

Greening Cycleways And Walk Trails

The benefits, challenges and design considerations.

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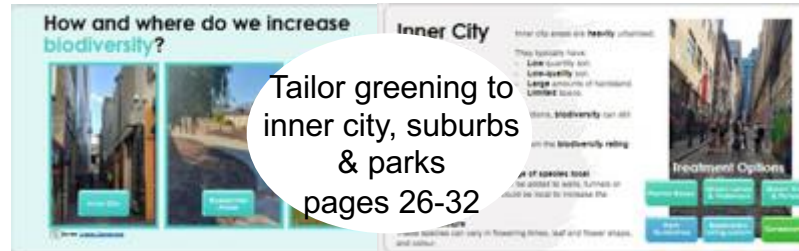
How to use the Guidelines

Click on this text throughout the presentation to return to the contents page

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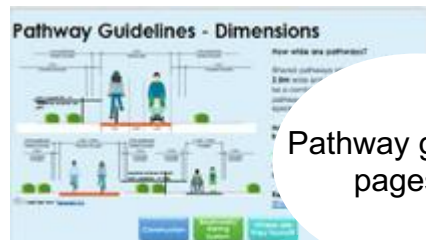
Why increase biodiversity?
pages 4-5



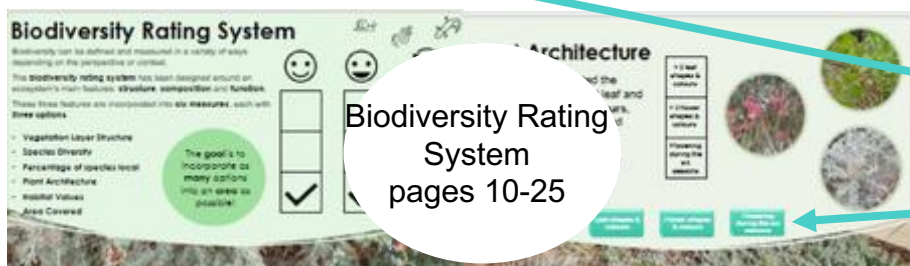
Tailor greening to inner city, suburbs & parks
pages 26-32



Pathways types
pages 6-7



Pathway guidelines
pages 8-9



Biodiversity Rating System
pages 10-25

The guidelines can be used in two different ways:

- Use the [contents](#) page to skip to the relevant section.
- Or work through the guidelines by using the links in each section.

Click the links to navigate the guidelines.



Greening treatments
pages 33-34



Considerations Including risks, construction, maintenance and planting.
pages 55-76



What is biodiversity?



[Return](#)

Biodiversity is **not** just a count of species in an area.

Biodiversity can be defined as the **variety** of life on Earth. The **different** plants, animals and microorganisms, their genetic information and their **ecosystems**.

Biodiversity affects the **function** and **structure** of an area.

Biodiversity is the **abundance** and **mix** of species and their **function**.

Biodiversity affects the **resources** offered by the **area** and its **species**.



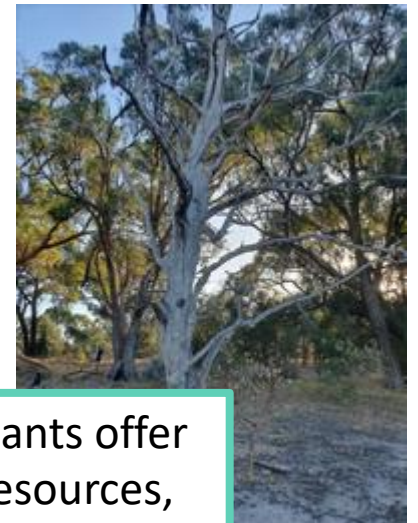
Planting vegetation in layers provides varying structure and function.



A biodiverse area attracts a variety of animals.



Different plants offer different resources, such as food or shelter.



Why increase biodiversity?

Urbanisation drives land use change and results in **fragmentation** of natural areas, **negatively impacting** native flora and fauna. Cycleways and walk trails are found throughout **urban areas**, linking suburbs and land-use areas.

By increasing **biodiversity** along cycleways and walk trails **ecological linkages** or **NatureLinks** can be created between **remnant patches of habitat**.

Increase biodiversity to create
NatureLinks!

[Return](#)

Resources

[NatureLinks Perth](#)

[ReWild Perth](#)

[Greener Places Better Spaces](#)

[Benefits](#)

[Pathways](#)

[Biodiversity
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system](#)

[Areas to
Green](#)

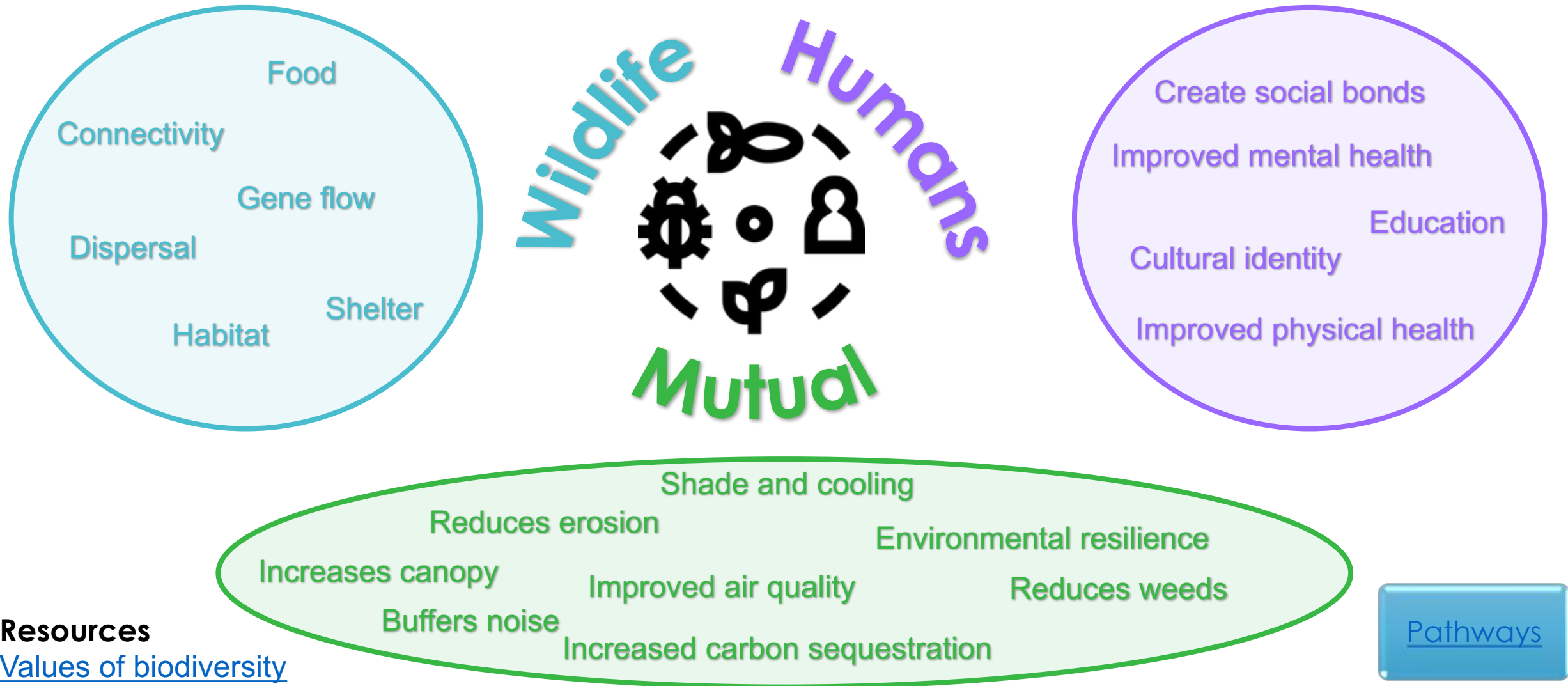
[Treatments](#)

[Considerations](#)



Benefits of Biodiversity

[Return](#)



Resources

[Values of biodiversity](#)

[What is biodiversity?](#)

[Pathways](#)

Pathway route types

Since 2016 **all** pathways in Western Australia are classed as **shared**, used by pedestrians and cyclists.

There are **three** broad types of pathway routes, primary, secondary and local which are **defined** by their **function**.

Resources

[Shared and separated pathway guidelines](#)

This guideline **will** cover **secondary** and **local** routes within urban areas.



Secondary routes connect primary and local routes and are found in recreational areas.



Local routes are found in residential areas connected to secondary routes.

This guideline will **not** cover **primary** (transit) routes and **adventure** trails in natural areas.



Pathway types

Three main pathway types are found in **urban** areas: unpaved, shared and separated.



Unpaved Walk Trail, commonly found in large parklands and constructed from bare earth or crushed limestone.



Shared Pathway, found throughout urban areas and are constructed from concrete or asphalt.



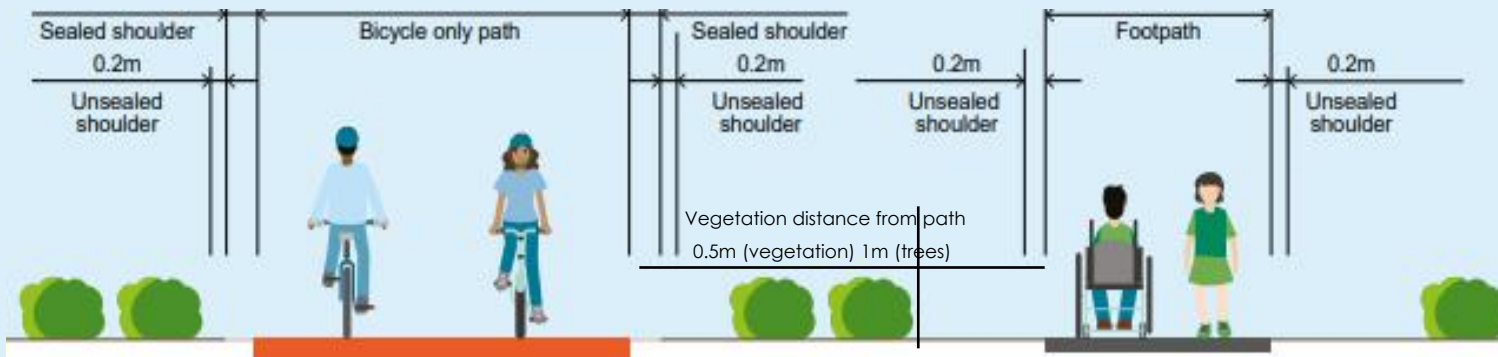
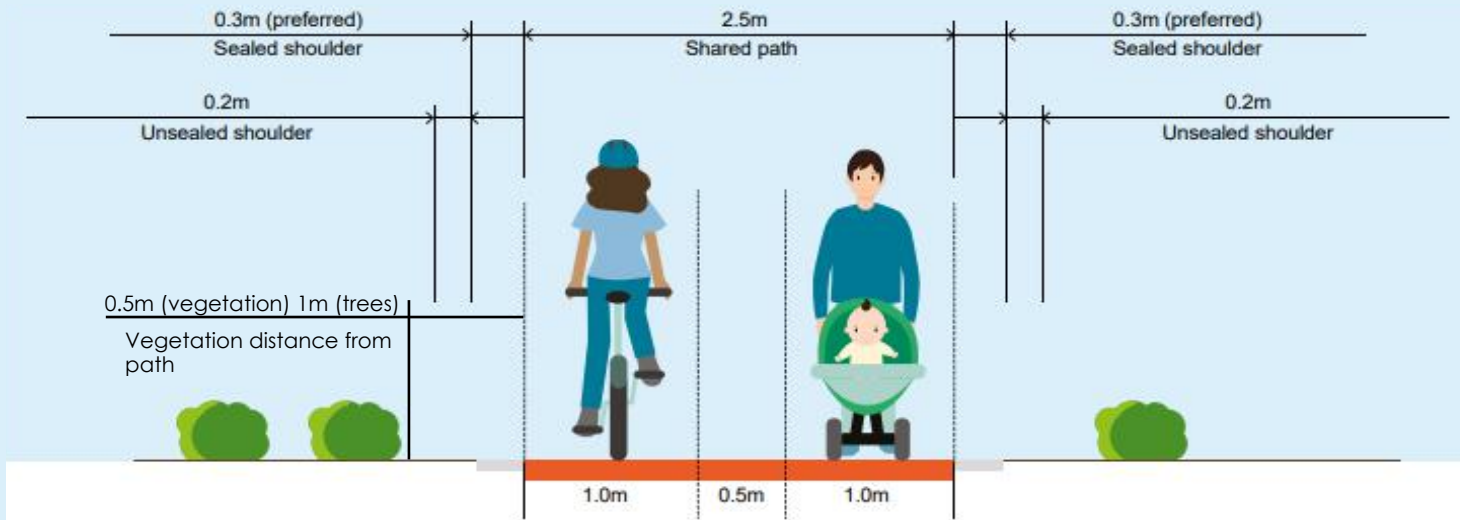
Separated Pathway, used in areas of high use to minimise collision risk. The cycle path is constructed from asphalt and pathway from concrete.

