the continued refinement and evolution of BPD principles, strategies and innovations. . Biodiversity Positive Design represents an emergent paradigm that will depend fundamentally upon the committed expertise and innovative vision of landscape architects throughout the profession.

Biodiversity-Positive Design Case Studies

Project Analysis and BPD Process Evaluation

Credit: Sydney Olympic Millenium Parklands/ Sydney Olympic Park Authority, Peter Walker and Partners (PWP), Bruce Mackenzie Design, Hassell, Kinhill Engineers / PWP Landscape Architecture

Case Study 1: Sydney Olympic Millenium Parklands, Sydney, NSW

Project Overview

Location: Homebush Bay, Western Sydney, NSW
Country: Wangal
Size: 404 hectares
Climate Zone: Humid subtropical
Project Team: Sydney Olympic Park Authority, Peter Walker and Partners (PWP), Bruce Mackenzie Design, Hassell, Kinhill Engineers
Budget: $50,000,000
Timeline: 1993-2000 (construction), ongoing management
Former Land Use: Contaminated industrial and commercial site including state abattoir (19th century), chemical and heavy manufacturing industries, state brickworks (20th century)
Designer / Consultants: Peter Walker Partners, George Hargreaves Associates, Bruce Mckenzie, Pittendrigh, Shinkfield and Bruce (PSB), Jane Irwin Landscape Architecture and others.

Project Context

Sydney Olympic Millennial Parklands represents one of Australia's most ambitious landscape-scale biodiversity restoration projects, transforming a severely contaminated brownfield site into a thriving ecosystem supporting 180 native bird species and threatened species such as the Green and Golden Bell Frog. The project was developed as the centrepiece for the Sydney 2000 Olympic Games, with environmental sustainability principles developed from inception. Water conservation, waste minimisation, pollution avoidance, and the protection of significant natural and cultural environments featured strongly although were contested and influenced the project in unforeseen ways.

The site presented extraordinary challenges with more than half the 404-hectare area contaminated with chemical waste from decades of toxic industrial use. However, it also presented unique opportunities. The identification of populations of the endangered Green and Golden Bell Frog in the former brick pit with direct connectivity to Parramatta River and Homebush Bay estuarine systems profoundly influenced the project in the long-term shaping the design outcomes of the project.

BPD Process Application

Stage 1: Community & Stakeholder Engagement
The project team, involving 15 organisations, engaged in extensive community and stakeholder consultation throughout the development process. This included coordination with Olympic organising committees, environmental agencies, local communities.
It is unclear if Traditional Owner groups were sufficiently consulted. The development process established shared environmental principles that guided all subsequent decision-making and created accountability mechanisms for biodiversity outcomes.

Stage 2: Ecological Site Analysis
Site analysis revealed the site's complex environmental conditions across multiple scales. Site-specific investigations documented extensive soil contamination patterns, existing endangered species populations (particularly the Green and Golden Bell Frog), remnant vegetation communities, including the critically endangered Turpentine-Ironbark ecological community, and hydrological systems. Precinct-level analysis examined connectivity opportunities with Parramatta River, Homebush Bay, and surrounding green infrastructure

Stage 3: Biodiversity, Climate & Country Goals
The project established ambitious integrated goals addressing biodiversity enhancement and site remediation. Biodiversity goals included habitat protection of remnant Turpentine-Ironbark Forest a critically endangered ecological community, habitat creation for endangered species, restoration of riverine communities, establishment of extensive parklands and reconstructed wetlands, and creation of habitat supporting diverse native bird populations. Climate goals were also developed with energy efficiency a priority for the athletes village and other elements .

Stage 4: Measurement & Targets
Baseline ecological surveys documented existing species populations, habitat conditions, and ecosystem functions. Specific measurable targets included doubling bird and insect habitat area, conserving viable Green and Golden Bell Frog breeding populations, achieving strong native plant species composition in restoration areas, and treating all surface stormwater and contaminated groundwater through innovative systems. Ecologists were involved for monitoring of species populations, habitat quality, water quality, and ecosystem service provision.

