Powerful pollinators

Encouraging insect pollinators in urban environments & gardens



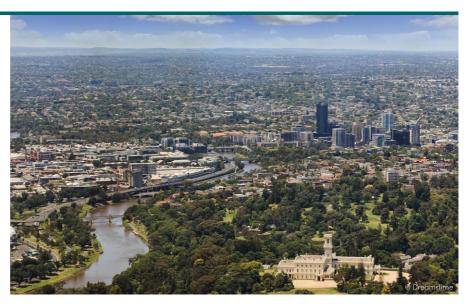
Pollinators are an essential component of our cities and suburbs. Enhancing pollinator resources to support a diverse range of beneficial insects is important for flourishing gardens, sustainable backyards, healthy green spaces, and thriving ecosystems. The Powerful Pollinators Guide provides an introduction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



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

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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 your existing pollinator habitat where possible. Gardens that already contain established trees, rockeries, ponds, bare soil and organic matter, and a variety of flowering plants, are a valuable resource for beneficial insects and pollinators.

Nature–strips, verges, laneways, vegetable gardens, orchards, nature reserves, and riverbanks and creeks can all be important pollinator–attracting areas. Protect and enhance native pollinator plants in your garden and surrounds 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 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 low impact, 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 North & East



Healthy populations of insect pollinators are important for sustainable and resilient gardens, vegie patches and native flora.

This Guide will help you select plant in your garden and community throughout the year.

The north and east bioregions of Melbourne include the southerly aspect of the Great Dividing Range, with moderate to steep slopes and valley flats. Vegetation includes dry forest woodland and damp forest on upper slopes, wet forest in valleys, and cool temperate rainforest in gullies. Less fertile hills support grassy dry forest. Granitic and sedimentary areas are heavily cleared grassy woodlands.

The climate is warm to hot and dry in summer, and cool to cold and wet in winter and spring. Snow may occur in elevated areas, and frosts in low-lying valleys.

The plants listed in this Guide will help supply rewards to pollinators, with an emphasis on species that are indigenous later flowering. and suited to local climates.

Garden centres sell many common pollinator-attracting ornamental flowers Most of the plant species listed are and herbs labelled as 'bee-friendly'.

The eucalypt species in this Guide are mostly large trees, and not suitable for all local environment groups. If you can't gardens, but have been included for their source these plants at your local garden value as good nectar producing species. centre, or indigenous nursery, ask them Most eucalypts do not flower every year, to contact the local wholesale nursery so choosing diverse species will help create continuously flowering habitat.

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.

species to attract and sustain pollinators For each species, the planting Guide lists:

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

available from retail or wholesale nurseries or native plant growers, and suppliers and plant growers listed online.

Sourcing plants

See the reverse of the Guide for details.