[Path design
Guidelines](#)

[Pathway
Construction](#)

[Where are
they found?](#)

Pathway Guidelines - Dimensions



How wide are pathways?

Shared pathways should be at least **2.5m** wide and separated pathways should be a combined **4m** wide. Unpaved pathways are designed to fit within the space available.

How far should vegetation be planted from a pathway?

Trees should be planted at least **1m** from a path edge and all other **vegetation** at least **0.5m**.

Resources

[Shared and separated pathway guidelines.](#)

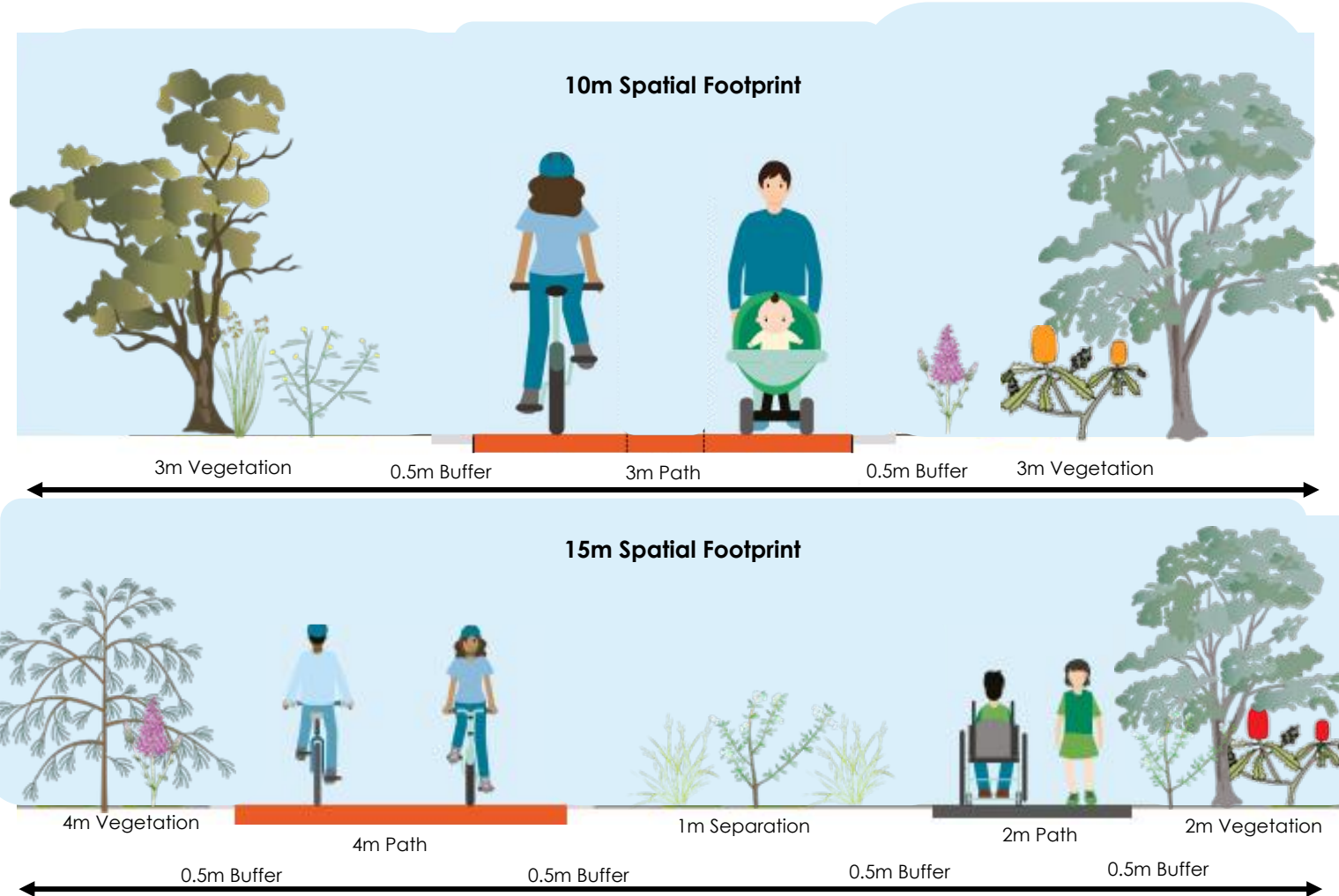
Modified from: [Transport WA](#)

[Pathway
Construction](#)

[Biodiversity
Rating
System](#)

[Where are
they found?](#)

Pathway Guidelines – Spatial Footprint



How much space is needed to green pathways?

The minimum area required for a 3m shared path with vegetation on each side is **10m**. This includes a 0.5m buffer between the path and vegetation and vegetation with a width that equals the path.

Separated pathways with vegetation on each side and a separation require a minimum of **15m**. This includes the path/vegetation buffer and a path separation.

Both pathway types also require an external buffer between vegetation and other land uses (e.g. roads) of at least 1m either side.



Modified from: [Transport WA](#)
Source: [Ian Image Library](#) &
[Nesp Resilient Landscapes Hub](#)

[Pathway
Placement](#)

[Pathway
Construction](#)

[Biodiversity
Rating
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they found?](#)

Pathway Guidelines

- Placement

Pathways should **NOT** be placed inside pockets of remnant bushland. Construction causes disturbance to the area.

Instead, place pathways along the **boundary** to the outside of remnant bushland areas. This minimises the **loss** of **valuable biodiversity**.

Placement of pathways on bushland boundaries **reduces** the required spatial footprint, as biodiversity is provided by the **remnant vegetation on one side**.

Placing pathways along remnant bushland boundaries helps to **buffer** the areas from the impacts of **urbanisation**. Path users can **benefit** from the natural areas without causing harm to them.

[Path design
Guidelines](#)

[Pathway
Construction](#)

[Biodiversity
Rating
System](#)

[Where are
they found?](#)



Pathway Guidelines - Construction

What materials are used?

Smooth skid-resistant materials. **Red asphalt** is preferable to black, and concrete is used in areas unsuitable for asphalt. Unpaved pathways use bare earth or crushed limestone.

What are the specifications of construction?

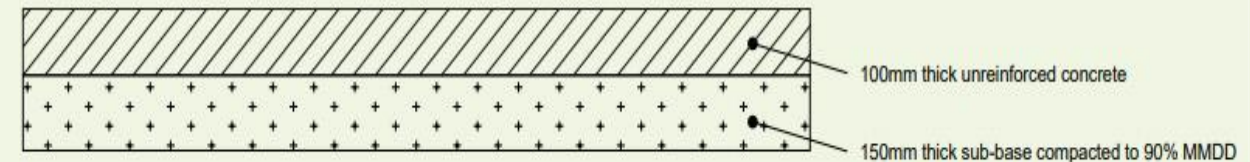
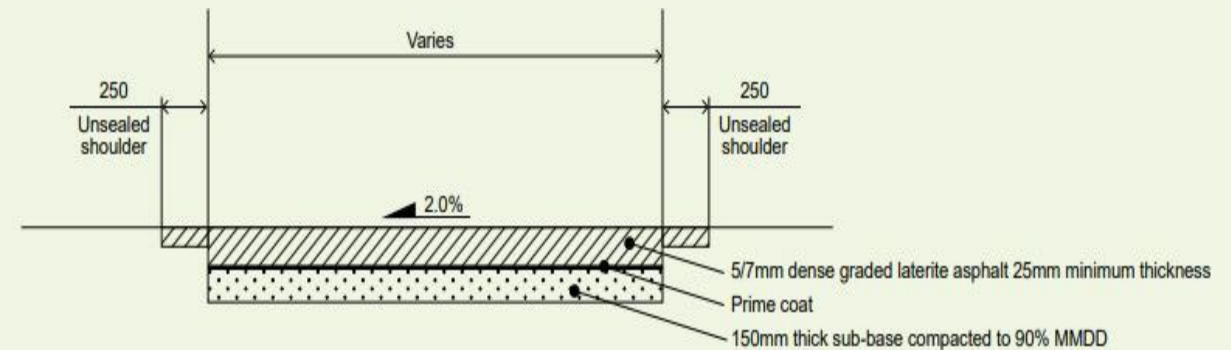
A specialised contractor is needed to install asphalt but not concrete. Specifications are as per the [pathway guidelines](#).

Are there specific design considerations?

- **Kerbing** can be used to reduce shoulder maintenance.
- To avoid pooling of water, paths should be designed with **2% cross fall**.
- To avoid visibility issues, pathways should never have sharp corners; they need curves with a **minimum of 10m curve radii**, and use warning signs where minimum radii are not possible.

Resources

[Shared and separated pathway guidelines](#).



Concrete Footpath Typical Cross Section (N.T.S.)

Specification:

1. Surface to be wood floated with broom finish to Type U4.
2. Smooth picture frame to be applied to path edges only and not contraction/expansion joints.
3. Contraction joints to be installed at 3m centres and of keyed type.
4. Expansion joints to be installed at 12m centres and at all changes in direction.
5. Expansion and isolation joints shall be filled with grey polyurethane (mastic) sealant.
6. Footpath must be the same width as the existing footpath but not less than 2.0m wide.



Source: [Transport WA](#)

Construction

Biodiversity
Rating
System



Biodiversity Rating System




Biodiversity can be defined and measured in a variety of ways depending on the perspective or context.