Stage 5: Design Strategies
Innovative design strategies addressed the dual challenges of contamination management and biodiversity enhancement. Contaminated soils were shaped and capped to create distinctive geometric landmarks called "Millennial Markers" which varied from 20m to 60m in elevation, , providing diverse experiences and habitat. Facsimile soils and on-site remediation techniques established growing conditions for native plant communities. Haslam's Creek was daylighted and restored to provide aquatic habitat and improve water quality. Linear forested areas created habitat corridors and buffers between different park zones. Bioretention ponds treated contaminated groundwater while providing wetland habitat. The design integrated recycled water irrigation systems to support establishment while minimising potable water consumption.

Stage 6: Ongoing Management
A comprehensive management plan guided the park's evolution with detailed ongoing planting strategies, maintenance protocols, and adaptive management procedures. Management activities included regular monitoring of endangered species populations, vegetation community health, water quality, and visitor impacts.

Stage 7: Handover & Use

The large scale of the project has been managed by a specially designated authority: the Sydney Olympic Park Authority. Ongoing monitoring demonstrated significant biodiversity improvements: bird and insect habitat doubled by 2010, the Green and Golden Bell Frog population became one of the largest in NSW, and native plant communities were successfully established across diverse habitat types.

Outcomes and Impact

The project achieved remarkable biodiversity outcomes despite extreme pollution and site constraints. Key successes include:

- Habitat creation supporting 180 native bird species
- Establishment of one of NSW's largest Green and Golden Bell Frog populations
- Restoration of 24 kilometres of riverine communities including mangrove wetlands.
- Creation of 15 hectares of urban forest
- Doubling of bird and insect habitat area within 10 years
- Successful remediation and productive reuse of severely contaminated land

Lessons Learned

This project demonstrates the potential for landscape-scale biodiversity enhancement even on severely degraded sites when supported by adequate resources, multidisciplinary expertise, and long-term commitment. Critical success factors included comprehensive ecological understanding, innovative soil management techniques, integrated water management systems, and sustained implementation of management plans. The urban water strategy implementation highlights the importance of delivering integrated infrastructure components to achieve optimal biodiversity outcomes.

Broader Significance

The landmark Sydney Olympic Millennial Parklands established new standards for brownfield remediation and urban biodiversity restoration in Australia.
The project's techniques for contaminated soil management, native ecosystem restoration, and endangered species habitat creation have been replicated across numerous subsequent projects.
The integration of Olympic legacy planning with biodiversity conservation demonstrates the potential for major events to catalyse landscape-scale environmental improvements.

Credit: Yitpi Yartapuultiku Cultural Centre / City of Port Adelaide Enfield (client), WAX Design (landscape architect), Ashley Halliday Architects / Bash Dissanayaka (BashImage)

Case Study 2: Yitpi Yartapuultiku Cultural Centre, Port Adelaide, SA

Project Overview

Location: Port Adelaide, South Australia
Country: Kaurna
Size: Approximately 4.8 hectares
Climate Zone: Warm temperate (Mediterranean)
Project Team: City of Port Adelaide Enfield (client), Yitpi Yartapuultiku Kaurna Elders Cultural Custodians, WAX Design (landscape architect), Ashley Halliday Architects
Timeline: Concept endorsed 2022, construction commenced 2022, completion expected 2025
Former Land Use: Capped brownfield site (open space)
Cultural Context: Kaurna Country, with extensive Traditional Owner leadership, co-design, and custodian group involvement

Project Context

Yitpi Yartapuultiku Cultural Centre represents a paradigm shift in biodiversity-positive design, demonstrating how authentic implementation of Designing with Country principles can deliver exceptional biodiversity outcomes. The project emerged from thirty years of advocacy by local Aboriginal communities for a culturally safe place to gather, learn, practice, share, celebrate, and record past, present, and future culture and to strengthen connections with Country.

