Powerful pollinators

Encouraging insect pollinators in urban environments & gardens

Pollinators are an essential component of our cities and suburbs. Enhancing pollinator resources to support a diverse range of beneficial insects is important for flourishing gardens, sustainable backyards, healthy green spaces, and thriving ecosystems. The Powerful Pollinators Guide provides an introduction to encouraging insect pollinators in the south-eastern suburbs and surrounds of urban Melbourne.

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The power of pollinators

Pollinators – mostly insects, but also birds and mammals – assist the formation of seeds and fruit in many plant species by visiting flowers in search of food (nectar and/or pollen). Whilst foraging they transfer pollen from one flower to another, facilitating fertilization, which results in fruits and seeds.

Honey bees, native bees and other native insects like hoverflies, wasps and butterflies provide essential pollination services for native plants, garden flowers, fruits and vegetables.

Increasing the abundance and diversity of native plants in urban landscapes supports pollinators by providing a range of food sources and nesting sites.

Pollinators and food security

Without insect pollinators, the quantity and diversity of food and flowers grown in backyard gardens would be severely restricted. Many of the foods we eat, from gardens and farms, benefit from pollination.

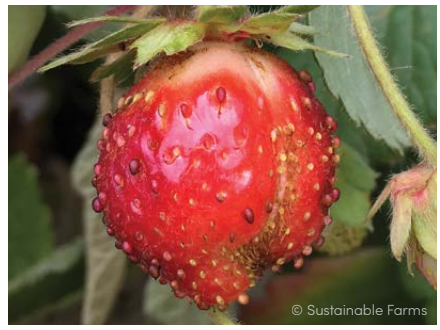
Pollinator-dependent foods include citrus, apples, stone-fruits, zucchini, pumpkins, strawberries and tomatoes, as well as plants grown for seed such as sunflowers, coriander and parsley.

The quantity and diversity of insect pollinators are key drivers of production as they influence both food yields and quality. Under-pollination results in smaller and misshapen fruit or seed that isn't viable to grow.

A diverse and healthy community of pollinators generally provides more effective and consistent pollination than relying on any single species.

Pollinators are essential to, and dependent upon, healthy ecosystems. A growing human population and increasing demand for food puts pressure on ecosystems, with potential negative impacts on biodiversity, the environment and food production.

Insect populations are in decline worldwide due to land clearing, intensive or monocultural agriculture, pesticide use, pollution, colony disease, increased urbanisation and climate change. Low pollinator numbers mean not all flowers are pollinated, leading to low fruit or seed set. This in turn reduces fruit and vegetable harvest yields, and decreases food supply.



Under-pollination results in smaller, misshapen fruit such as this strawberry.

Backyard biodiversity

Insect pollinators are a prime example of the importance of healthy ecosystems in urban gardens, parks and reserves. Insects are the 'canaries in the coal mine' of our urban and rural environments. Without our 'littlest creatures', we lack pollinators, natural beneficial pest control services, and critical food source for other insects, birds, amphibians, reptiles and mammals.

The presence of connected and widespread pollinator habitat is critical to support insect populations if we are to maintain sustainable cities and productive, healthy gardens and urban farms for food security and biodiversity.

Pollinators require habitat that contains year-round food sources, breeding resources and nesting sites. The presence of pollinator habitat adjacent to food crops has been shown to improve food production by enabling a greater variety and number of pollinators to persist year-round, providing pollination services when required.

Turn to the centre of this brochure for a guide to planting for pollinators.

Diapause or diet? Where are the insects?

Many insect pollinators undergo a diapause during colder winter months. Diapause is a period of suspended development during unfavourable environmental conditions, and during this period insect pollinators do not need flowers. Birds and other small mammals will continue to benefit from available pollen and nectar during this time.

If there are low numbers of insect pollinators in your local area, it is important to determine whether this is because of diapause, or because of an inadequate availability of nectar and pollen creating a 'food desert' where insect pollinators cannot survive.

There are still many unknowns about insect pollinators in Australia. Take part in Australian Pollinator Week or in the bi-annual Wild Pollinator Count to learn more about pollinators in your area — visit **AustralianPollinatorWeek.org.au** and **WildPollinatorCount.com**

Encouraging pollinators in your garden

Create pollination reservoirs

Pollination reservoirs are areas that provide floral resources for pollinators. They can be gardens, new planting or existing habitat such as established trees, or even local bushland, parks or reserves. A high diversity of plant species is essential to provide nectar, pollen and nesting sites throughout the year. Pollination reservoirs need to be close enough to where pollinators live to ensure that they can fly easily to them.