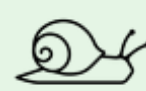
The **biodiversity rating system** has been designed around an ecosystem's main features: **structure**, **composition** and **function**.

These three features are incorporated into **six measures**, each with **three options**.

- **Vegetation Layer Structure**
- **Species Diversity**
- **Percentage of local species**
- **Plant Architecture**
- **Habitat Values**
- **Area Covered**

The **goal** is to incorporate as **many** options into an **area** as possible!

		
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[Return](#)



Biodiversity Rating System

[Return](#)

Vegetation
Layer
Structure

Species
diversity

Percentage of
local species

Plant
Architecture

Habitat values

Area covered

3 layers

21- 40
Species

90-100%
Local
Species

> 3 leaf
shapes and
colours

Food and
nesting
resources

Continuous
vegetation
for 80% of
path

2 layers

11-20
Species

70-90%
Local
Species

> 3 flower
shapes and
colours

Artificial
habitat

> 3m
wide

1 layer

1-10
Species

50-70%
Local
Species

Flowering
during the
six seasons

Dense
Vegetation

Vegetation
on both
sides

Example



Tree layer

Trees are available in **various mature growth** sizes and provide various food resources and shelter. Trees canopies cool the environment and provide leaf litter. They have **high biodiversity** value and **benefit** a large variety of fauna.

Shrub layer

> **knee-height** shrubs have foliage coverage from the ground up, creating a dense structure. They provide **shelter** and **food** for birds, mammals, insects, reptiles and pollinators.

Ground cover layer

< **knee-height** ground cover provides **shelter** and **food**, particularly for invertebrates and reptiles.

3 layers



2 layers



1 layer



Vegetation Layer Structure

Species diversity

Species diversity refers to an area's overall **variety** and **abundance** of plant species. Based on the [Woody Meadows method](#), this guideline counts number of different species per **9 square meters**.

[Maximise](#) the diversity by **varying** the selection of species along the path.

There are many **benefits** to increasing species diversity in an area;

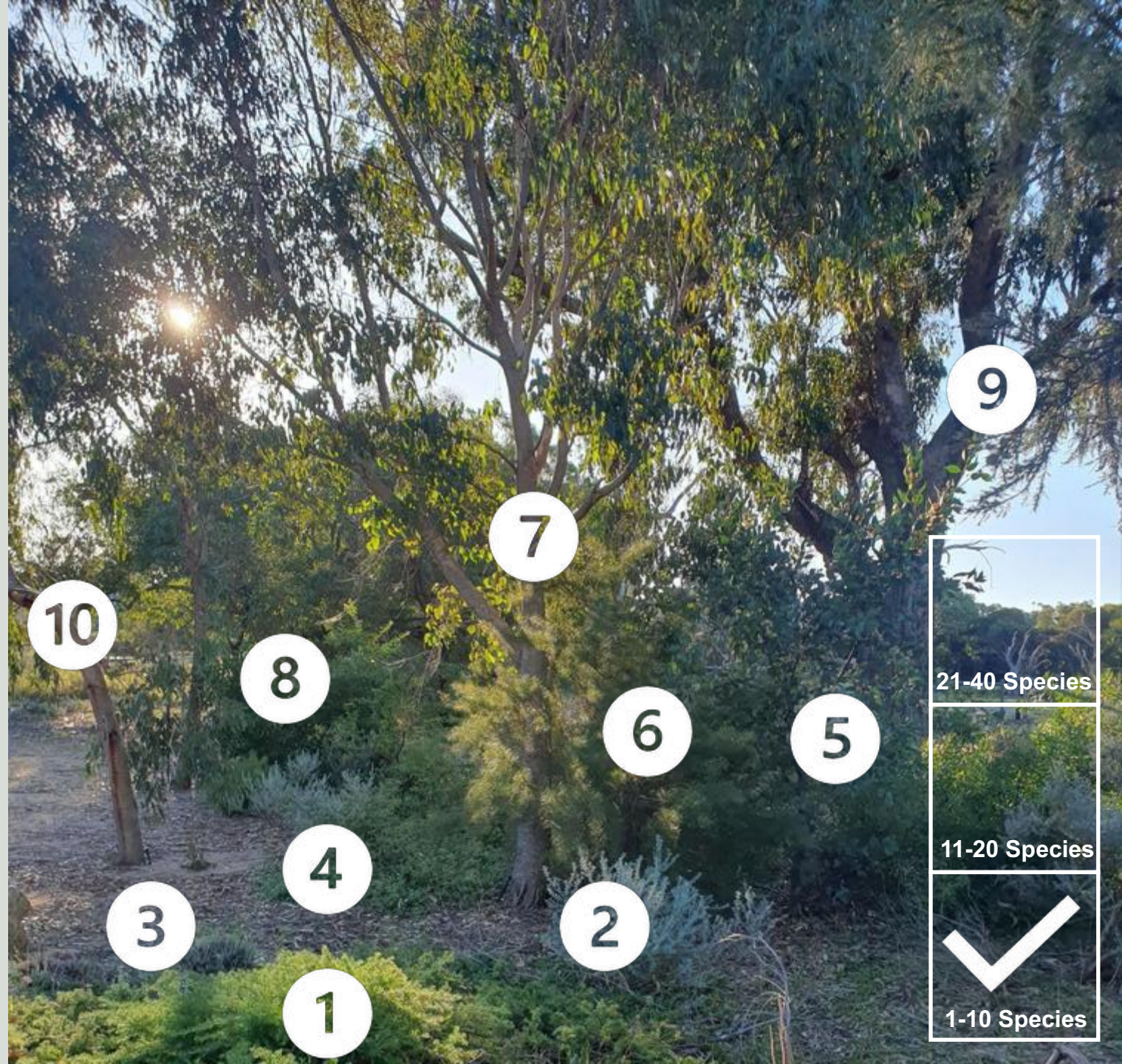
- Increases **resilience** to pests and disease.
- Improves **soil health**.
- Improves **nutrient cycling**.
- Attracts more **pollinators**.
- Increases **habitat availability**.
- Extends **flowering periods**.
- Reduces **weeds**.

Resources

[Biodiversity, why it is important.](#)

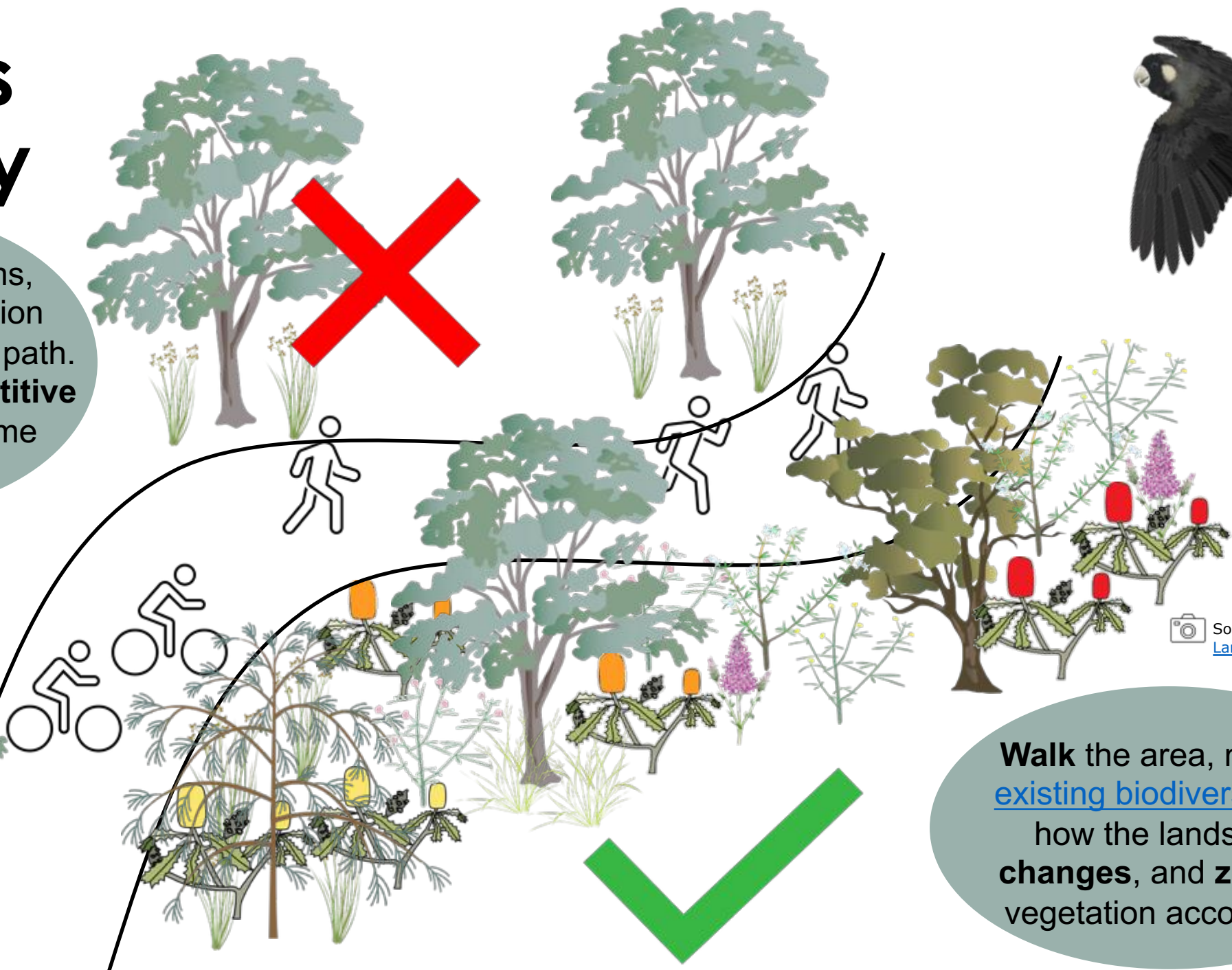
[Native gardens and their value](#)

[Return](#)



Species diversity

In natural systems, species composition **changes** along the path. There is **not** a repetitive pattern of the same plants.



Source: [Nesp Resilient Landscapes Hub](#)

Walk the area, note the [existing biodiversity](#), see how the landscape **changes**, and **zone** the vegetation accordingly.

Source: [Ian Image Library](#)

Percentage of Local Species

Using **local** plant species in an area's design further **improves** the **biodiversity** of an area.

Local species are **adapted** to local **conditions** and, therefore, will:

- Have a **high survival** rate
- **Establish** quickly.
- Require **minimal** maintenance.
- Help to retain the **character** of the area.
- Help to **suppress** weeds.
- Provide **habitat** for native wildlife.

Aim to include a **high percentage** of local species in an area's design!