Biodiversity positive design was an outcome of the Country led process and not explicitly stated in the original project brief. Rather the cultural vision required authentic expression of Country through landscape restoration, making biodiversity outcomes essential and integral to the success of the project. This case study demonstrates how Traditional Owner leadership and cultural authenticity create conditions for biodiversity enhancement that exceed conventional conservation approaches by making space for care and connection.

BPD Process Application

Stage 1: Community & Stakeholder Engagement
The project was initiated and led by Aboriginal communities following a long lead period of advocacy and relationship building with the City of Port Adelaide Enfield. A custodian group representing local Indigenous communities was established as the primary decision-making body, ensuring Traditional Owner leadership throughout the process. Extensive workshops used physical modelling techniques to enable collaborative design development that honoured cultural protocols and at the same time building a shared understanding among the many stakeholders. This approach established the deep relationships and cultural competency necessary for Country-centred design. Landscape architects helped provide a visual language to bring the stakeholders together. The project is "marked by a commitment of respect, deep listening, collaboration and shared learning between the City of PAE, the Yitpi Yartapuultiku Aboriginal Working Group, Ashley Halliday Architects and WAX Design". In March 2022, the local government endorsed a concept plan and business case for the project and agreed to start on detailed designs. The occasion was "momentous", with Project Custodian Group representatives present.

Stage 2: Ecological Site Analysis
Comprehensive ecological analysis examined the site's past and present ecology within the broader Kaurna Country context. Historical and community research revealed pre-colonisation ecosystem patterns. Current site conditions were assessed for remnant vegetation, soil health, hydrological patterns, and connectivity opportunities with adjacent creek and shoreline systems. Traditional Ecological Knowledge provided essential understanding of seasonal patterns, species relationships, and appropriate management practices and protocols. Riverine red gum woodlands, mangrove communities, sheoak windbreaks, and dry forest systems were identified as plant communities to be restored.

Stage 3: Biodiversity, Climate & Country Goals
Integrated goals emerged from the cultural vision rather than being considered as separate objectives. Country goals focused on creating culturally safe spaces that authentically express Kaurna landscapes and enable traditional cultural practices. Biodiversity goals included restoration of culturally significant ecological communities, removal of engineered revetment and re-establishment of intertidal 'living shoreline' systems, and creation of habitat supporting traditional food and medicine species.

Stage 4: Measurement & Targets
Baseline documentation combined landscape surveys with Traditional Ecological Knowledge to establish comprehensive understanding of existing conditions. Targets included 100% native species composition in revegetation areas, successful establishment of riverine red gum woodland along creek systems, restoration of mangrove and samphire communities along shoreline areas, and creation of habitat supporting traditional cultural practices. Success metrics therefore expressed an integration of ecological indicators with cultural values including community use patterns and understanding of Country. .

Stage 5: Design Strategies
Design strategies emerged through collaborative workshops using physical three dimensional modelling to explore cultural narratives, landform, vegetation, and circulation patterns. Existing vegetation was retained and protected as the foundation for expanded native plant communities. The intertidal 'living shoreline' was re-established to provide habitat while protecting against erosion. All plant selections prioritised culturally significant species local to the area.

Stage 6: Ongoing Management
The project is very much "owned" and cared for by community. Community stewardship programs enable ongoing Traditional Owner leadership in site management while building broader community understanding of Country-centred approaches.

Stage 7: Handover & Use
Project completion has involved the establishment of cultural protocols, and community engagement methods. Knowledge sharing has focused on communicating this Traditional Owner leadership model and Country-centred design approaches in conferences and publications.

