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Better Best Practice Note
Biodiversity Sensitive Urban Design

There are some critical urban design landscape elements that will support plants, animals and other species in an urban landscape.

Step 1. Provide spaces for biodiversity to live and move

Allocating open space in built up urban areas is critical to providing opportunities for vegetation to be planted, and for canopies to grow well.

Protect existing trees and habitat wherever possible, by adjusting landscape designs to minimise the loss of existing vegetation and avoid the loss of native vegetation. New habitat, connections created at the ground and tree canopy levels between open spaces will provide additional habitat and better allow biodiverse species to move through the landscapes.

Action: Review designs to minimise loss of vegetation

The next two elements determine which plant and animal species can live in these newly created spaces.

Step 2. Soften the impact of urban environments

The urban heat island, altered water cycles, urban noises, artificial light at night and other human impacts can play a strong role in determining which plant and animal species are able to persist in an urban landscape.

By designing landscapes that reduce these harmful impacts, we are creating better environments for biodiversity, as well as creating more pleasant landscapes in which people can live, work and play.

Action: support healthy people and fauna by:

- *applying good hygiene practices for soil equipment to reduce the spread of pests and diseases*
- *increasing tree canopy to reduce urban heat impacts*
- *providing additional temporary vegetation during construction to help fauna deal with disruption*

Step 3. Provide food and shelter

The critical habitat elements for plants living in urbanareas include suitable soils, availability of water and sun, and good management to support their life cycle.

Plants may also rely on the presence of birds or insects for pollination or seed dispersal, earthworms and other invertebrates to return nutrients to the soil, and the presence of other species that help control their exposure to pests, pathogens and other forms of damage. For other groups of biodiversity, such as birds, insects, mammals,reptiles, frogs, fungi and fish, their presence in the landscape will be influenced by their ability to find suitable food, shelter and mates.

Elements of urban landscapes that are most important in supporting biodiversity, are habitat patch area, corridors and vegetation structure.[1]

Action: design for patch area, corridors and vertical vegetation structure

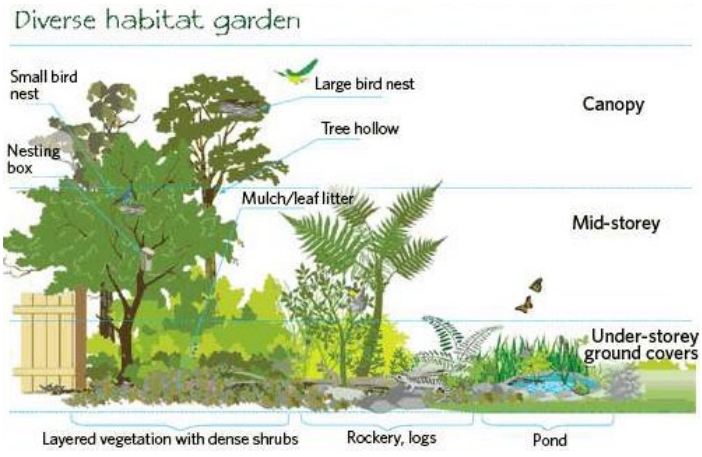

Image: Hunter's Hill Council, Wildlife Friendly Garden

[1] *Beninde J, Veith M & Hichkich A (2015) Biodiversity in cities needs space: a meta-anlaysis of factors determining intra-urban biodiversity variation. Ecology Letters 18 581-592*

Step 4. Create complex vegetation structure

Areas of multi-storey vegetation will support close to twice the diversity of birds and animal species compared to simple turf and tree cover. This is particularly so if the 30% vegetation volume threshold has been reached.[2]

Select plants to favour dense layers of vegetation in the area 10-50 cm above ground ("bump" layer), and the scattered use of plant species with a more open canopy architecture in the layer 50 cm – 150 cm above ground ("emergent" layer).