90-100%
Local
Species

70-90%
Local
Species

50-70%
Local
Species

WEST COASTAL SOILS SPECIES LIST					
Start of flowering time: Spring Summer Autumn Winter All Year					
Common Name	Botanical Name	Height (m)	Flower Colour	Flower Time	
TREES (Up to 15m)					
Peppermint	*Agonis flexuosa	12-15	white	Aug-Dec	1
Fraser's Sheoak	Allocasuarina fraseriana	15	brown	May-Oct	1
Candle Banksia	Banksia attenuata	5-8	yellow	Sep-Oct	1
Bull Banksia	Banksia grandis	10	yellow	Sep-Dec	1
Firewood Banksia	*Banksia menziesii	10	pink & red	Feb-Aug	1
Saw-tooth Banksia	Banksia prionotes	10	cream & orange	Feb-Aug	1
Rottnest Island Pine	Callitris preissii	4-6	brown	Jan-Dec	1
Silver Princess	*Eucalyptus caesia	12	pink, red	May-Sep	1
Byarrie	Eucalyptus erythrocorys	7	yellow	Feb-Apr	1
Coastal Blackbutt	Eucalyptus tottblana	9-16	creamy white	Feb	1
Rottnest Tea-tree	Mealeucya lanceolata	5	white	Oct-Mar	1
Albizia	Paraserianthes lophantha	10	greenish yellow	Aug-Sep	1
Sandplain Woody Pear	Xylomelum angustifolium	7	creamy white	Dec-Feb	1

KEY

- * Comes in different forms (ie a shrub might have a groundcover form or different flower colours)
- ★ - Star Performer (hardy or long flowering)
- ✈ - Butterfly attracting
- 🐦 - Bird attracting
- ⬜ - Limestone tolerant
- WA - Western Australian plant not a local plant

There are **many** resources to use to make including local species in an area's design **simple**.

1 – [SERCUL](#)

2 – [ReWild Perth](#)

3 – [Water Corporation](#)

rewild
PERTH

2

Find Resources

Select a suburb

Suburb

Keyword

Keyword or term

Topic

Select

Resource Type

Select

Plant

Select

Animal

Select

Habitat

Select

Other

Select

Search & Refine

Waterwise plants

3

Plants suited to our climate need less water, are low maintenance and will look great in your garden. Use our directory to find waterwise plants that will grow best where you live.

Search by suburb or plant name (common or genus)

Please enter your suburb or plant name (common or genus)

Optional filters

Availability

All

Origin

All

Garden type

All

Colour

All

Growth Habit

All

[Return](#)

Plant Architecture

Not all plants are created the same; they have different leaf and flower **structures** and **colours**, **flowering times**, **shapes** and **sizes**.

Aim to have a wide **variety** of **plant architecture** types to attract a variety of **wildlife**.

> 3 leaf
shapes &
colours

> 3 flower
shapes &
colours

Flowering
during the
six
seasons



Leaf shapes &
colours

Flower shapes
& colours

Flowering
during the six
seasons

Leaf shapes & colours

Aim to have more than **three** different leaf **shapes** and **colours**.



Toothed leaf



Serrated leaf



Silver needle leaf



Soft grey leaf

Sedges, grasses, prickly, broad, needle-like, serrated, oval in differing shades of green and grey.



Prickly leaf

The more **variety**, the more **resources** are offered.

[Return](#)

Flower shapes & colours

Aim to have more than **three** different flower **shapes** and **colours**.



Purple, pink, orange, red, yellow, tubular, cone-shaped, inflorescences, flower spikes and heads.



The more **variety**, the more **resources** are offered.

[Return](#)

Flowering during the six Noongar seasons

Plumed Feather flower
Verticordia plumosa
Noongar name: Unknown
Flowering: Djilba-Birak
(Sep-Dec)




 Source: [Georgie Elliott](#)

Pincushion hakea
Hakea laurina
Noongar name: Kodjet
Flowering: Birak- Djeran
(Dec-Apr)



Cockies tounge
Templetonia retusa
Noongar name: Yackal Djarr
Flowering: Djeran – Djilba
(Apr-Sep)



 Source: [Loxley Fedec](#)


Resources

[Rewild Perth](#)

[Water Corp – Water-wise Plants](#)


[SERCUL – Plant Guides](#)



 Source: [BGPA](#)

Native Wisteria
Hardenbergia comptoniana
Noongar name: Koorla
Flowering: Makuru – Djilba (Jun-Sep)



 Source: [Bryony Fremlin](#)

[Return](#)



Habitat Values

[Return](#)

A habitat has **everything** an organism needs to **survive**.

Different animals have different requirements, and by providing a **range** of habitat types, an area can attract a wider **variety** of animals.

Options to increase the habitat value of an area include:

- **Food & nesting resources**
- **Artificial habitat**
- **Dense vegetation**

Resources

[Assessing Wildlife Habitat](#)

[Food & Nesting Resources](#)

[Artificial Habitat](#)

[Dense Vegetation](#)

Food & Nesting Resources

Offer a range of food and nesting **resources** to support a **variety** of native wildlife. The following are just some examples of potential inclusions.

Large old trees provide:

- Hollows
- Nectar and fruit.
- Leaf litter and twigs.
- Bark.
- Nesting and perching areas

Dead trees provide:

- Hollows
- Nesting and perching areas

Vine species provide:

- Nesting
- Food

Resources

[Assessing Wildlife Habitat](#)



Artificial Habitat

[Return](#)

Biodiversity can be further **increased** by including **additional** habitat elements in the path design.

1 - Nesting Boxes can be added to younger trees.

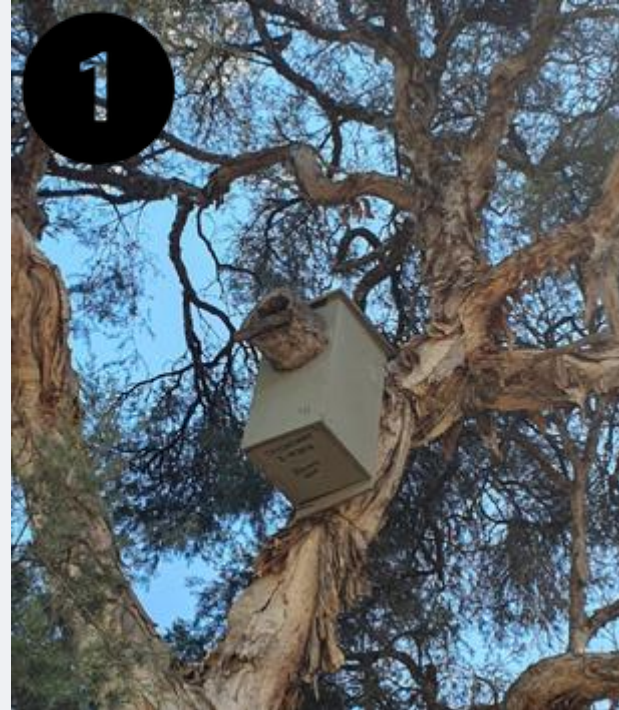
2 - Bat Boxes should be placed without surrounding obstructions.

3 - Rocks are used for basking, shelter and feeding for reptiles, birds, invertebrates and frogs.

4 - Logs are used for foraging, resting, perching and basking for mammals, reptiles, birds and invertebrates.

Resources

[Assessing Wildlife Habitat](#)
[Bat Boxes](#) [Nesting Boxes](#)



Dense Vegetation

Dense vegetation is particularly **important** in urban areas as it offers **protection** to wildlife from **predators such as foxes, dogs, cats, ravens and other carnivorous birds**.

Additionally, it offers:

- Nesting
- Perching
- Food resource
- Shelter

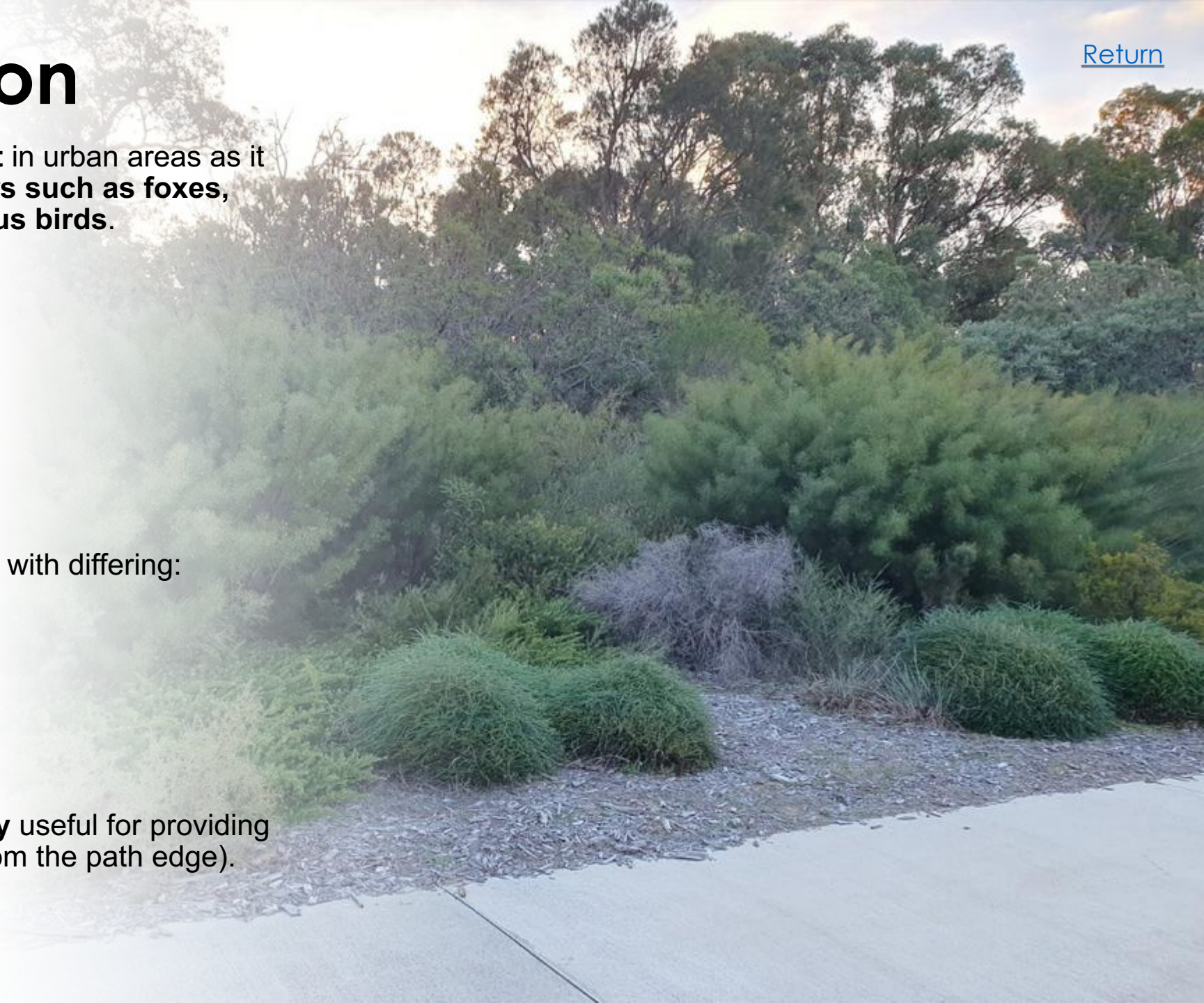
Aim to have a **variety** of dense vegetation with differing:

- Heights
- Densities
- Leaf shapes
- Flowers types

Prickly types of vegetation are **especially** useful for providing wildlife **refuge** (but plant them away from the path edge).