WheenBeeFoundation.org.au

Indi Grou Grou Grou	Lifeform igenous plants undcovers	Common name	Scientific name	Family	Vegetation type	Height	Flower colou	ır	Flowering	Aspect	Soil moisture	Pollinato	r reward			Visitation	by pollin	ator		\
Grou Grou Grou						_			Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1.0000.	3011 IIIOISIUI E	Pollen	Nectar	Native bees	Honey bees H	overflies \	Nasps B	utterflies I	Moths Beet	les Flies
Grou Grou	undcovers								, , , , , , , , , , , , , , , , , , , ,						,					
Grou		Austral Indigo	Indigofera australis	Fabaceae	Woodland, Forest, Heathland	2.5 m	Mauve-Purple			Sun to semi-shade	Dry	•	•	•	•		•	•		
	undcovers	Running Postman	Kennedia prostrata	Fabaceae	Woodland, Forest, Heathland	< 0.3 m	Red			Sun	Dry		•		_			•	• •	
	undcovers undcovers	Matted Bush Pea Native Violet	Pultenaea pedunculata Viola hederacea	Fabaceae Violaceae	Dry Forest Moist Forest, Heathland, Woodland	0.1 m < 0.3 m	Yellow & Red White & Purple			Sun to semi-shade Semi-shade – shade	Dry Wet to moist	•	•	•	•	•		•	• •	
	s & Irises	Chocolate Lily	Arthropodium strictum	Asparagaceae	Grassland, Herbfield, Woodland	0.3 m	Pink-mauve			Sun	Moist to dry	*	•	•				•		
	s & Irises	Bulbine Lily	Bulbine bulbosa	Goodeniaceae	Grassland	0.3 m	Yellow			Sun to semi-shade	Moist to dry	•	•	•	•	•		•	• •	•
Lilies	s & Irises	Native Flax Lily	Dianella revoluta	Asphodelaceae	Grassland, Herbfield, Woodland	0.8–1.5 m	Blue			Sun to semi-shade	Moist to dry	•		•*						
	s & Irises	Grass Trigger-plant	Stylidium graminifolium	Stylideaceae	Heathland, Woodland, Open Forest	0.3-0.75 m	Pink			Sun to semi-shade	Moist to dry		•	•			•		•	
	dflowers	Cut-Leaf Daisy	Brachyscome multifida	Asteraceae	Forest, Woodland	< 0.5 m	Mauve			Sun	Moist to dry	•	•						•	
	dflowers	Lemon Beauty Heads	Calocephalus citreus	Asteraceae	Woodland, Grassland, Herbfield	< 0.5 m	Yellow			Sun	Moist	•	•	•	•	•		•		•
	dflowers dflowers	Milky Beauty Heads Clustered Everlasting	Calocephalus lacteus Chrysocephalum semipapposum	Asteraceae Asteraceae	Grassland, Herbfield Grassland, Herbfield, Woodland	< 0.75 m 0.15-0.6 m	White			Sun	Moist Dry to moist	•	•	•	•	•		•		•
	dflowers	Austral Crane's Bill	Geranium solanderi	Geraniaceae	Grassy Woodland		Pink			Sun	Moist				•			•	•	
	dflowers	Yam Daisy, Murnong	Microseris walteri	Asteraceae	Open Woodland, Grassland	< 0.5 m	Yellow			Sun	Moist to dry	•	•	•	•		•	•	•	,
		Magenta Stork's Bill	Pelargonium rodneyanum	Geraniaceae	Woodland, Heathland	0.5 m	Mauve			Sun	Moist to dry	•	•	•	•		•	•	•	•
	dflowers	Australian Buttercup	Ranunculus lappaceus	Ranunculaceae	Grassy Woodland, Moist Forest	0.2-0.9 m	Yellow	0		Sun to semi-shade	Moist to dry	•	•	•	•	•		•	• •	•
ac –	dflowers	Slender Speedwell	Veronica gracilis	Plantaginaceae	Grassland, Grassy Woodland	< 0.6 m	Lilac			Sun to semi-shade	Moist	•	•	•	•			•		
	dflowers	Narrow-leaf New Holland Daisy	Vittadinia muelleri	Asteraceae	Grassland, Dry Woodland, Dry Forest					Sun to semi-shade	Dry	•	•	•				•	•	•
		Tall Bluebell	Wahlenbergia stricta	Campanulaceae	Grassland, Herbfield, Woodland	0.3 m < 0.1 m	Blue Yellow & Red			Sun	Moist to dry Moist	•	•	•					•	
		Creeping Bossiaea Small-leaved Clematis	Bossiaea prostrata Clematis microphylla	Fabaceae Ranunculaceae	Open Forest, Heathland Woodland	< 5 m	White			Sun Sun to semi-shade	Dry to moist			•		•		•		
	es & Climbers	Pink Bindweed	Convolvulus angustissimum	Convolvulaceae	Grassland, Woodland	>2 m Ø	Pink			Sun	Dry to moist	•	•	•	•	•				
		Purple Coral-Pea	Hardenbergia violacea	Fabaceae	Woodland, Heathland, Forest	< 2 m	Purple	•		Sun	Moist to dry	•	•	•	•	•			•	