Outcomes and Impact

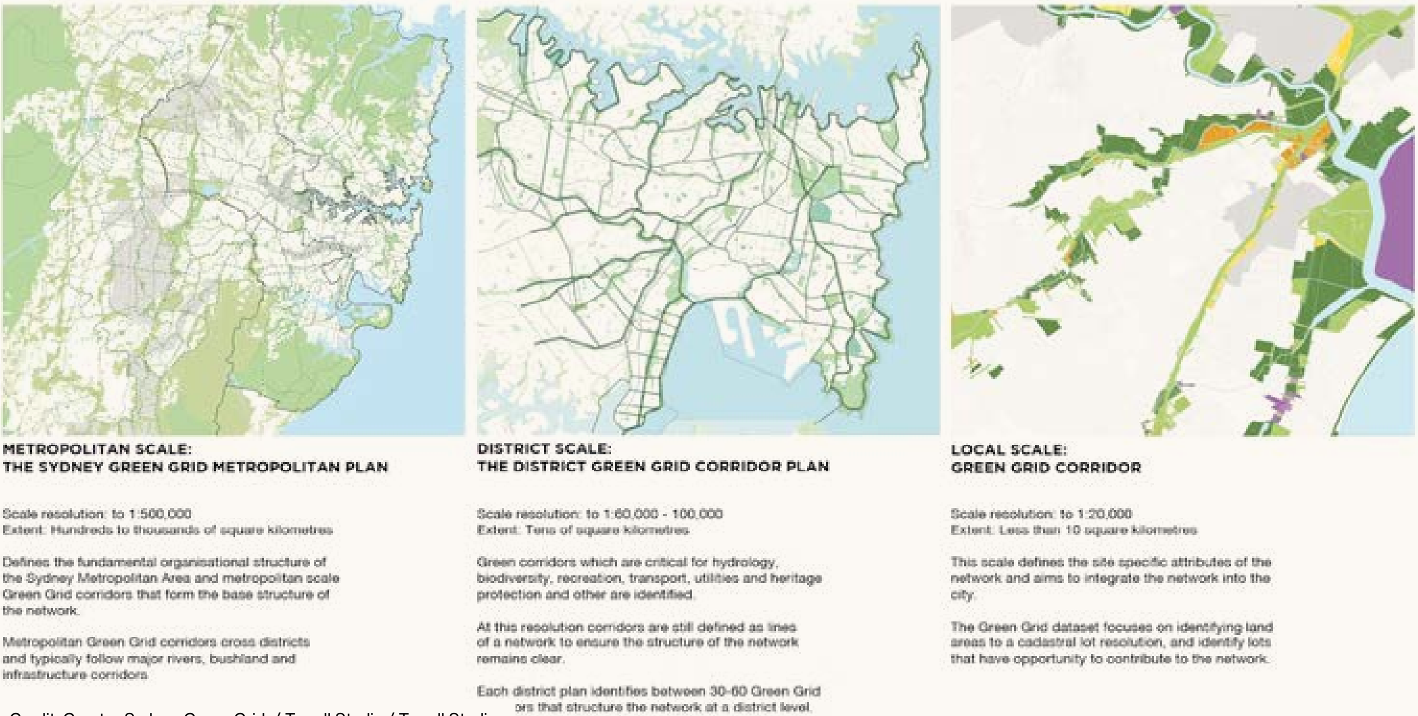
- Establishment of new models for Traditional Owner leadership in landscape architecture
- Integration of cultural and biodiversity objectives through Country-centred design
- Development of collaborative design methods that honour cultural protocols
- Creation of templates and design processes for authentic Designing with Country implementation
- Demonstration of how cultural authenticity and Country led design enhances biodiversity outcomes.

Lessons Learned

This project demonstrates that authentic implementation of Designing with Country principles inherently deliver biodiversity outcomes. Traditional Owner leadership and cultural authenticity create conditions for ecosystem restoration that reflects deep ecological understanding developed over tens of thousands of years. The collaborative design process using physical modelling enables meaningful participation while respecting cultural protocols. Most significantly, the project shows that cultural and biodiversity objectives are synergistic rather than competing when approached through Traditional Owner leadership.

Broader Significance

Yitpi Yartapuultiku Cultural Centre establishes new standards for Traditional Owner leadership in landscape architecture while demonstrating the biodiversity benefits of authentic Country-centred design. The project's methods for collaborative design, traditional management integration, and cultural-ecological synthesis provide templates for transforming landscape architecture , and architectural practice across Australia. The integration of cultural safety with biodiversity enhancement creates models for addressing both the biodiversity crisis and cultural recognition simultaneously.