Resources


[Assessing Wildlife Habitat](#)



Area covered

This category rates how **much** area along the pathway is covered.

- Is the vegetation **continuous** along the pathway? Avoid **patches** of vegetation, the goal is to increase **connectivity**. Aim for vegetation to be **continuous** for at least **80%** of the pathway length.
- How **wide** is the area? Aim to have the vegetation width **greater** than the pathway's width.
- Is **biodiversity** added to **both** sides of the pathway? Biodiversity can be **maximised** by adding vegetation to **both** sides of the pathway.



Continuous vegetation for 80% of the path
> Path width
✓
Both sides



Biodiversity rating system example



Vegetation Layer Structure

Species diversity

Percentage of local species

Plant Architecture

Habitat values

Area covered

3 layers

21-40
Species

90-100%
Local
Species

> 3 leaf
shapes &
colours

Food &
nesting
resources

Continuous
vegetation
for 80% of
the path

2 layers

11-20
Species

70-90%
Local
Species

> 3 flower
shapes &
colours

Artificial
Habitat

> Path
width

1 layer

1-10
Species

50-70%
Local
Species

Flowering
year round

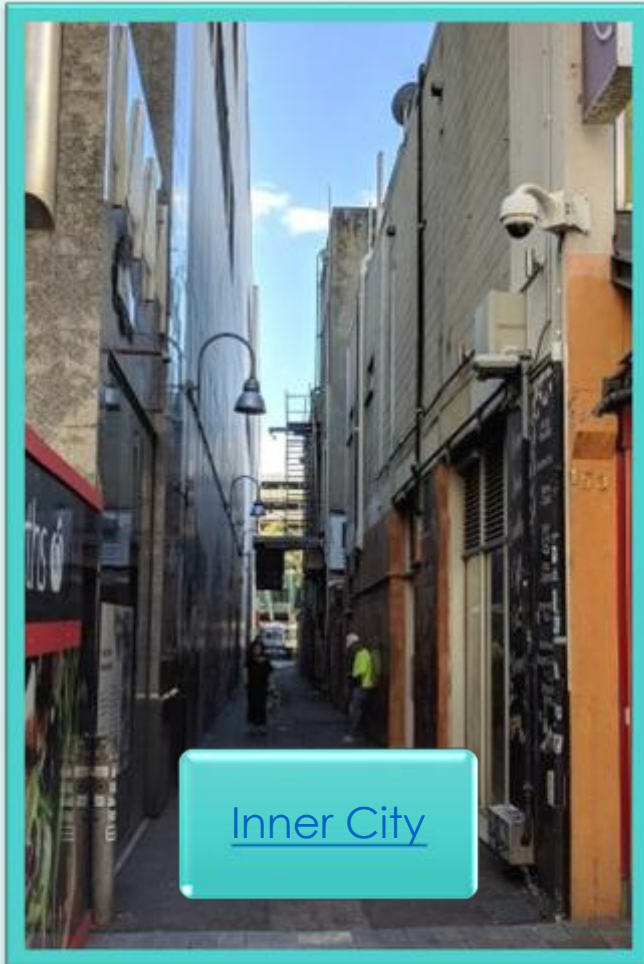
Dense
Vegetation

Both sides

Areas to
Green

Return

Tailor greening to inner city, suburbs and parks.



 Source: [Andrew Caneppele](#)

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Inner City

Inner City



Inner city areas are **highly** urbanised.

They typically have:

- **Low** quantity soil.
- **Low quality** soil.
- **Large** amounts of hardstand.
- **Limited** space.

Though these areas have **many** restrictions, **biodiversity** can still be increased in inner city areas.

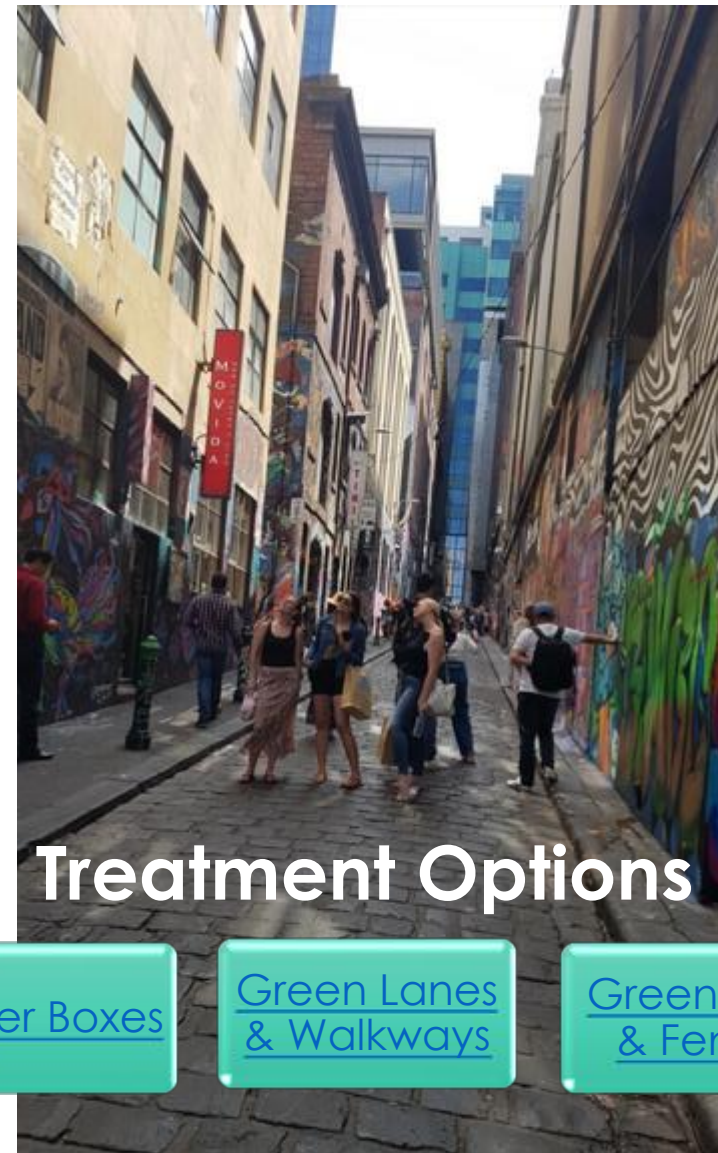
Focus on the **achievable** elements of the **biodiversity rating system**.

Species diversity and Percentage of local species.

A variety of different species can be added to walls, tunnels or planter boxes. Use locally native species where possible to bring nature alive in the city.

Plant architecture

Capture Noongar seasons with different flowering times, leaf and flower shape, and colour.



Treatment Options

[Planter Boxes](#)

[Green Lanes
& Walkways](#)

[Green Walls
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[Path
Guidelines](#)

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Residential Areas

Residential Areas



These areas may be space restricted but have many opportunities to increase **biodiversity**. Potentially all **six** measures could be achieved in these areas.

- **Vegetation Layer Structure**
- **Species Diversity**
- **Percentage of local species**
- **Plant Architecture**
- **Habitat Values**
- **Area Covered**

Residential areas are spaces in suburbs that are not parks. Areas such as **laneways** between houses, council-maintained **verges**, or small **stormwater** runoff points. These areas tend to be space **limited** and, depending on the area's age, may have **construction impacts** that require mitigation.



Treatment Options

[Planter Boxes](#)

[Green Lanes
& Walkways](#)

[Green Walls
& Fences](#)

[Woody
Meadows](#)

[Path
Guidelines](#)

[Biodiversity
rating system](#)

[Considerations](#)

Parks & Public Open Spaces





Parks & Public Open Spaces

These areas have low restrictions with many opportunities to increase **biodiversity**.

Potentially all **six** measures could be achieved in these areas.

- **Vegetation Layer Structure**
- **Species Diversity**
- **Percentage of local species**
- **Plant Architecture**
- **Habitat Values**
- **Area Covered**

Parklands and open public spaces are defined as any **large** open space in urban areas. Parklands usually **do not** have space **limitations** and contain a variety of path types. Parklands are places of **recreation**, have high visitation and provide a great opportunity to increase **biodiversity** along paths.



[Planter Boxes](#)

[Green Lanes & Walkways](#)

[Return](#)

[Green Walls & Fences](#)

[Woody Meadows](#)

[Pocket or Tiny Forests](#)

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[Biodiversity rating system](#)

[Considerations](#)

Treatments to Increase Biodiversity



[Planter Boxes](#)



[Green Lanes
& Walkways](#)



[Green Walls
& Fences](#)



Source: Ali Babington

[Woody
Meadows](#)



Source: [Ferns and Feathers](#)

[Pocket or
Tiny Forests](#)

We provide **five** treatments that can be used in **urban areas** to increase biodiversity along cycleways and walk trails.

These treatments aim to **inspire action** but are not the only options out there!

These treatments could also be used to increase biodiversity on **verges**. For more information of verge improvement – link Kayla's

Planter Boxes

What are they?

Permanent or removable planter boxes placed along pathways to increase **biodiversity** in areas where soil is **scarce**.



Planter Boxes

Why?

Planter boxes are available in a variety of designs and are a great way to add biodiversity in areas with high amounts of hardstand.

What are the issues and requirements?

Plant selection must consider its tolerance for pots and maximum growth size. [Irrigation](#) or regular watering and nutrient inputs will be required. Regular vegetation maintenance is required to ensure no encroachment.

Where could it be used?

This treatment could be used anywhere.

Resources

[Natives suitable for pots guide.](#)

How to plant natives in pots

[ReWild Perth Zanthorrea Nursery](#)

[Planter Box Guidelines](#) – City of Bayswater

[Urban Greening Guidelines](#) – City of Yarra



Source: [City of Yarra](#)

Planter box guidelines. Placed at least 1m away from other street furniture and away from corners to avoid hazards and ensure sightlines. Adapted from [City of Bayswater guidelines.](#)



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[How they rate](#)

[Biodiversity rating system](#)

How Planter Boxes rate on the Biodiversity Rating System



<u>Vegetation Layer Structure</u>	<u>Species diversity</u>	<u>Percentage of local species</u>	<u>Plant Architecture</u>	<u>Habitat values</u>	<u>Area covered</u>
3 layers	21-40 Species	90-100% Local Species	> 3 leaf shapes and colours ✓	Food and nesting resources ✓	Continuous vegetation for 80% of path ✓
2 layers ✓	11-20 Species ✓	70-90% Local Species	> 3 flower shapes and colours	Artificial habitat	> Path width
1 layer	1-10 Species	50-70% Local Species	Flowering during the six seasons	Dense Vegetation	Vegetation on both sides ✓



Planter Box Inspiration

Green Lanes & Walkways

What are they?

The creation of green tunnels over pathways using **climbing** species and wire or created infrastructure.

[Return](#)

[How to?](#)

Green Lanes and Walkways

Why?

This method can use either planter boxes or shallow soil to grow climbing plant species to create green tunnels. It creates a great focal point in urban areas.

What are the issues and requirements?

Plants must be a hardy climbing or creeper species such as *Hardenbergia comptoniana*. Ongoing monitoring and maintenance is required to ensure tidy even cover and plant survival. Create new or adapt existing infrastructure.

Where could it be used?

This treatment could be used anywhere.