sts: Vines	es & Climbers	Native Bramble	Rubus parvifolius	Rosaceae	Woodland, Forest	1 m	White	0		Sun to semi-shade	Moist to dry	•	•	•	•	•	•	•	•	•
Shru	ubs / Small	Grey Parrot Pea	Dillwynia cinerascens	Fabaceae	Open Forest, Woodland	0.3–1 m	Yellow & Red			Sun	Dry to moist	•	•	•	•	•			•	•
	ubs / Small	Hop Goodenia	Goodenia ovata	Goodeniaceae	Moist Woodland, Damp Forest	< 2 m	Yellow			Sun to semi-shade	Moist		•	•	•	•			•	
	ubs / Small	River Mint	Mentha australis	Lamiaceae	' '	< 0.3 m	White			Shade to semi-shade			•	•	•			•		
	ubs / Small ubs / Small	Twiggy Daisy Bush Common Rice Flower	Olearia ramulosa Pimelea humilis	Asteraceae Thymelaeaceae	Riparian Forest, Damp Forest Woodland, Forest	<1 m	White-cream			Semi-shade Sun to semi-shade	Moist to dry		•	•				•	•	
	ubs / Small	Common Flat-pea	Platylobium obtusangulum	Lamiaceae	Heathland, Woodland	<1 m	Red & Yellow			Sun to semi-shade	Moist to dry				•					
	ubs / Small	Creamy Stackhousia	Stackhousia monogyna	Celastraceae	Heathland, Woodland, Open Forest		White			Sun to semi-shade	Moist to dry		•	•				•	• •	
		Wirilda	Acacia provincialis	Fabaceae	Woodland, Open Forest	6–8 m	Pale Yellow	0		Sun to semi-shade	Dry	•		•	•				•	,
Shru	ubs / Medium	Common Apple Berry	Billardiera scandens	Pittosporaceae	Woodland, Dry Open Forest	< 3 m	White	0		Sun to semi-shade	Dry	•	•	•				•	•	
	ubs / Medium	Shining Cassinia	Cassinia longifolia	Asteraceae	Dry Open Forest	< 3 m	White			Sun to semi-shade	Dry to moist	•	•	•	•			•	• •	
	ubs / Medium	Hop Bush	Dodonaea viscosa	Sapindaceae	,	3–4 m	Pink			Sun to semi-shade	Dry	•	•	•	•	•				
		Turkey Bush	Eremophila deserti	Scrophulariaceae	, ,	< 4 m	Cream			Sun to comi charde	Dry to moist	•	•	•	•	•	•	•	•	
	ubs / Medium ubs / Medium	Silky Hakea Woolly Tea Tree	Hakea decurrens Leptospermum lanigerum	Proteaceae Myrtaceae	Woodland, Forest Woodland, Heathland, Forest	1–5 m 4 m	White-Pink White			Sun to semi-shade Sun to semi-shade	Dry to moist Wet to moist						•		• •	
. Chru	ubs / Medium	•	Melicytus dentatus	Violaceae			Pale Yellow			Sun	Moist to dry	•	•	•	•	•		•	•	
9		Sticky Boobialla	Myoporum petiolatum		Heathland, Shrubland	< 2 m	White-Pink			Sun	Moist to dry	•	•	•	•		•	•	• •	,
Shru	ubs / Medium	Tree Everlasting	Ozothamnus ferrugineus	Asteraceae	Moist Forest	2–5 m	White	0		Sun to semi-shade	Moist		•	•				•	• •	
31.7	ubs / Medium	Kangaroo Apple, Poroporo	Solanum laciniatum	Solanaceae	· · · · · · · · · · · · · · · · · · ·	2–3 m	Purple			Sun to semi-shade	Moist to dry	•*		•			•			
	9	Gold Dust Wattle	Acacia acinacea	Fabaceae	, ,	< 2.5 m	Yellow			Sun	Dry	•		•	•		•	•	• •	•
	ubs / Large	Kurwan; Sweet Bursaria; Blackthorn	Bursaria spinosa	Pittosporaceae	Woodland, Shrubland	4–6 m	White			Sun to semi-shade	Dry	•	•	•	•		•	•	• •	
	ubs / Large ubs / Large	River Bottlebrush Rock Correa	Callistemon sieberi Correa glabra	Myrtaceae Rutaceae	Woodland, Riparian Woodland, Heathland, Shrubland	4 m < 2.5 m	Pink Green-Cream			Sun to semi-shade Sun	Wet to moist Dry to moist	•		•	•	•	•	•	• •	
	ubs / Large	Native Hemp Bush	Gynatrix pulchella	Malvaceae	, ,	4 m	Green-white			Semi-shade	Moist	•	•	•			-	•		
	ubs / Large	Swamp Paperbark	Melaleuca ericifolia	Myrtaceae	Riparian, Wetland	< 7 m	White	Ö		Sun to semi-shade	Wet to moist	•	•	•	•	•		•	• •	•
	ubs / Large	Hazel Pomaderris	Pomaderris aspera	Rhamnaceae	Wet Forest	2–15 m	White	Ŏ		Semi-shade	Wet to moist		•	•				•	•	
	ubs / Large	Victorian Christmas Bush	Prostanthera lasianthos	Lamiaceae	Woodland, Open Forest	1-6 (< 12) m		Ŏ		Semi-shade	Dry to moist	•	•	•	•			•		