Credit: Greater Sydney Green Grid / Tyrrell Studio / Tyrrell Studio

Case Study 3: Sydney Green Grid, Sydney, NSW

Project Overview

Location: Greater Sydney, New South Wales
Country: Dharug, Dharawal, and Eora nations
Scale: Metropolitan-wide network across Greater Sydney region
Climate Zone: Temperate oceanic to humid subtropical
Client: NSW Department of Planning and Environment
Project Team: Tyrrell Studio (spatial framework development, environmental analysis and urban design), NSW Government Architect (project coordination and review), Greater Sydney Commission, 33 local councils, state agencies, Traditional Owner groups, community organisations (local and regional data contributions).
Timeline: 2016-ongoing (spatial framework), long-term implementation across multiple decades
Project Type: Metropolitan green infrastructure network and strategic spatial planning framework

Project Context

The Sydney Green Grid represents Australia's most ambitious metropolitan-scale biodiversity and green infrastructure initiative, guiding the creation of a network of high-quality green spaces for sport, recreation, biodiversity, and waterway health across Greater Sydney. Initiated by the NSW Department of Planning and Environment with consultants the NSW Government Architect with Tyrrell Studio, the Green Grid creates a strategic framework that connects strategic centres and local centres, public transport hubs, and residential areas through an integrated network of green corridors, open spaces, and waterways.

The project was developed prior to the widespread promotion of nature positive initiatives in city planning and is therefore a landmark case study. While the word "biodiversity" is not explicitly foregrounded in the various reports and plans that make up the policy, the project was nevertheless developed using best available data on critical ecological systems and landscapes and therefore forms a strong foundation for biodiversity positive design initiatives throughout the metropolitan area at the intersection of a range of competing land uses. The very act of visualising and analysing blue and green systems at the metropolitan scale provided a fundamentally new way to see the city in terms of its ecological systems.

The initiative therefore addresses the critical challenge of maintaining and enhancing biodiversity in one of the region's and Australia's fastest-growing metropolitan areas, where urban development pressure threatens natural remnants and endangered communities. The Green Grid framework recognises that traditional approaches to open space planning - focused primarily on recreation and amenity - are insufficient to address contemporary challenges of biodiversity loss, climate change, and urban heat island effects – therefore seeking to integrate multiple types of infrastructures along with implementation strategies.

The project demonstrates how strategic spatial planning can create the framework for hundreds of individual biodiversity-positive design projects across multiple jurisdictions, scales, and timeframes. The Green Grid has established the metropolitan context and connectivity framework enabling myriad other local projects to contribute to landscape-scale biodiversity conservation outcomes.

BPD Process Application

Stage 1: Community & Stakeholder Engagement
The Green Grid was developed through extensive multi-stakeholder engagement involving 33 local councils, state agencies, environmental organisations, and community groups. Regional forums established shared vision and priorities while local workshops identified specific opportunities and constraints. Traditional Owner engagement protocols were considered at a later stage and not part of the project per se.

Stage 2: Ecological Site Analysis
Comprehensive ecological analysis operated at multiple scales from regional ecosystem mapping to site-specific assessments. Regional analysis identified priority corridors, , and connectivity gaps across the metropolitan area. Precinct-level analysis examined opportunities for green infrastructure enhancement within existing green spaces and development areas. Site-specific analysis documented existing vegetation communities, and hydrological systems across hundreds of individual sites.

Stage 3: Biodiversity, Climate & Country Goals
Integrated goals address green and blue infrastructure conservation and enhancement across the metropolitan scale along with human nature connection. Biodiversity was not the preeminent focus but ecosystem health was considered across the various aims and objectives established. Country goals were not an explicit part of the project but subsequently actioned through a parallel project known as the Ochre Grid.

Stage 4: Measurement & Targets
Baseline mapping using legacy GIS datasets documented existing green and blue infrastructure, ecosystem values, and connectivity patterns across the metropolitan area as they related to terrain and urban development. Specific targets include development of priority sites and engaging local government to scale up green infrastructure implementation. Protocols for biodiversity mapping were not established but the framework provides a strong foundation for such future work and linking in community members for nature stewardship activities.