Improve on what you have

Enhance and improve existing pollinator habitat where possible. Gardens that already contain elements such as large trees, rockeries, water sources, bare soil and organic matter, and a variety of flowering plants are a valuable resource for beneficial insects and pollinators.

Nature-strips and verges, ponds, vegetable gardens, orchards, bushland, grassland, and river and creek edges can all be important pollinator-attracting areas. Protect and enhance any native pollinator plants in your garden or on your property for the future.

Plant trees, shrubs and groundcovers

Planting a variety of species of groundcovers, shrubs and trees to in your garden will further attract pollinators to your patch. Initial watering and protection will improve the success rate of young plants. Some species such as wildflowers or native pea species are excellent pollinator attractors and reward careful attention by keen gardeners.

Be a citizen scientist and do some detective work to discover local pollinators in your patch. Visit **inaturalist.ala.org.au** to be involved.

Construct insect real estate

Insect hotels, which are both functional and attractive, are a great way to add to habitat and nesting places for pollinators and insects in your backyard or garden. The hotels are easily moved to be close to flowering plants and those needing pollination, especially if you have a new garden that is still growing. Include lots of different sized holes, cracks and crevices to provide homes for various solitary insect pollinators.

Plant for the future

When establishing pollinator habitat, consider including species that are indigenous to your area but can tolerate increasingly drier and warmer conditions, to create resilient habitat for climate change. Rehabilitate weedy areas into managed pollination reservoirs by introducing lots of flowering plant diversity. Be careful not to plant invasive or listed weeds, and look for suitable replacements.

Amplify the flower signal

Plants have evolved large flowers or clusters of smaller flowers because they attract more pollinator visits. Large, colourful and diverse plantings attract more pollinators. Ideally, plant in groups that contain different vegetation layers — combine a species-rich mixture of wildflowers, ground-covers, herbs, lilies, rushes, climbers, shrubs and trees.

Connectivity counts

Insect pollinators benefit from greater connectivity of habitat in a landscape, which allows them to forage over a wider radius and increase in numbers in a local area. Encourage friends and neighbours to plant for pollinators and create connections in your community.

Get to know your local flora

Your local government area has distinct populations of insects, depending on the local flora and environment. Knowing your local insect species will help you develop better plantings.

The plants growing in nearby nature reserves or bushland will be suited to your climate and soils. Local environment groups and specialist native nurseries can provide information about local plants.

Grow a bumper crop

Pollinator-attracting plants include many fruits and vegetables grown in backyards, community and market gardens, and orchards. Pollinators ensure good yields of crops such as apples, beans, avocado, and almonds, and bush foods such as lilly-pilly and yam daisy.

Reduce chemical use

Insecticides, fungicides and herbicides, even 'natural' products, all affect pollinator health. Herbicides can reduce or eradicate the availability and diversity of flowers, and plants that support insect life. Most insecticides are non-specific, killing both beneficial insects and pests.

There are other means of protecting plants, such as with approved netting, and pest-repellent plants like marigolds and lavender.

When pollinators are allowed to flourish, they help control pest insects. Consider wildflowers instead of lawn, or let dandelions flower instead of mowing or spraying.

If chemical usage is unavoidable, choose non-systemic products, and apply when pollinators are less active. Always follow directions.

Safeguard the bees? The best way to 'save the bees' and protect our pollinators is to create an abundance of diverse habitat — from the ground up! There is much interest in keeping a bee hive to promote pollinators, but there are serious legal and biosecurity responsibilities that must be considered, and that the introduction of a bee hive does not displace existing native pollinators and insects. Be a friend of pollinators and say it with flowers!

A guide to planting for pollinators for Metropolitan & Greater Melbourne South East

Healthy populations of insect pollinators are important for sustainable gardens, productive orchards and vegetable crops, and healthy native vegetation.

This Guide will help you select plant species to attract and sustain pollinators in your garden throughout the year.

The south-eastern Melbourne metropolitan region is defined by mostly alluvial geology, with hilly and undulating topography. The climate is characterised by cool to mild and wet winters, and dry, often hot summers. The vegetation communities that grow naturally include areas of wet forest, woodlands and heathlands, as well as coastal scrub, riparian (streamside) communities, and pockets of cool-climate rainforest.

The plants listed in this Guide have been selected for their resilience and capacity to supply rewards to pollinators, with an emphasis on species that are indigenous and suited to local climates.