Design for small areas of exposed soil, or for the accumulation of natural leaf litter, as this will provide additional habitat for native bees, earthworms and other decomposers that help return the nutrients to the soil and reduce the reliance on artificial fertilizers.

A recent study has shown that the number of insect species present in mid-storey plantings is greater than trees, grasslands and lawn[3]. Using information like this can help inform planting design for biodiversity goals.

Placement of multi-storey vegetation can be achieved while still meeting the Crime Prevention through Environmental Design (CPTED) guidelines.[4]

Maintaining more complex vegetation structure plantings can have challenges, although these are likely to be reduced as multi-storey plantings become more frequently incorporated into urban areas.

To help maximise success, ensure the ultimate land manager of each site is consulted during the design phase to understand current and future maintenance challenges for the site. This knowledge will affect the final landscape designs and long-term operational maintenance plans.

Action: Support varying densities of vegetation in multiple smaller areas of multi-storey plantings

Action: plan for maintenance with the land manager

Source: Urban Ecology Park Scenario, Moonee Valley

[2] *Threlfall CG, Mata L, Mackie JA, Hahs AK, Stork NE, Williams NSW, Livesley SJ. (in press) Increasing biodiversity in urban green spaces through simple vegetation interventions. Journal of Applied Ecology*

[3] *Mata L et al. (2016) The Little Things that Run the City – Insect ecology, biodiversity and conservation in the City of Melbourne. Report prepared for the City of Melbourne.*

[4] *Fennelly L, Crowe T (2013) Crime Prevention Through Environmental Design. Butterworth-Heinemann. https://www.elsevier.com/books/crime-prevention-through-environmental-design/fennelly/978-0-12-411635-1*

Step 5. Select Plant Species

The choice of plants in a landscape needs to be informed by their suitability to current and future environmental conditions. Trees are very long-lived and we need to account for this.

The configuration of plants will determine the amount of sunlight they are likely to receive, as well as the amount of sunlight likely to reach the pedestrian zone. Plants that are performing well are less likely to attract negative comments from the public, and are also more likely to deliver their maximum ecosystem service potential within the expectations of a changing climate.

Plant selection contributes strongly to the character of the neighbourhood, both as the most obvious visual component of biodiversity, as well as influencing the birds and other animals that may be present.

Balancing the various considerations during plant selection can be difficult, but there are several resources available to assist with this process (see list on back page).

Heritage values play a key role in plant species selection in a small number of locations throughout the project. All areas to be planted within a heritage listed landscape must adhere to vegetation design guidelines, conservation management plans, and planning controls.

Native plants are an important part of the mix, and the inclusion of indigenous species is highly recommended,with an emphasis on avoiding an over-reliance on mass plantings of a small number of species. This is often an opportunity to integrate local small to medium enterprise outcomes in the sourcing of additional planting stock.

For best outcomes, tree supply must comply with Australian Standard AS2303: Tree Stock for Landscape Use.

Action: Maximise vegetation viability by:

- *purchasing plant stock from nurseries that provide supporting evidence that they use quality growing substrates and good hygiene practices (to reduce transfer of weeds and pests) to produce high quality planting stock.*
- *establishing all plants, including drought-tolerant species, require by applying supplementary water for at least two growing seasons.*
- *applying physical materials (e.g. mulch or other surface covers) to control weeds during plant establishment.*
- *providing long-term maintenance plans as part of the landscape handover process.*

Step 6. Incorporate Novel Habitats

Whilst remnant habitats are of the highest importance, newly created 'novel' habitats are a valuable in urban landscapes.

The addition of nest boxes that are designed to mimic hollows of different shapes and sizes can increase the diversity of hollow-nesting animal species in the landscape. These can even be created by repurposing timber from trees removed during associated or adjacent works.

Many new examples of novel habitat resources are being incorporated into cities around the world, including floating habitat islands, bee hotels for beneficial insects, and public art sculptures that are designed as bat roosts or honeybee hives.

