Southeast Queensland

Powerful pollinators

Encouraging insect pollinators in rural and urban landscapes

Pollinators are an essential component of healthy, biodiverse landscapes and provide critical pollination services to native flora and agriculture production across the country.

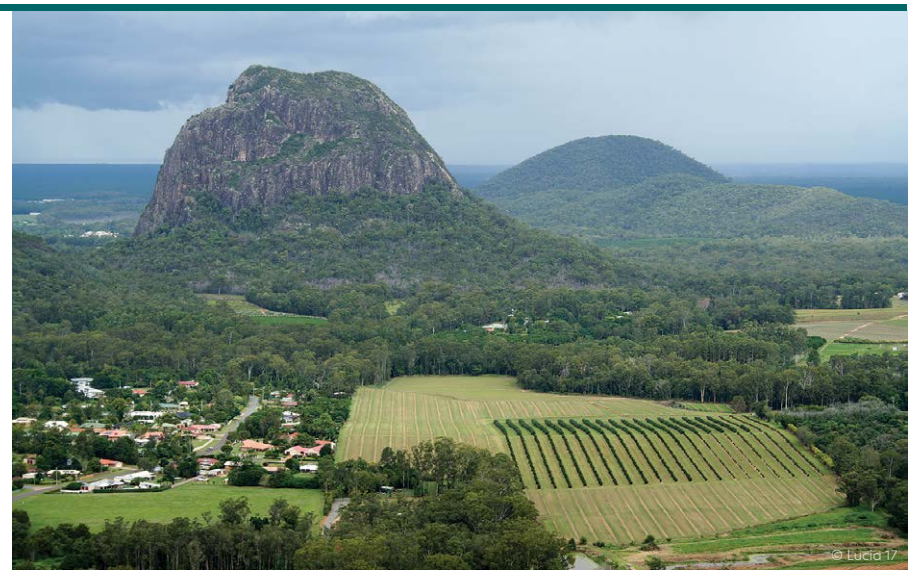
This guide provides information on ways to encourage a diverse range of insect pollinators across all properties, and includes a planting calendar to help select plants to support diverse pollinators throughout the year.

WHEEN BEE FOUNDATION

The power of pollinators

Pollinators – mostly insects, but also birds and mammals – assist the production 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 fertilisation, 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, pastures, crops, fruits and vegetables.



Native vegetation supports pollinators by providing food and nesting sites. Nearby crops and pastures will benefit from the increased abundance and diversity of pollinators in the landscape.

Pollinators and food security

Without insect pollinators, the quantity and diversity of food grown for humans in contemporary agricultural systems would be severely restricted. Many of the food crops we eat, as well as pasture and fodder crops, benefit from pollination by insects.

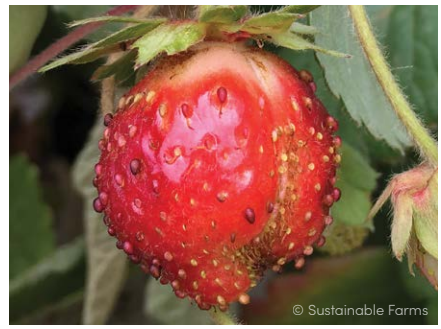
Pollinator-dependent crops include macadamias, avocados, strawberries and vegetables, as well as many crops grown for seed production, such as canola, sunflowers and clovers.

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

Grazing enterprises can also suffer from a reduction in the abundance or diversity of pollinators, due to the role these insects play in the persistence of nitrogen-fixing pasture legumes such as clover.

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

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.

Healthy ecosystems

Pollinators are both essential to, and depend upon, healthy ecosystems. A growing human population and increasing demand for food puts pressure on ecosystems, while declining ecosystem function will in turn negatively impact food production.

Insect pollinators are a prime example of this — without healthy ecosystems and the presence of patches of native vegetation to support insect populations, pollination will decline. This will threaten both crop productivity and the persistence of native, pollinator-dependent flowering plants.

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 annual Australian Pollinator Count to learn more about pollinators in your area – visit: **AustralianPollinatorWeek.org.au** and **AustralianPollinatorCount.au**

Encouraging pollinators on your property

Create pollination reservoirs

Pollination reservoirs are areas of native plant species that provide floral resources for pollinators. They can be new plantings or existing habitat, such as shelterbelts or remnant vegetation. 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 crops to ensure that pollinators can fly easily to them.