The eucalypt species in this Guide are mostly large trees, but have been included for their value as good nectar producing species. Most eucalypts do not flower every year, so choosing diverse species will help create continuously flowering habitat.

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The pollinator plant list

To create pollinator-attracting plantings, use the Guide to choose a selection of plants with a variety of flower colours, different growth habits and a range of flowering seasons.

For each species, the planting Guide lists:

- life-form/'habit' (such as climber, herb, shrub or tree) and height
- the vegetation type in which they naturally occur
- flower colour and flowering season
- growth requirements (sun or shade, moist or dry)
- the insect groups that may visit each plant and the pollinator reward (pollen and/or nectar).

The coloured bars indicate the flowering months for each species. Darker shading denotes the peak flowering period, with a lighter shading for non-peak flowering months. Flowering dates may differ between regions and seasons, particularly for non-peak times, if your local climate is consistently warmer or cooler than average, with earlier or later flowering.

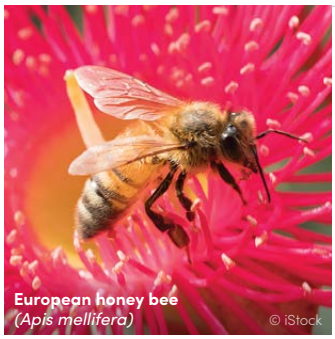
Sourcing plants

Most of the plant species listed are available from retail or wholesale nurseries or native plant growers, and local environment groups. If you can't source these plants at your local garden centre, or indigenous nursery, ask them to contact the local wholesale nursery suppliers and plant growers listed online. See the reverse of the Guide for details.