Resources

[Climbing natives](#) [Melbourne Green laneway](#)

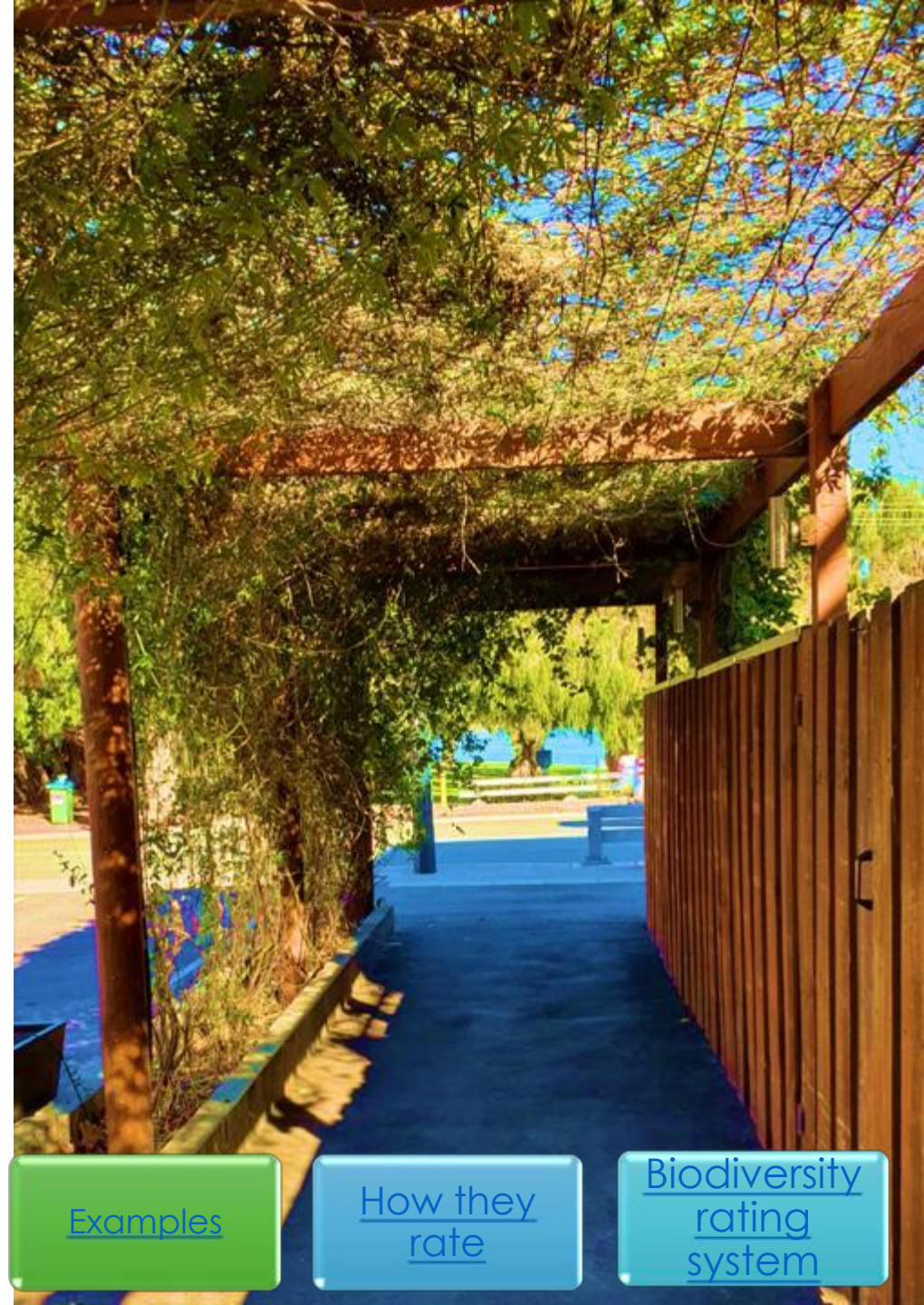
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[Biodiversity
rating
system](#)



How Green Lanes & Walkways rate on the Biodiversity Rating System



<u>Vegetation Layer Structure</u>	<u>Species diversity</u>	<u>Percentage of local species</u>	<u>Plant Architecture</u>	<u>Habitat values</u>	<u>Area covered</u>
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Green Lanes and Walkways Inspiration

Green Walls & Fences

What are they?

Growing **plants** up or on fences or walls to increase **biodiversity** in space restricted areas.

[Return](#)



[How to?](#)

Green Walls and Fences

Why?

This method can use planter boxes or small amounts of soil with climbing and creeping species to green walls and cool urban areas.

What are the issues and requirements?

Regular pruning is required to ensure vegetation does not become hazardous. If planter boxes are used, continuous irrigation and nutrient inputs will be required.

Green walls require special media, mulch, water and nutrient inputs.

This method may be used in areas with low sunlight and space availability; plant selection should reflect this.

Where could it be used?

This flexible treatment method could be used anywhere. Particularly in areas unsuitable for trees due to overhead or underground infrastructure.

Resources

[Junglefy](#) – Breathing and Green Walls
[Living Infrastructure](#) [Climbing natives](#)

[Considerations](#)

[Examples](#)

[How they
rate](#)

[Biodiversity
rating
system](#)



How Green Walls & Fences rate on the Biodiversity Rating System



<u>Vegetation Layer Structure</u>	<u>Species diversity</u>	<u>Percentage of local species</u>	<u>Plant Architecture</u>	<u>Habitat values</u>	<u>Area covered</u>
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1 layer ✓	1-10 Species ✓	50-70% Local Species	Flowering during the six seasons	Dense Vegetation ✓	Vegetation on both sides



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Green Walls and Fences Inspiration

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Woody Meadows

What are they?

The creation of a **dense** area of **vegetation** using a variety of **native species** maintained by **hard pruning**. Woody meadows have low space requirements and create dense canopies full of **flowers**.

[How to?](#)

Woody Meadows

Why?

This method creates a highly diverse area supporting lots of wildlife. Additionally, the design excludes weeds, encourages flower growth and is low maintenance.

What are the issues and requirements?

The minimum space requirement is 9m² in a 3x3m plot. Site preparation to remove weeds and remediate compaction of the soil is necessary. Maintenance involves coppicing (pruning plants to 10-20cm high) every 2 – 4 years. Once established plants do not require irrigation. Plants selected must be able to reshoot and be drought tolerant.

Where could it be used?

This treatment method could be used anywhere.

[Return](#)

Resources

[Woody Meadows guidelines](#) [Woody Meadows Website](#)



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How Woody Meadows rate on the Biodiversity Rating System



<u>Vegetation Layer Structure</u>	<u>Species diversity</u>	<u>Percentage of local species</u>	<u>Plant Architecture</u>	<u>Habitat values</u>	<u>Area covered</u>
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Woody Meadow in Birrarung Marr, VIC
Planted 2016



Woody Meadow in Hassett Park ACT
Planted 2020

[Return](#)

Examples of Woody Meadows

The Woody Meadows method is relatively young. Development of the method commenced in 2015, so many of these examples show early growth.

[WA Example](#)



Source: [Uni of Melbourne](#)



Woody Meadow in City of Port Philip, VIC
Planted 2021



Woody Meadow Bell-Moreland, VIC



1



2




3



[Return](#)

Woody Meadow in Burge Way, East Cannington WA Planted 2021

- 1 - Original area.
- 2 - Scalping.
- 3 - Planting
- 4 - Prior to coppice.
- 5 - Post-summer.
- 6 & 7 - Currently.

 Source: Ali Babington



4



5



6



7

[Return](#)

Pocket or Tiny Forests

What are they?

Developed by Japanese botanist Akira Miyawaki this method involves **dense** planting of species **native** to the area. It creates a diverse fast growing mini forest in urban areas with **low maintenance** requirements.



[How to?](#)

Pocket or Tiny Forests

Why?

This method produces native forests which grow faster, denser and with more biodiversity than regular methods. They have low space and maintenance requirements and high plant survival rate.

What are the issues and requirements?

The minimum space requirement is 3 sqm. Plant selection (up to 40 species) is based on studies on nearby remnant bushland, ensuring species are endemic (local) to the area.

Soil remediation is needed to reverse impacts from human activities. This involves loosening soil and adding nutrients to a depth of 1 meter.

Vegetation is planted densely, 3-5 plants per sqm. Mulch is added to retain moisture and to help establish insect species.

Maintenance is only required to establish the forests for the first 2 or 3 years.

Where could it be used?

This treatment method could be used in areas with at least 3 sqm of space, residential areas or parklands.

Resources

[How to guide – Miyawaki Forest](#) [Pocket Forests WA](#) [WA example – South Padbury School](#)

[Considerations](#)

[Examples](#)

[How they rate](#)

[Biodiversity rating system](#)




Site prep,
planting and
one year of growth
at South Padbury
School.

Source: [Sugi Project](#)

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How Pocket Forests rate on the Biodiversity Rating System



<u>Vegetation Layer Structure</u>	<u>Species diversity</u>	<u>Percentage of local species</u>	<u>Plant Architecture</u>	<u>Habitat values</u>	<u>Area covered</u>
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Pocket or Tiny Forests

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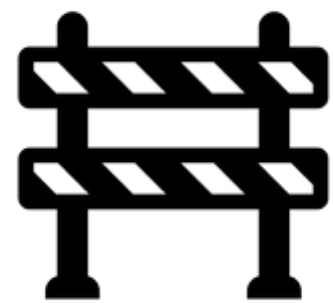


The development of the method started in the 1970s in Asia. The method's use on other continents is more recent, and many Tiny Forest examples show early growth.



Source: [Sugi Project](#)

Considerations



[Construction](#)



[Maintenance](#)



[Risks & Hazards](#)



[Other Elements](#)

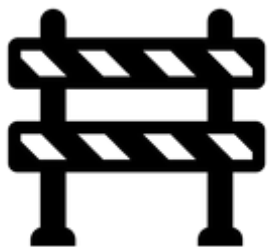


[Flora](#)



[Community Engagement](#)

Construction



[Path
Construction](#)



[Compaction](#)



[Root Zones](#)



[Weeds](#)



[Path
Guidelines](#)

Compaction

Construction in urban areas results in **soil compaction**. Compaction reduces soil **permeability** to water, air, and roots which **negatively** affects plant growth. Compaction increases **runoff** and **erosion** which is particularly relevant to unpaved pathways.

Soil compaction can be **mitigated** by:

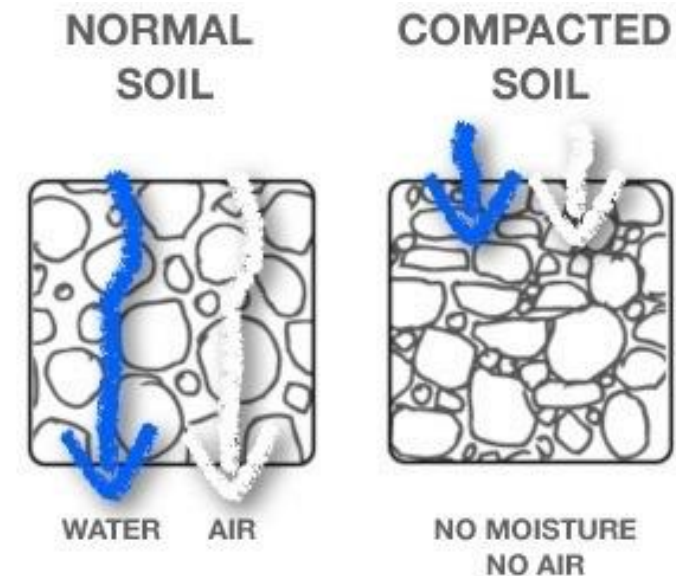
- **Aeration**
- **Tillage/Ripping**
- **Scoop** and dump technique
- Hand **digging**
- Adding **gypsum**, if the soil is clay.
- Adding an **organic matter** top layer.
- Use of **structural Soil**.