Use existing habitat

Protect and improve existing habitat where possible. Roadsides, shelterbelts, dam margins, woodlands, grasslands, rocky areas, river and creek edges can all be important pollinator-attracting areas, bringing valuable pollination services to your property.

Native vegetation stands provide habitat for pollinators, and special attention should be paid to enhance and protect these areas.

Get to know your local flora

Each property and region will have distinct populations of insects, based on the plants and climate. Identifying and understanding the insects in your area will help you develop better plantings.

The plants growing in nearby bush will be well suited to the climate and soils in your region. Local community groups and specialist native nurseries can provide useful information and usually produce local plant species.

Plant trees, shrubs and groundcovers

Planting a variety of species of groundcovers, shrubs and trees on your property will further attract pollinators to your area. Use a combination of direct seed sowing and planting tube stock to establish new vegetation. Initial watering and protection from grazing will improve the success rate of young plants. Wildflowers, including our native pea species, are excellent at attracting a diverse range of native pollinators.

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 neighbours and other landholders to plant for pollinators and create connections across your landscape.

Utilise ecotones

Ecotones are the margins between two different habitats. Ecotones often contain a more diverse mixture of pollinator species because they are inhabited by pollinators from both habitats. Protect and utilise ecotones such as the transition zones between woodland and grassland, or heath and shrubland, to create highly diverse floral and insect communities.

Amplify the flower signal

Plants have evolved large flowers or clusters of smaller flowers which 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, groundcovers, herbs, lilies, rushes, climbers, shrubs and trees.

Plant for the future

When establishing pollinator habitat, consider including species that are indigenous to your area and can tolerate increasingly warmer and drier (or wetter) conditions, to improve resilience to 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.

Double the crop value

Plants that are pollinator-attracting may be commercially viable crop species in their own right and can be used to diversify farm production. Bush foods such as Native Ginger, Finger Lime, Lemon Myrtle and many more are in high demand for use in fresh and manufactured products. Native plant seed is also needed for revegetation projects. Farmers can also support beekeepers by hosting beehives to increase pollinator numbers on a farm.

Reduce chemical use

Insecticides, fungicides and herbicides all affect the health of bees, bee colonies and native pollinators. Herbicides can impact pollinators by reducing the availability and diversity of flora and removing vegetation that helps support insect life. Some herbicides can also harm the beneficial microbes in the insect gut. In many circumstances, beneficial insects will, in healthy numbers, help control pest insects, ultimately reducing the need for insecticide use.

When chemical pest control is unavoidable, select products that are least harmful for pollinators and apply insecticides in the evening or at night when pollinators are not active.

Always use according to directions, especially for withholding periods, and notify beekeepers a few days before spraying chemicals so beehives can be safely relocated away from harm.

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

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 beehive to promote pollinators, but there are serious legal and biosecurity responsibilities that must be considered, and that the introduction of a beehive 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 the Southeast Queensland region

Healthy populations of insect pollinators are important for crop yields, orchard production and thriving native vegetation.

This planting guide will help you choose plant species to attract and keep pollinators on your property throughout the year.

Southeast Queensland stretches from the Sunshine Coast to the Gold Coast and west to the Great Dividing Range. It is highly urbanised, but still contains a diverse range of landscapes from ancient rainforests and wetlands to woodlands and wallum heaths. The subtropical climate, characterised by mild winters, hot and humid summers, and high rainfall along the coastline, makes the region highly flood-prone. Crops include tropical fruits and nuts on the coast and herbs and vegetables in the valleys, accounting for half the state's horticultural production. A diversity of pollinators are active throughout the year, including bees and other insects, birds and bats.

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

The eucalypt species in the chart have been selected as high quality honey production 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' (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 later flowering.