Lifeform	Common name	Scientific name	Family	Vegetation type	Height	Flower colour	Flowering												Aspect	Soil moisture	Pollinator reward		Visitation by pollinator							
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			Pollen	Nectar	Native bees	Honey bees	Hoverflies	Wasps	Butterflies	Moths	Beetles	Flies
Groundcovers	Sheep's Burr, Bidgee Widgee	*Acaena novae-zelandiae*	Rosaceae	Grassland, Woodland	0.3 m	Cream													Sun to semi-shade	Moist to dry		●		●						
Groundcovers	Austral Indigo	*Indigofera australis*	Fabaceae	Woodland, Forest, Heathland	2.5 m	Mauve-Purple													Sun to semi-shade	Dry	●	●	●	●		●	●			
Groundcovers	Running Postman	*Kennedia prostrata*	Fabaceae	Woodland, Forest, Heathland	< 0.3 m	Red													Sun	Dry		●					●	●	●	
Groundcovers	Native Violet	*Viola hederacea*	Violaceae	Moist Forest, Heathland, Woodland	< 0.3 m	White & Purple													Semi-shade to shade	Wet to moist	●		●				●			
Groundcovers	Small Grass Tree	*Xanthorrhoea minor*	Asphodelaceae	Heathland, Heathy Woodland	< 0.3 m	White-Cream													Sun to semi-shade	Moist to dry	●	●	●	●			●		●	
Wildflowers	Cut-Leaf Daisy	*Brachyscome multifida*	Asteraceae	Forest, Woodland	< 0.5 m	Mauve													Sun	Moist to dry	●	●							●	
Wildflowers	Blue Pincushion	*Brunonia australis*	Goodeniaceae	Grassland, Herbfield, Woodland	0.3 m	Blue													Sun	Dry	●	●								
Wildflowers	Clustered Everlasting	*Chrysocephalum semipapposum*	Asteraceae	Woodland, Heathland	< 0.6 m	Yellow													Sun	Moist to dry	●	●	●				●		●	●
Wildflowers	Button Everlasting	*Coronidium scorpioides*	Asteraceae	Grassland, Herbfield, Woodland	0.3 m	Yellow													sun	Dry	●	●	●	●	●	●	●		●	●
Wildflowers	Billy Buttons	*Craspedia variabilis*	Asteraceae	Grassland, Open Woodland	< 0.5 m	Yellow													Sun	Moist to dry	●	●	●	●		●	●		●	
Wildflowers	Austral Stork's Bill	*Pelargonium australe*	Geraniaceae	Woodland, Heathland	0.5 m	Mauve													Sun	Moist to dry	●	●	●	●		●	●		●	●
Wildflowers	Tall Bluebell	*Wahlenbergia stricta*	Campanulaceae	Grassland, Herbfield, Woodland	0.3 m	Blue													Sun	Moist to dry	●	●	●						●	
Lilies & Irises	Pale Vanilla Lily	*Anthropodium milleflorum*	Asparagaceae	Grassland, Open Woodland,	< 1 m	White-Mauve													Sun	Moist to dry		●	●				●		●	
Lilies & Irises	Chocolate Lily	*Arthropodium strictum*	Asparagaceae	Grassland, Herbfield, Woodland	0.3 m	Pink-mauve													Sun	Moist to dry	●*	●	●							
Lilies & Irises	Bulbine Lily	*Bulbine bulbosa*	Goodeniaceae	Grassland	0.3 m	Yellow													Sun to semi-shade	Moist to dry	●	●	●	●	●		●	●	●	●
Lilies & Irises	Black Anther Flax Lily	*Dianella revoluta*	Asphodelaceae	Woodland, Heathland	1 m	Indigo													Sun to semi-shade	Moist to dry	●*		●							
Lilies & Irises	Tasman Flax Lily	*Dianella tasmanica*	Asphodelaceae	Woodland, Forest	1 m	Indigo													Sun to semi-shade	Moist to dry	●*		●							
Sedges & Tussocks	Tall Sedge	*Carex appressa*	Cyperaceae	Woodland, Wetland	1–2 m	Yellow-brown													Sun	Moist to wet		●	●				●	●		
Sedges & Tussocks	Wattle Mat-rush	*Lomandra filiformis*	Asparagaceae	Wet Heathland, Woodland, Wetland	< 0.3 m	White-Cream													Sun to semi-shade	Moist to dry	●	●	●	●		●	●		●	●
Sedges & Tussocks	Spiny-headed Mat Rush	*Lomandra longifolia*	Asparagaceae	Woodland, Heathland, Wetland	100 cm	White-cream													Sun to semi-shade	Moist to dry	●	●	●	●		●	●		●	●
Sedges & Tussocks	Grass Tree	*Xanthorrhoea australis*	Asphodelaceae	Grassland, Woodland	2 m	Cream													Sun to semi-shade	Dry	●	●	●	●			●		●	
Vines & Climbers	Mountain Clematis	*Clematis aristata*	Ranunculaceae	Woodland, Shrubland	2–4 m	Cream													Sun to semi-shade	Moist to dry	●	●	●	●	●		●			
Vines & Climbers	Twining Glycine	*Glycine clandestina*	Fabaceae	Forest, Woodland, Heathland	> 2 m	Purple													Sun to semi-shade	Moist to dry		●					●	●		