Resources

[ABC Compacted soil solutions](#)

[Urban Green Cover Structural soil](#)
pg. 39

[Ripping for Soil Compaction](#)
[Scoop and dump technique](#)

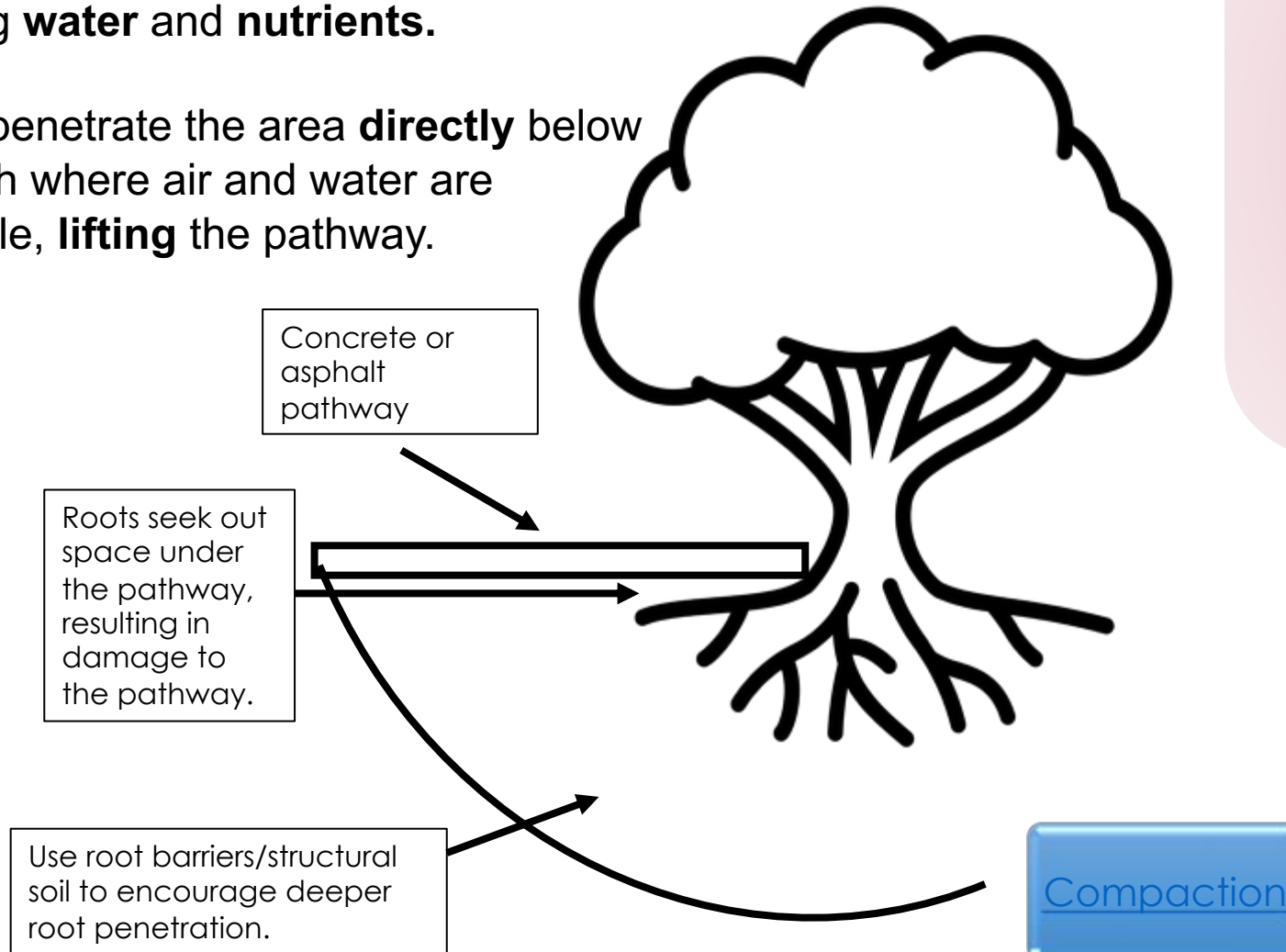


Source: [The Real Dirt Blog](#)

Root Zones

Roots cause damage to pathways when seeking **water** and **nutrients**.

Roots penetrate the area **directly** below the path where air and water are available, **lifting** the pathway.



Mitigate by:

- Ensure **adequate** soil volumes and depths.
- **Remediate** soil compaction prior to planting.
- Use root barriers to **prevent** root encroachment.
- Ensure no underground services are within the soil zone to avoid **damage**
- Consider **structural soil**

Resources

[Urban Green Cover NSW](#) pg. 39-41

[Root Barriers](#)

[Soil volumes](#) and [Soil for trees](#)

[Structural soil](#)

[Underground services](#) - DBYD

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Weeds have **detrimental** impacts on native vegetation and natural areas. They thrive in **disturbed** areas and create **competition** for native plants. They also increase **fire** risk by increasing the fuel load in an area.

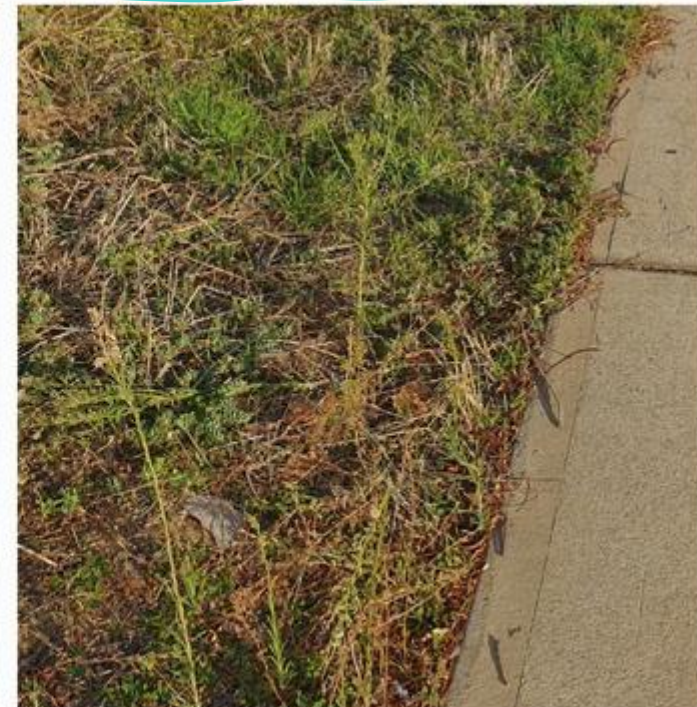
Weed **control** requires **long-term** integrated management combining **biological**, **physical**, and **chemical** methods.

Additionally, weeds can be managed by:

- Good **hygiene protocols**
- Regular **monitoring**
- **Maintenance**
- **Native flora** can **suppress** weed growth and establishment.
- **Mulch** can suppress weed growth.
- Use of educational **signage** to help reduce the spread of weeds or other pathogens such as dieback.
- **Scalping** prior to planting can also help to remove any weed seed bank.

Resources

[Weeds Australia](#)
[DBCA Weeds](#)



Maintenance



[Vegetation
Maintenance](#)



[Path
Maintenance](#)



[Weeds](#)



[Irrigation &
Water](#)

Vegetation Maintenance

[Return](#)



What is needed?

Maintenance regimes should include **watering, pruning, weeding** and **inspection** for disease or pests.

How often?

The first **two** growing seasons are critical for plant establishment.

After establishment, maintenance needs reduce, and regimes will include pruning for **encroachment** and watering during particularly **dry periods**.

Careful plant selection and placement and correct path construction should **minimise** maintenance.



Resources

[Urban greening guide, pg. 48](#)
[How to - Native gardens](#)

Path Maintenance

[Return](#)



What is needed?

Paths require **regular** maintenance to **reduce risks**.
Maintenance regimes should include the following.

- **Repair** of surface damage.
- Regular **removal** of debris and vegetation pruning to stop encroachment.
- **Cleaning** of drainage areas
- **Weeding**
- Repair and **replacement** of markings and signage

Crushed limestone and bare earth paths are at a higher risk of **erosion** due to construction.



Resources

[Pathway guidelines](#)

Irrigation and water



What irrigation is needed?

Native Australian plants have **low** water requirements. Watering for the first **two growing seasons** is commonplace using temporary irrigation or hand watering. Watering then is only required during **extended hot periods**.

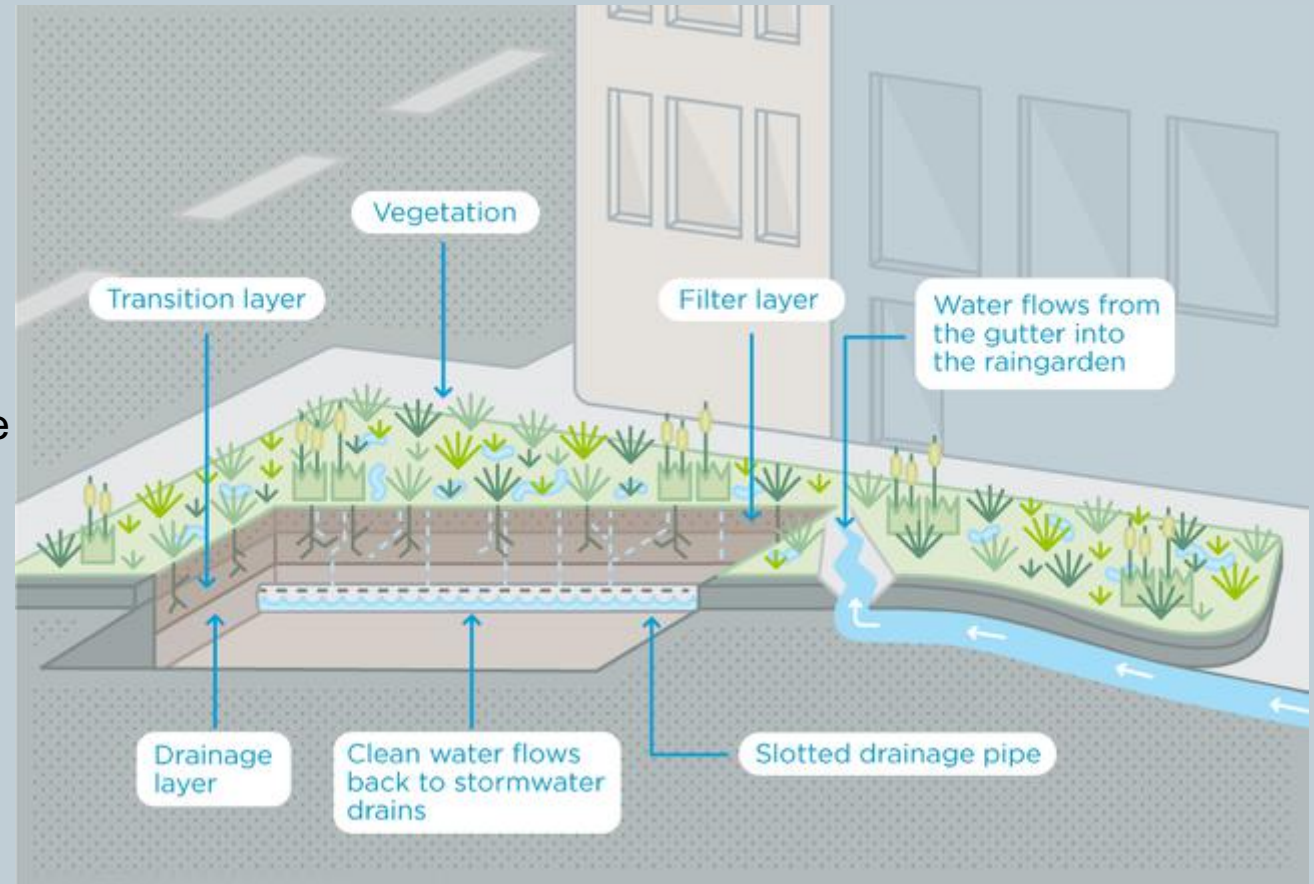
If permanent irrigation is required, **drip irrigation** is the most **water-efficient** option.