Action: Include novel habitats that mimic the role of nature

Step 7. Minimise Artificial Light at Night

Upgrades to urban public lighting generally incorporate LED technology due to their lower greenhouse emissions and running costs. However, evidence is now emerging that bright white LED lights have adverse impacts on biodiversity (and on human sleep patterns).

Several principles have been identified to help minimise the impact of LED lights at night without compromising human safety or other obligations.

Action: Minimise fauna disruption by:

- *reducing the intensity of the lighting*
- *reducing the blue area of the spectra*
- *minimising glare and intrusion by using shields and other directional aids*
- *keep lights as close to the ground as possible*
- *minimise the number of lights and their hours of operation especially in natural areas*

Cross section with planted nature strip.

(Source: Urban Ecology Park Scenario, Moonee Valley City Council)

Pollinator Pathways

Pollinator pathways are designed to indirectly link habitat areas and are a novel variation on the habitat corridor concept.

In urban environments, land allocation in a continuous corridor is difficult to achieve unless there is a waterway corridor or an older railway track or easement that remains undeveloped.

A 'pollinator pathway' provides an urbanised variation to the habitat corridor by planting with design consideration to flying species that support pollination.[5]

Pollinator pathways can include low lying flowering plants as well as trees that provide sources of nectar which can support the movement of pollinators (bees, beetles, birds, small possums) across the landscape.

Bike paths can also provide an opportunity to deliver additional biodiversity gain. This could include a 'bike lane-led' pollinator pathway which captures an important opportunity for the community to benefit from the multimodal links connecting the people and biodiversity. For bike lane led pollinator pathways, bike lane design should incorporate habitat links however the layout must be best practice to ensure smooth and safe route for cyclists.

What's involved in a Pollinator Precinct Assessment?

A pollinator precinct assessment requires the mapping of key ecological features within proximity to the site.

The suggested scale is 400m radius around the site (or 200m radius for those sites with multiple pollinator options that are better shown in greater detail). The map is to show:

- Location, area & habitat quality of nearby open space
- Location and species of street trees
- Location & habitat quality of nearby green roofs & walls
- Location and habitat quality of any nearby waterbodies
- Future greening plans of local government
- Key pollinator species to support in inner Melbourne include: European honeybee, 13 native bees and many beetles, butterflies, moths, invertebrates[6], as well as birds and small mammals.

Planting for Urban Habitat Additional Information

The following links describe specific habitat resources that can be incorporated into urban landscapes to support specific groups of animals. To date, there is a gap in the availability of design guidelines to support urban fauna opportunities however the following websites may help as starting point for habitat design considerations.

A Guide To Wildlife Friendly Gardens in Victoria - RSPCA

Guidelines for Creating Bird Habitats - Birds In Backyards

Ringtail & Brushtail Possum Factsheet - City of Melbourne

Bat Fact Sheets - Australasian Bat Society

Designing you Butterfly Garden - SGA

Attracting Native Bees to your Garden - Flora for Fauna

Urban Ecology Park Scenario - Moonee Valley City Council

Start with the Grasslands Design Guidelines to Support Native Grasslands in Urban Areas - VNPA & AILA

Plant Species Selection Additional Information

Information to help with plant species selection

Urban Forest Diversity Guidelines – City of Melbourne

Future Urban Forest Report – City of Melbourne

Urban Forest Precinct Plans – City of Melbourne

Growing Green Guide 2014. Technical Guide

Sustainable SITES Initiative v.2

LOCI Environment & Place

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Attach this Better Best Practice Note next time you request a quote, and ask bidders how they will incorporate best possibilities for your project.

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[4] *http://www.thenatureofcities.com/2016/01/20/can-cities-save-bees-how-can-urban-habitats-be-made-to-serve-pollinator-conservation-how-can-that-story-be-better-told/*

[5] *Mata L et al. (2016) The Little Things that Run the City – Insect ecology, biodiversity and conservation in the City of Melbourne. Report prepared for the City of Melbourne.*