Vines & Climbers	Purple Coral-Pea	*Hardenbergia violacea*	Fabaceae	Woodland, Heathland, Forest	< 2 m	Purple													Sun	Moist to dry	●	●	●	●	●			●		
Vines & Climbers	Wonga Vine	*Pandorea pandorana*	Bignoniaceae	Wet Forests, Moist Gullies	> 6 m	White & Purple													Sun to semi-shade	Moist	●	●	●	●			●		●	
Vines & Climbers	Native Bramble	*Rubus parvifolius*	Rosaceae	Woodland, Forest	1 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●		●	●
Shrubs / Small	Common Aotus	*Aotus ericoides*	Fabaceae	Open Forest, Healthland	< 2 m	Yellow & Red													Sun to semi-shade	Dry to moist	●	●	●	●	●					
Shrubs / Small	Showy Bossiaea	*Bossiaea cinerea*	Fabaceae	Woodland, Heathland	< 1.5 m	Red & Yellow													Sun	Dry	●	●	●	●	●					
Shrubs / Small	Native Fuchsia	*Correa reflexa*	Rutaceae	Woodland, Heathland	0.5–3 m	Pink-Red													Sun to semi-shade	Moist to dry	●	●	●	●			●		●	
Shrubs / Small	Smooth Parrot Pea	*Dillwynia glaberrima*	Fabaceae	Woodland, Heathland	0.5–2 m	Yellow & Red													Sun	Dry	●	●	●	●	●					
Shrubs / Small	Common Heath	*Epacris impressa*	Ericaceae	Woodland, Open Forest, Heathland	1.2–2 m	White or Pink													Sun to semi-shade	Moist to dry	●	●	●	●		●	●			●
Shrubs / Small	River Mint	*Mentha australis*	Lamiaceae	Riparian Forest, Damp Forest	< 0.3 m	White													Shade to semi-shade	Wet to moist		●	●	●			●			
Shrubs / Small	Common Rice Flower	*Pimelea humilis*	Thymelaeaceae	Woodland, Forest	0.3 m	White-cream													Sun to semi-shade	Moist to dry	●	●	●	●	●		●		●	
Shrubs / Small	Creamy Candles	*Stackhousia monogyna*	Celastraceae	Open Forest, Woodland, Heathland	< 0.6 m	Cream													Sun	Dry		●	●	●			●	●		●
Shrubs / Small	Pink Bells	*Tetratheca ciliata*	Elaeocarpaceae	Woodland, Forest, Heathland	< 1 m	White-Pink													Sun to semi-shade	Moist to dry	●	●	●	●					●	
Shrubs / Medium	Prickly Currant Bush	*Coprosma quadrifida*	Rubiaceae	Open Forest, Riparian, Rainforest	2–5 m	Green-Pale Pink													Sun to semi-shade	Wet to moist		●	●	●						
Shrubs / Medium	Hop Bitter Pea	*Daviesia latifolia*	Fabaceae	Woodland, Heathland	1–5 m	Red & Yellow													Sun to semi-shade	Dry	●	●	●	●	●					
Shrubs / Medium	Hop Bush	*Dodonaea viscosa*	Sapindaceae	Woodland, Forest	3–4 m	Pink													Sun to semi-shade	Dry	●	●	●	●	●					
Shrubs / Medium	Hop Goodenia	*Goodenia ovata*	Goodeniaceae	Woodland, Forest	2 m	Yellow													Sun to semi-shade	Moist		●	●	●	●					
Shrubs / Medium	Yellow Hakea	*Hakea nodosa*	Proteaceae	Woodland, Heathland	2–4 m	Cream-Yellow													Sun	Dry	●	●	●	●	●		●	●	●	●
Shrubs / Medium	Prickly Tea Tree	*Leptospermum continentale*	Myrtaceae	Woodland, Heathland, Forest	3 m	White													Sun to semi-shade	Moist to dry	●	●	●	●		●	●	●	●	●
Shrubs / Medium	Woolly Tea Tree	*Leptospermum lanigerum*	Myrtaceae	Woodland, Heathland, Forest	4 m	White													Sun to semi-shade	Wet to moist	●	●	●	●		●	●	●	●	●
Shrubs / Medium	Tree Violet	*Melicytus dentatus*	Violaceae	Woodland, Shrubland	2–5 m	Pale Yellow													Sun	Moist to dry	●	●	●	●	●		●		●	●
Shrubs / Medium	Sticky Boobialla	*Myoporum petiolatum*	Scrophulariaceae	Heathland, Shrubland	< 2 m	White-Pink													Sun	Moist to dry	●	●	●	●		●	●	●	●	●
Shrubs / Medium	Snowy Daisy Bush	*Olearia lirata*	Asteraceae	Wet Forest, Woodland	< 4 m	White-Yellow													Semi-shade	Moist to dry	●	●					●	●	●	
Shrubs / Medium	Tree Everlasting	*Ozothamnus ferrugineus*	Asteraceae	Woodland, Shrubland	2–5 m	White													Sun	Dry	●	●					●			●
Shrubs / Medium	Hazel Pomaderris	*Pomaderris aspera*	Rhamnaceae	Wet Forest	2–15 m	Cream													Semi-shade	Wet to moist	●	●	●	●			●			
Shrubs / Medium	Christmas Bush	*Prostanthera lasianthos*	Lamiaceae	Woodland, Forest,	1–5 m	White-Mauve													Sun to semi-shade	Moist to dry	●	●	●	●			●			
Shrubs / Medium	Kangaroo Apple, Poroporo	*Solanum aviculare*	Solanaceae	Woodland, Shrubland, Forest	2–3 m	Purple													Sun to semi-shade	Moist to dry	●*		●			●				