		Lightwood	Acacia implexa	Fabaceae	Open Forest, Woodland		Pale Yellow			Sun	Dry	•		•	•		•	•	• •	
	es / Small es / Small	Golden Wattle Prickly Moses	Acacia pycnantha Acacia verticillata	Fabaceae	Woodland Woodland	5 m	Yellow Yellow			Full sun Sun	Moist to dry	•		•	•		•	•	• •	
	es / Small	Muttonwood	Myrsine howittiana	Fabaceae Primulaceae	Riparian Forest, Tall Open Forest	< 15 m	Cream			Shade	Moist to dry Moist	•	•							,——
		Silver Wattle	Acacia dealbata	Fabaceae	· · · · · · · · · · · · · · · · · · ·	3–30 m	Yellow			Sun to semi-shade	Dry	•	-	•	•		•	•	• •	
	es / Medium	Blackwood	Acacia melanoxylon	Fabaceae	Woodland, Forest		Pale Yellow			Sun to semi-shade	Dry	•		•	•		•	•	• •	•
en Trees	es / Medium	Black Sheoak	Allocasuarina littoralis	Casuarinaceae	Grassland, Woodland	5–11 m	Red & Yellow			Sun	Dry	•		•	•	•				
	es / Large	Red Gum	Eucalyptus camaldulensis	Myrtaceae	Woodland, Open Forest, Riparian	< 40 m	Cream			Sun	Dry to wet	•	•	•	•		•	•	• •	•
		Yellow Gum	Eucalyptus leucoxylon	Myrtaceae	Woodland, Forest	< 25 m	Cream-pink			Sun	Moist to dry		•	•	•		•	•	• •	
116.	es / Large	Yellow Box Red Box	Eucalyptus melliodora	Myrtaceae	Woodland Forest	< 30 m	White	<u> </u>		Sun	Moist to dry		•	•	•		•	•	• •	
S.	-	Iron Bark	Eucalyptus polyanthemos Eucalyptus tricarpa	Myrtaceae Myrtaceae	Woodland, Forest Woodland, Forest	< 30 m	White-pink			Sun Sun	Moist to dry Moist to dry		•		•		•	•	• •	
	es / Large	Manna Gum	Eucalyptus viminalis	Myrtaceae	Woodland, Forest	25 m	White			Sun	Moist to dry	•	•	•	•		•	•	•	
	d garden plants		/ / / / / / / / / / / / / / / / /	.,											-		-			
Annu		Sunflower, Lettuce,	Helianthus, Lactuca sp.	Asteraceae			Yellow	_		Sun	Dry to moist	•	•	•	•	•	•	•	• •	
Annu		Fennel, Carrot, Parsley		Apiaceae			Green-Yellow			Sun	Moist	•	•		•	•				•
Annu		Rocket, Kale, Broccoli, Cauliflower	Brassica sp.	Brassicaceae	Ornamental and Horticulture	<1 m	Cream-Yellow			Sun	Moist	•	•	•	•	•	•	•	• •	•
		Onion, Garlic, Leek	Allium sp.	Amaryllidaceae	Ornamental and Horticulture	<1 m	White-Purple			Sun to somi shada	Moist	•	•	•	•	•	•	•	• •	
		Mint, Sage, Salvia, Lavender, Basil Apple, Quince, Cherry, Almond	Mentha, Salvia, Lavandula, Ocimum sp. Malus, Cydonia, Prunus sp.	Lamiaceae Rosaceae		1–3 m 1–5 m	White-Blue-Red White-Pink			Sun to semi-shade Sun	Dry Moist	•		•	•	•	•	•	• •	•
1166	Jo / Giridii	Apple, Quince, Cherry, AllHona	maras, cyaoma, maras sp.	NOSACEGE	omamental and Homeundre	1 3111	WING THIK			Suii		Buzz Poll								

*Buzz Pollinated

Know your pollinators



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.



Australian native bees comprise more than 2000 species, 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.



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 small 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.



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.



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.



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.



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



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.



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 pollencollecting 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

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

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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, *Lasioglossum* (Parasphecodes) hiltacum.
- 2. Aerial view over northern suburban Melbourne. (Photo: Shutterstock)
- 3. European honey bees, Apis mellifera. (Photo: Kirrily Hughes)

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