Stage 5: Design Strategies
Design strategies were devised across multiple scales from regional corridor planning to local blue green infrastructure network creation. Regional strategies focus on identifying and protecting priority

connectivity corridors, establishing links to high value core habitat areas, and coordinating green infrastructure delivery across council boundaries. Local strategies include identification, audit and the prioritisation of existing projects to assess which ones might catalyse the the most positive outcomes.

Stage 6: Ongoing Management
Management coordination involved multiple agencies and local and state government groups working within an integrated framework. The metropolitan scope of the project set the framework for future projects. This foundational policy has enhanced local scaling and resulted in various local governments developing their own green grids.

Stage 7: Handover & Use
Knowledge sharing occurred through annual forums, technical workshops, and online platforms and has enabled replication of successful approaches across different sites and contexts. Ongoing monitoring hasn't been supported but the policy document is publicly available on the Government Architect website. Future work might include the development of a live green infrastructure portal for tracking biodiversity positive initiates at the city scale linking to specific threatened species recovery targets.

Outcomes and Impact

- A connected network of priority corridors will serve as the core corridors of the Green Grid as it is delivered, establishing the strategic backbone for Sydney's green infrastructure implementation
- Implementation across Sydney's six districts through comprehensive spatial framework covering the entire Greater Sydney Basin, connecting strategic centres, public transport hubs, and residential areas
- Development of integrated GIS database integrating multiple infrastructure, transport, housing, zoning, and ecological data to support evidence-based decision making
- Priority projects identified in the Green Grid strategy spanning from Palm Beach to Manly, Penrith to Campbelltown, and throughout the Metropolitan Sydney area Green Grid Implementation
- Engagement with All Sydney Local Government Areas through strategic planning integration, with projects embedded into Sydney's district plans and alignment with local council open space strategies
- Establishment of green infrastructure network addressing hydrological, ecological, and recreational performance through stakeholder workshops and consultation processes with state and local government agencies

Lessons Learned

The Green Grid demonstrates the potential for metropolitan-scale biodiversity enhancement through coordinated governance. Critical success factors include multi-jurisdictional coordination mechanisms, integration with development planning processes, and community stewardship network development. Challenges include maintaining momentum across political cycles, coordinating diverse stakeholder priorities, and ensuring equitable distribution of green infrastructure benefits.

Broader Significance

The Green Grid establishes new models for metropolitan-scale biodiversity conservation that integrate multiple jurisdictions, funding sources, and community groups. The initiative's approaches to corridor planning, community engagement, and adaptive management provide templates for other Australian cities facing similar urban growth and biodiversity challenges. The integration of biodiversity conservation with climate adaptation and community health can be further strengthened as future phases and scaling of the project is carried out.

Credit: Pakapakanthi / South Parklands Wetland / TCL / Jackie Gu

Case Study 4: Pakapakanthi / South Parklands Wetland, Adelaide, SA

Project Overview

Location: Adelaide Park Lands, South Australia (Kaurna Country)
Size: 3.4 hectares
Climate Zone: Mediterranean
Client: Brown Hill Keswick Creek Stormwater Project
Project Team: TCL – Landscape Architecture
Design Flow – Hydraulic Engineering
Tonkin – Lead / Civil Engineering
Procure PM – Project Management
Allan Sumner – Artist / Kaurna Ngarrindjeri and Yankunytjatjara
RAW – Cultural Heritage Survey
Bardavcol – Civil / Landscape Construction Lead
EcoDynamics – Landscape Construction Partners
Traditional Owner Engagement – Kaurna Yerta Aboriginal Corporation
Timeline: 2018–2024 (design and construction), ongoing management
Photography: Jackie Gu
Project Type: Integrated stormwater management and habitat and recreation creation.