Shrubs / Medium	Dusty Miller	*Spyridium parvifolium*	Rhamnaceae	Moist Forest, Woodland, Heathland	1.5–3 m	White-Pale Brown													Sun to semi-shade	Moist	●	●	●	●		●	●	●		
Shrubs / Large	Cinnamon Wattle	*Acacia leprosa*	Fabaceae	Southern Rainforests, Wet Forests	1–5 m	Pale Yellow-Red													Sun to semi-shade	Moist to dry	●		●	●		●	●	●	●	●
Shrubs / Large	Kurwan, Sweet Bursaria, Blackthorn	*Bursaria spinosa*	Pittosporaceae	Woodland, Shrubland	4–6 m	White													Sun to semi-shade	Dry	●	●	●	●		●	●	●	●	●
Shrubs / Large	Native Hemp Bush	*Gynatrix pulchella*	Malvaceae	Woodland, Forest	4 m	Green-white													Semi-shade	Moist	●	●	●				●			
Shrubs / Large	Silky Hakea, Bushy Needlewood	*Hakea decurrens*	Proteaceae	Woodland, Heathland	0.5–4.5 m	White-Cream													Sun to semi-shade	Dry	●	●	●		●		●	●	●	
Shrubs / Large	Yarra Burgan	*Kunzea ericoides*	Myrtaceae	Riparian Forest, Damp Forest	2– > 5 m	White													Sun to shade	Wet to moist	●	●	●	●		●	●	●	●	●
Shrubs / Large	Swamp Paperbark	*Melaleuca ericifolia*	Myrtaceae	Riparian, Woodland, Forest, Wetland	< 7 m	White-Cream													Sun	Wet to moist	●	●	●	●		●	●	●	●	●
Trees / Small	Golden Wattle	*Acacia pycnantha*	Fabaceae	Woodland	5 m	Yellow													Full sun	Moist to dry	●		●	●		●	●	●	●	●
Trees / Small	Prickly Moses	*Acacia verticillata*	Fabaceae	Woodland	3 m	Yellow													Sun	Moist to dry	●		●	●		●	●	●	●	●
Trees / Small	Coast Banksia	*Banksia integrifolia*	Proteaceae	Woodland, Heathland	< 10 m	Yellow													Sun	Moist to dry	●	●	●	●			●	●	●	●
Trees / Small	Silver Banksia	*Banksia marginata*	Proteaceae	Grassland, Woodland	5–11 m	Yellow													Sun	Wet to moist	●	●	●	●	●		●	●	●	●
Trees / Small	Saw Banksia	*Banksia serrata*	Proteaceae	Coastal Heathland, Open Forest	< 15 m	Cream-Yellow													Sun	Dry to moist	●	●	●	●	●		●	●	●	●
Trees / Small	River Bottlebrush	*Callistemon sieberi*	Myrtaceae	Woodland, Riparian	4 m	Pink													Sun to semi-shade	Wet to moist	●	●	●	●		●	●	●	●	●
Trees / Small	Scented Paperbark	*Melaleuca squarrosa*	Myrtaceae	Forest, Wetland	< 10 m	White-cream													Sun	Wet to moist	●	●	●	●			●			●
Trees / Medium	Silver Wattle	*Acacia dealbata*	Fabaceae	Woodland	3–30 m	Yellow													Sun to semi-shade	Dry	●			●		●	●	●	●	●
Trees / Medium	Blackwood	*Acacia melanoxylon*	Fabaceae	Woodland, Forest	8–20 m	Pale Yellow													Sun to semi-shade	Dry	●			●		●	●	●	●	●
Trees / Medium	Drooping Sheoak	*Allocasuarina verticillata*	Casuarinaceae	Grassland, Woodland	5–11 m	Red & Yellow													Sun	Dry	●		●	●	●					
Trees / Medium	Bundy	*Eucalyptus goniocalyx*	Myrtaceae	Woodland, Open Forest	< 15 m	Cream													Sun	Dry to moist	●	●	●	●		●	●	●	●	●
Trees / Large	Red Gum	*Eucalyptus camaldulensis*	Myrtaceae	Woodland, Open Forest, Riparian	< 40 m	Cream													Sun	Dry to wet	●	●	●	●		●	●	●	●	●
Trees / Large	Broad-Leaved Peppermint	*Eucalyptus dives*	Myrtaceae	Woodland, Open Forest	< 20 m	Cream													Sun to semi-shade	Moist to dry	●	●	●	●		●	●	●	●	●
Trees / Large	Yellow Gum	*Eucalyptus leucoxylon*	Myrtaceae	Woodland, Forest	< 25 m	Cream-pink													Sun	Moist to dry		●	●	●		●	●	●	●	●
Trees / Large	Yellow Box	*Eucalyptus melliodora*	Myrtaceae	Woodland, Forest	15 m	White													Sun	Moist to dry		●	●	●		●	●	●	●	●
Trees / Large	Swamp Gum	*Eucalyptus ovata*	Myrtaceae	Woodland, Open Forest	< 20 m	Cream													Sun	Moist to wet	●	●	●	●		●	●	●	●	●
Trees / Large	Candlebark	*Eucalyptus rubida*	Myrtaceae	Woodland, Forest	< 35 m	Cream													Sun	Moist to dry		●		●						
Trees / Large	Manna Gum	*Eucalyptus viminalis*	Myrtaceae	Woodland, Forest	25 m	White													Sun	Moist to dry	●	●		●		●	●	●	●	●
Trees / Large	Lilly Pilly	*Syzygium smithii*	Myrtaceae	Wet Forest, Woodland	> 20 m	Cream													Shade to semi-shade	Wet to moist	●	●	●	●			●			