Are there other options?

The path design could incorporate **raingardens** or **bioswales**. They collect, filter and clean **stormwater runoff**, reducing the need for **irrigation**.

They can be **constructed** as shallow depressions or sunken below adjacent path.

Plant species should be selected to **tolerate** dry and short wet periods. They will require regular **rubbish removal** and **cleaning** of overflow pits.



Raingarden components.  Source: [City of Melbourne](https://www.cityofmelbourne.vic.gov.au/urban-landscape/raingardens)

Resources

[Irrigation and water efficiency guide](#)
[Rain gardens and bioswales – NSW Urban Green Cover](#)
[Rain gardens](#) – City of Melbourne

Risks and Hazards



[Fire risk](#)



[Wildlife
Interactions](#)



[Slips, Trips &
Falls](#)



[Reduced
Visibility](#)



[Weeds](#)



[Path &
Vegetation
Issues](#)

Fire Risk

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In Southern WA, bushfire season is between October to April. **Fire management** planning is vital to **minimise risk**.

Some fire management strategies may include.

- **Weed control** to reduce fuel load.
- Thinning of understory as required to **minimise fuel load**.
- **Public education** and engagement to help reduce arson risk, increase prompt reporting of issues and increase knowledge of fire impacts.
- Ensure access for **emergency response**.
- Careful planning of plant placement to contain fires, a **fire-safe landscape design**.
- Consider **water** in design to mitigate risk.

Resources

[DFES](#) [WALGA – Fire Management](#)



Wildlife Interactions

[Return](#)

Increasing vegetation along pathways, providing habitat for **wildlife**, will increase the likelihood of **interactions** between humans and animals.

To **reduce** risk to both humans and wildlife, include **educational [signage](#)** in the pathway design. The signage can be **multipurpose**.

- **Warn** path users of what wildlife they may encounter.
- **Educate** users on what to do if they encounter wildlife.
- Educate users about wildlife, and use facts to **engage** users.



Use **[Community engagement](#)** to educate users about what to do when encountering wildlife and to increase **knowledge** of their local **fauna**.



Slips, Trips, Falls and Reduced Visibility

Poor path planning, vegetation **encroachment**, overhanging **branches** and dropping of **debris** increase the **risk** of slips, trips, falls and reduced visibility.

Mitigate by:

- **Regular maintenance**, removing and pruning vegetation and debris.
- Careful **plant selection** and **placement**, ensuring large growing or dense species are placed adequate distances from pathways.
- **Sight distances** should be maintained to reduce poor visibility risk; double a bicycle rider stopping distance with path curve radii greater than **10m**.
- Use warning **signs** for unavoidable risks.

Resources

[Shared and separated pathway guidelines.](#)

1 – **Visibility** is maintained on the curved path.

2 – **Sharp** corners reduce visibility, increasing collision risk.



 Source: [Transport WA](#)

All about Plants!



[Planting](#)



[Placement](#)



[Selection](#)

Considerations for planting

Planting

Plant during **autumn** to take advantage of the **winter rain** to help **establish** the vegetation.

Planting during **summer months** will require a minimum of **daily** watering to ensure plant establishment.

Mulch

Mulch helps **retain** soil moisture levels, reduces soil temperatures, and **suppresses** weed growth.

Choose mulch **free** of soil, weeds, seeds and inorganics such as plastics with variable particle sizes.

Resources

[SERCUL](#) – Plant guides
[How to mulch natives](#)

[Return](#)



Considerations for Placement

Consider if vegetation will:

- 1 - Be a **visibility issue**; large dense shrubs should be placed away from **curves** in the path to maintain **sightlines**.
- 2 - Drop **large fruits**; they can become **slip-and-trip** hazards.
- 3 - Have **spikes, thorns** or are **prickly** and could harm users. However, use of these plants can **deter trampling**.
- 4 - Pose an **allergy risk**, some **grevillea** species cause skin irritations.
- 5 - Have **large root** systems, they can become a trip risk.

These species should be included along pathways. Placing them back from the path will reduce risk to users.



[Return](#)



Resources

[SERCUL ReWild Perth](#)
[Water Corporation](#)

Plant Selection

[Return](#)

Selecting plants [native](#) to the area increases their use as a **resource** to native wildlife.

Try to **maximise** the [biodiversity](#) of an area when selecting plants.

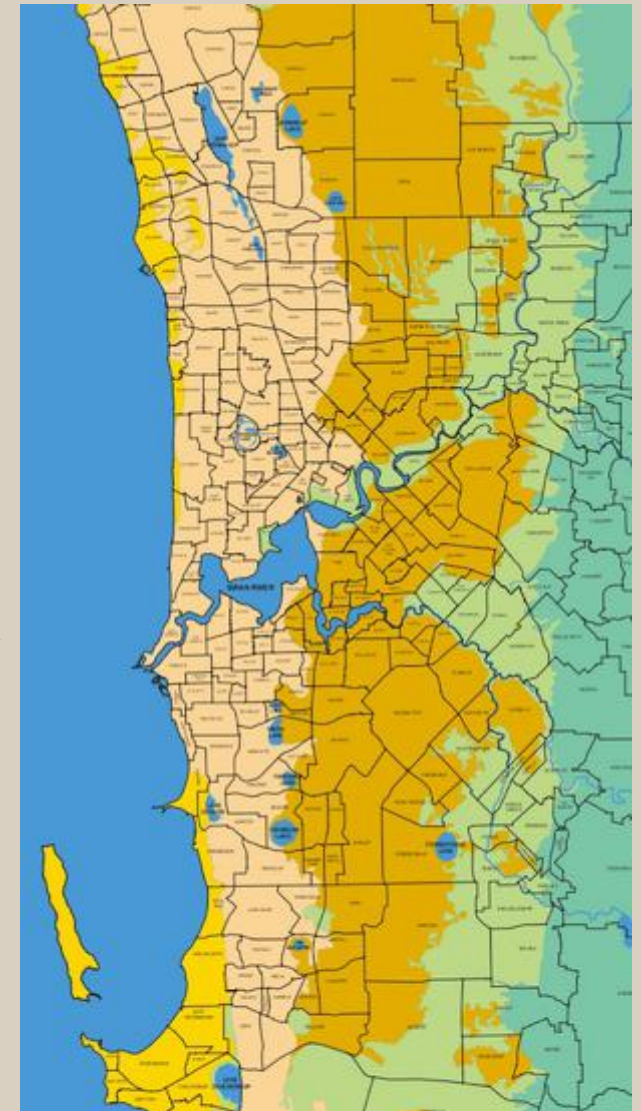
Plants can be selected to suit:

- **Soil Type**, this increases the plant's survivability.
- **Traits and attributes**, such as height, flowering time and root systems.
- **Water needs**, drought-resistant plants will better suit low irrigation.
- **Locality**, species local will be more suited to the conditions of an area.

There are a variety of **resources** available to help **simplify** selections.



Examples of
the soil &
plant guides
available
from SERCUL.



Resources

[SERCUL](#) – Soil types & plant guides.

[ReWild Perth](#) – Growth habits & flowering information.

[Water Corporation](#) – Waterwise gardens.

[NatureLinks](#) – Native plant attributes & traits.

COASTAL SOILS SPECIES LIST					
Start of flowering time: Spring Summer Autumn Winter All Year					
Common Name	Botanical Name	Height (m)	Flower Colour	Flower Time	Other Info
TREES (Up to 15m)					
Peppermint	<i>Agonis flexuosa</i>	12-15	white	Aug-Dec	1
Fraser's Sheoak	<i>Alecassurina fraseriana</i>	15	brown	May-Oct	1
Ashby's Banksia	<i>Banksia ashbyi</i>	1-8	orange	Dec-Feb	5
Candle Banksia	<i>Banksia attenuata</i>	5-8	yellow	Sep-Oct	1
Cut-leaf Banksia	<i>Banksia praemorsa</i>	4	gold	Jul-Oct	5
Rottnest Island Pine	<i>Callitris preissii</i>	4-6	brown	Jan-Dec	1



Other Elements



[Habitat
Elements](#)



[Existing
Biodiversity](#)



[Signage](#)



[Outdoor
Furniture](#)

Existing Biodiversity Elements

Some urban areas may already have **biodiversity**, which should be **preserved** wherever possible.

Elements such as **significant trees**, tree **hollows** or known **nesting** sites.

Walk through the area, see what already **exists** and how it could be **incorporated** into the design.



Source: [Transport WA](#)

- 1 - **Split** paths around existing trees.
- 2 - **Curve** or **design** paths around trees
- 3 - **Retain** existing hollows or known nesting areas



[Return](#)

Resources
[Rewild Perth](#)
[Shared and Separated Path guidelines](#)
[Protecting and recreating habitat for urban wildlife](#)



Source: [Keith Lightbody](#)



Signage

Why include signs?

Signage can be used to **warn**, **educate** and be **interpretive**, providing a better experience for users to enjoy the path safely.

[Return](#)



Outdoor Furniture

Why include it?

[Return](#)

Offering elements such as seating, bins or water fountains can encourage use of the area.



Community engagement

Engaging community members is vital to a project's **success** and produces many **benefits**.

- Community **involvement** and **volunteering**.
- **Improved** social outcomes.
- Opportunity to **educate** locals.
- **Collaboration** and project support.
- Improved awareness of the project and its **goals**.


How?

- Community **planting** days.
- **Surveys** for design and flora preferences.
- Involve the community in **naming** the pathway or area.

Resources

[Social Aspects and project success](#)

[Return](#)

 Source: [Sugi Project](#)

Community members planting Miyawaki forest in Cambridge, MA, USA.