Project Context

The South Parklands Wetland represents a paradigm shift in urban infrastructure design for Adelaide, demonstrating how flood mitigation infrastructure can simultaneously deliver exceptional biodiversity, cultural, and community outcomes. As part of the broader Brown Hill Keswick Creek Stormwater Project spanning five council areas, the wetland detains and treats flows from Brownhill Creek while substantially reducing 1/100 year flood risks for surrounding communities.

Located within Adelaide's internationally significant Park Lands on Kaurna Country, the project transforms essential flood infrastructure into a thriving ecosystem that enhances water quality, ecological value, amenity, and recreational benefits. The design embodies principles of community health and wellbeing, nature connection, building stronger communities, delivering connectivity and access for all, contributing to neighbourhood character, and supporting resilient neighbourhoods.

The project demonstrates how landscape architects can design green and blue infrastructure to address multiple urban challenges simultaneously—

flood mitigation, climate resilience, biodiversity enhancement, cultural recognition, and community wellbeing—while prioritising social and environmental benefits compatible with risk driven engineering solutions.

BPD Process Application

Stage 1: Community & Stakeholder Engagement
Extensive engagement with Kaurna Traditional Owners established cultural protocols and Traditional Ecological Knowledge foundations for the project. Community workshops with residents, environmental groups, and recreational users identified shared priorities for habitat restoration, water quality improvement, and cultural recognition. Stakeholder engagement continued throughout design and construction phases, with regular site visits and collaborative decision-making processes that built shared ownership and understanding.

Stage 2: Ecological Site Analysis
Comprehensive ecological analysis examined historical and current conditions across multiple scales. Research revealed pre-colonisation vegetation systems, seasonal flooding patterns, and native plant communities that supported diverse wildlife populations. Current site analysis documented soil compaction, and connectivity barriers. Regional analysis positioned the site within broader hydrological systems and identified opportunities to support threatened species recovery and habitat connectivity.

Stage 3: Biodiversity, Climate & Country Goals
Integrated goals emerged from collaborative planning with stakeholders. Biodiversity goals focused on habitat creation for waterbirds, amphibians, including habitat for the rare Chequered Copper Butterfly as well as enhancement of connectivity and recreational uses aligning the adjacent Park Lands areas. Climate goals emphasised stormwater management, urban cooling, and carbon sequestration through extensive native vegetation establishment.

Stage 4: Measurement & Targets
Baseline surveys documented existing vegetation communities, fauna populations, water quality, and soil conditions. Specific targets included achieving an authentic native species composition, establishing habitat for 20+ waterbird species, improving water quality by through natural filtration systems, and creating habitat corridors connecting to adjacent Park Lands areas. Monitoring protocols track vegetation diversity and establishment, species populations water quality, and community use patterns.

Stage 5: Design Strategies
Design strategies integrated contemporary restoration techniques with engineering requirements. Native plant communities were established using species selected for habitat value, cultural significance, and climate resilience. A range of diverse habitats were created through shaping the topography to create different wetland zones from permanent water to seasonal swamps and dry grasslands. The project design transitioned the site from a simple lawn monoculture to a complex, thriving habitat by establishing over 50 plant species endemic to the Greater Adelaide bioregion.

Stage 6: Ongoing Management
Management planning integrates traditional practices with contemporary conservation techniques. Traditional burning protocols maintain appropriate vegetation structure and species composition while reducing fire risk. Community stewardship programs engage volunteers in monitoring, maintenance, and educational activities. Adaptive management protocols enable seasonal adjustments based on monitoring results and changing environmental conditions. Water quality monitoring ensures ongoing effectiveness of natural filtration systems.

Stage 7: Handover & Use
Project completion included comprehensive documentation of restoration techniques, monitoring protocols, and management requirements.

Community education programs included workshops and talks highlighting biodiversity outcomes, cultural significance, and ongoing stewardship opportunities. Ongoing monitoring demonstrates sustained biodiversity improvements, community engagement and outstanding increase in biodiversity with various rare birds sighted and identified. The project is the largest Adelaide Parklands project undertaken in over 50 years and has attracted a wide diversity of casual users and regular active volunteers.