*Buzz Pollinated

Know your pollinators



European honey bee
(Apis mellifera) © iStock

European honey bees have two pairs of wings and long, segmented antennae. They are daytime-flying and feed on nectar and pollen. They are generalist pollinators and provide the bulk of pollination services for horticulture and crop plants. Honey bees and native bees are both essential to functioning ecosystems and food security in Australia.

Honey bees have become an important part of the Australian landscape. Honey bees live as colonies, and have a long history of coexistence with humans, including in domestic gardens.

Leafcutter bee
(Megachile maculariformis) © Karen Retra

There are more than 2000 species of **native Australian bees,** which provide essential pollination services. Native bees are generally solitary and live in nests in the ground or in hollow stems, old borer holes and other cracks and crevices, and some have evolved to pollinate particular native flowers through 'buzz pollination'. Although many Australian native bees are generalist foragers, some species have co-evolved with native plants and adapted to be the most effective pollinators of their flowers. Many native plant species, such as *Dianella* and *Grevillea* require specially adapted insects to access their nectar and enable the transfer of pollen to the stigma. Most native bees are solitary, but some species found in northern Australia (*Tetragonula* sp. and *Austroplebia* sp.) are social bees and are used for commercial pollination of crops like macadamia nuts.

Bee fly
(Family *Bombyliidae*) © Karen Retra

Fly species number up to 30,000 in Australia, and can be identified by having only one pair of flight wings. A second set of wings are modified into club-shaped paddles that allow flies to hover and stabilise their flight. Unlike bees and wasps, they have very small, clubbed antennae at the front of their head. Flies, including blowflies, are often attracted to flowers that smell like carrion; they generally have hairy bodies that easily collect pollen while they are feeding. Flies provide a range of services in the garden, including pollination, decomposition and predation.

Hoverfly
(Family *Syrphidae*) © Karen Retra

Hoverflies are a type of fly, distinguishable by their large eyes, short antennae, bright black and yellow abdomen and their hovering flight behaviour. Adult hoverflies are nectar and pollen feeders. Hoverfly larvae feed on pests such as aphids, thrips and leafhoppers and are useful biocontrol agents.

Horned beetle
(Rhipicera femorata) © J. Hort

Beetles have hard outer wings that form their distinctive beetle shape. Their outer wings form a T-shape where they join at the top, unlike bugs where the outer wings make an X- or Y-shape. Beetles feed on nectar and pollen, usually by crawling over flower surfaces. There are around 30,000 species of beetles in Australia, with many yet to be formally described.

Meadow argus
(Junonia villida) © J. Hort

Butterflies have wings covered in tiny scales. They have clubbed antennae and hold their wings upright when at rest. They are day-flying and have long tongues that they can use to feed on nectar in flowers with deep tubes. Butterflies are usually brightly coloured, with approximately 600 species found in Australia.

Beautiful leaf moth
(Gastrophora henricaria) © Karen Retra

Moths also have wings covered in tiny scales and tend to be subtle in colour. They have antennae without clubs and hold their wings flat when at rest. They are generally dusk- and night-flying but there are some exceptions: the grapevine moth is a commonly seen day-flying moth. Moths feed on nectar. Australia has a high diversity of moth species, with up to 22,000 species thought to exist across the continent.

Flower forms

© Meredith Cosgrove

Generalist flowers can be pollinated by many different insects and animals. They are typically saucer shaped with many stamens and have a surface that insects can walk on. *Eucalyptus* flowers and daisy flowers are generalist flowers — they can be pollinated by bees, flies, beetles and butterflies.

© Meredith Cosgrove

Specialist flowers have modifications to their shape and size that only let certain pollinators access the nectar and pollen. These flowers might have deep flower tubes or narrow entry points so that only a select group of pollinators can access them. The advantage of specialisation is that pollination is very targeted and efficient, with accurate pollen placement made possible by co-evolution between flowers and insects. The disadvantage is that if the correct pollinator isn't there, the flowers aren't pollinated. Often, nectar is produced at the base of the flower, forcing pollinators to enter the flower fully and in the process, become covered in pollen.

Pollinator rewards

Nectar is a sugary solution, rich in carbohydrates, vitamins and minerals, produced by flowers and sometimes by glands on leaves or stems (called extra-floral nectaries). Nectar is attractive to insects, and provides an immediate energy source needed for tasks such as hunting pest insects, laying eggs in decomposing organic matter, collecting pollen, or parasitising other insects.

Carbohydrates alone don't support everything needed for health and growth, so insects also need pollen.

Pollen is rich in protein, fats and nutrients. Bees are vegetarian, and need to collect pollen to feed their offspring.

Buzz pollination

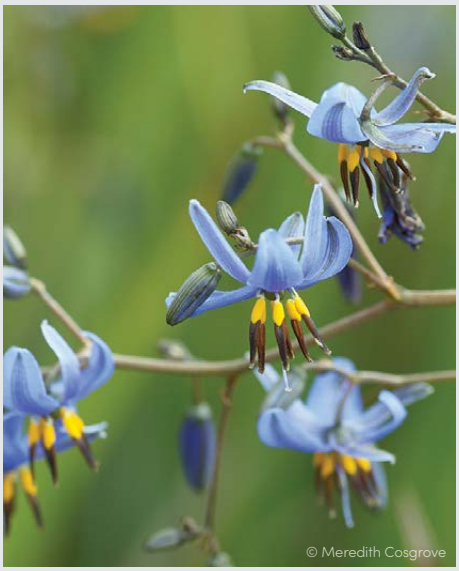
Some flowers do not produce any nectar; they specifically target pollen-collecting bees, and only offer pollen rewards. To limit pollen loss and ensure effective pollination, some plants produce flowers with specialised, tubular anthers, that only open at the tip. To extract pollen, bees use vibrations to 'buzz' the pollen grains out of the pores of these anthers. Many crops are buzz pollinated, including tomatoes, potatoes, eggplants, capsicum, chillies, tomatillo and cranberries.

European honey bees are unable to buzz pollinate flowers, but several native bees, such as the blue-banded bee, and teddy bear bee (*Amegilla* sp.) and carpenter bee (*Xylocopa* sp.) are exceptionally good large buzz pollinators, and have evolved to pollinate native plants such as flax lilies (*Dianella* sp.). Many of our smaller, ground nesting bees utilise vibration to help them excavate their burrows, and they also use that skill to buzz pollen from the anthers of native plants.

Planting buzz-pollinated species will encourage populations of buzz pollinators for successful pollination of food crops and ensure seed set in native plants. Many small ground nesting bees also buzz pollinate native flowers.

Nectar feeding

Grevillea flowers and other tubular flowers are often adapted to be successfully pollinated by birds. Pollen is 'presented' on a floral stigma that extends outside the flower. When birds feed on the nectar, pollen is deposited on their beaks or heads. Bees, also attracted to the sugary nectar, crawl into the side of the flower and feed on the nectar without encountering the pollen-laden stigma. The plant doesn't receive the pollination benefit from the insect, but flowers such Grevillea species can be a very useful source of nectar for insects in the cooler months.



Wholesale Nurseries

Most of the plants shown in the planting guide will be available at nurseries that have a good stock of native plants. But if your local nursery doesn't stock the plant you're after, ask them to order it in. For a list of wholesale nurseries that stock all the plants shown in the planting guide, plus other useful resources, visit the Wheen Bee Foundation website or scan the QR code.

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WheenBeeFoundation.org.au/our-work/powerful-pollinators

Wheen Bee Foundation

Powerful Pollinators Planting Guides are produced by Wheen Bee Foundation. We fund vital strategic research and education initiatives that strengthen bees, improve pollination efficiency, and protect our food security and ecosystem health. Visit the website for more information.

WheenBeeFoundation.org.au

Far left: The spreading flax lily, *Dianella revoluta*, is buzz pollinated.

Left: This European honey bee is 'side-working': feeding on the nectar-rich flowers without coming into contact with the plant's pollen.

Front cover:
1. Australian native bee, *Lipotriches* species. (Photo: Erica Siegel)
2. Aerial view over of south-eastern Melbourne suburbs. (Photo: Dreamstime)
3. European honey bees, *Apis mellifera*. (Photo: Kirrily Hughes)

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