Outcomes and Impact

The project has achieved significant biodiversity and community outcomes:

- Establishment of native plant communities
- Return waterbird species including several threatened species
- Improvement in water quality and flooding outcomes. Creation of habitat corridors connecting to broader Park Lands system
- Creation of habitat corridors connecting to broader Park Lands system
- Engagement of community members in stewardship and recreation activities
- Recognition as a model for urban wetland restoration nationally

Lessons Learned

Critical success factors include integration of cultural and ecological objectives, and long-term community stewardship development. The project shows how urban infrastructure can be redesigned to support biodiversity while maintaining essential services like stormwater management.

Broader Significance

The Pakapakanthi / South Parklands Wetland project establishes new standards for urban wetland reconstructions that integrate ecological science, and community engagement. The project's approaches to hydrology restoration, native plant community establishment, and community stewardship provide templates for similar projects across Australian cities. The project demonstrates how urban infrastructure can simultaneously address multiple social and environmental priorities within a large urban park.

Template: Biodiversity-Positive Design Case Studies

Project Overview

Project Name: [Insert project name]
Location: [Location, Traditional Country]
Size: [Area/scale]
Timeline: [Period]
Project Team: [Key organisations]
Former Land Use: [Previous conditions]
Investment: [Budget if available]

Project Context

2-3 sentences describing project significance, key challenges, opportunities, and strategic importance within environmental, cultural, and community context.

BPD Process & Principles Application

7-Stage Process	Application	BPD Principles Addressed
1. Community & Stakeholder Engagement	Key stakeholders and methods	
2. Ecological Site Analysis	Site/precinct/regional assessment	
3. Biodiversity, Climate & Country Goals	Integrated objectives	
4. Measurement & Targets	Baselines and targets	
5. Design Strategies	Key design approaches	
6. Ongoing Management	Management protocols	
7. Handover & Use	Knowledge transfer	

Key Outcomes & Evidence Base

Outcome Category	Specific Results	Evidence Contribution
Biodiversity	[Species numbers, habitat area, restoration]	[Monitoring data, research outcomes]
Cultural	[Traditional Owner engagement, cultural practices]	[Cultural protocols, knowledge integration]
Community	[Engagement numbers, stewardship activities]	[Participation metrics, education outcomes]
Climate	[Carbon sequestration, resilience building]	[Climate adaptation measures, mitigation]

Critical Success Factors & Lessons

Success Factors: [3 key factors]
Challenges: [2 key challenges and responses]
Innovation: [Unique approaches]

Broader Significance & Replication

2-3 sentences on contribution to BPD practice, replication potential, and influence on policy/practice. Include evidence base contribution.

Template Version: 1.0
Date: [Insert date]
Prepared by: [Author/Organisation]

Usage Guidelines
Purpose: Document BPD projects using the 7-stage process and 8 principles framework. **Target:** One page (800-1000 words). **Focus:** Measurable outcomes, Traditional Owner leadership, community stewardship, evidence-based practice. **Integration:** Design with Country, Climate Positive Design, Evidence-based Practice.

The Biodiversity Postive Design Workflow

INCEPTION | INITIATION | ANALYSIS | CONCEPT | DETAILED DESIGN | CONSTRUCTION | HANDOVER | USE

1 Community & Stakeholder Engagement
Who are the human and non-human inhabitants of the place and what is the shared understanding of it? (Enabling)

2 Ecological Site Analysis
What is the past and present biodiversity potential of the place? (Scoping)

3 Biodiversity, Climate & Country Goals
What biodiversity positive outcome are we aiming for? (Vision setting)

4 Measurement & Targets
What is the current biodiversity baseline and how will we evaluate success? (Measuring)

5 Design Strategies
How do the design concepts and strategies support biodiversity positive actions? (Actioning)

6 Ongoing Management
How are biodiversity positive outcomes supported through procurement, construction, establishment and management? (Enabling)

7 Handover & Use
How will biodiversity positive outcomes be supported in the long-term through stewardship and monitoring? (Empowering)