Sourcing plants

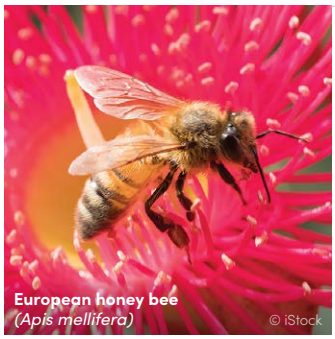
Most of the plant species listed are available from retail or wholesale nurseries or native plant growers, and local environment groups. If you can't source these plants at your local garden centre, or indigenous nursery, ask them to contact the local nursery suppliers and plant growers listed online.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

WheenBeeFoundation.org.au

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
Crop plants																														
Forbs / Herbs	Brassicas	*Brassica rapa, B. oleracea*	Brassicaceae	Cultivated	0.3 m	White, Yellow													Sun	Moist to dry	●	●	●	●	●		●	●	●	●
Forbs / Herbs	Strawberry	*Fragaria × ananassa*	Rosaceae	Cultivated	0.2 m	White, Pink													Sun to semi-shade	Moist	●*	●	●	●	●	●	●	●	●	●
Forbs / Herbs	Rosemary, Sage	*Salvia rosmarinus, S. officinalis*	Lamiaceae	Cultivated	1 m	Blue, Purple, White, Pink													Sun	Dry	●	●	●	●	●	●	●	●		
Shrub	Chili, Capsicum	*Capsicum annuum*	Solanaceae	Cultivated	0.3–2 m	White													Sun	Dry to moist	●	●	●	●						
Shrub	Tomato	*Solanum lycopersicum*	Solanaceae	Cultivated	1–3 m	Yellow													Sun to semi-shade	Moist	●*		●							
Tree	Macadamia, Bauple Nut	*Macadamia tetraphylla x integrifolia*	Proteaceae	Cultivated	5–20 m	Cream, White, Pink													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Vine	Passionfruit	*Passiflora edulis*	Passifloraceae	Cultivated	Climber	Purple													Sun	Dry to moist	●	●	●	●	●	●	●			
Indigenous plants																														
Forbs / Herbs	Dwarf Ginger	*Alpinia arundelliana*	Zingiberaceae	Wet Sclerophyll Forest, Rainforest	< 2 m	Pink, Red													Sun to semi-shade	Moist	●	●	●							
Forbs / Herbs	Native Ginger	*Alpinia caerulea*	Zingiberaceae	Rainforest, Coastal	3 m	White													Semi-shade to shade	Moist to dry	●	●	●							
Forbs / Herbs	Yellow Buttons	*Chrysocephalum apiculatum*	Asteraceae	Grassland, Woodland	0.4 m	Yellow													Sun	Moist to dry	●	●	●	●	●	●	●		●	●
Forbs / Herbs	Bush Basil	*Coleus graveolens*	Lamiaceae	Forest, Woodland, Heathland	1 m	Blue, Mauve													Sun to semi-shade	Moist to dry	●	●	●	●	●		●			●
Forbs / Herbs	Common Flax-Lily	*Dianella caerulea*	Asphodelaceae	Woodland, Heath	0.7 m	Blue													Sun to semi-shade	Dry to moist	●*		●							
Forbs / Herbs	Dune Fan Flower	*Scaevola calendulacea*	Goodeniaceae	Coastal	0.4 m	Purple													Sun	Dry		●	●	●	●	●	●			●
Forbs / Herbs	Golden Everlasting	*Xerochrysum bracteatum*	Asteraceae	Forest, Woodland, Grassland	0.2–0.8 m	Yellow													Sun	Moist to dry		●	●	●	●		●			
Herb to shrub	Native Rattlepod	*Crotalaria linarifolia*	Fabaceae	Dry Sclerophyll Forest	0.4 m	Yellow													Sun	Dry to moist	●	●	●	●			●			
Herb to shrub	Wax Flower	*Philotheca myoporoides*	Rutaceae	Heathland, Dry Sclerophyll Forest	0.8–1 m	White, Pink													Sun, light shade	Dry	●	●	●	●		●	●	●		
Herb to shrub	Queensland Wax Flower	*Philotheca queenslandica*	Rutaceae	Heathland, Dry Sclerophyll Forest	1 m	White, Pink													Sun	Dry	●	●	●	●		●	●			
Herb to shrub	Woollsia	*Woollsia pungens*	Ericaceae	Heathland, Dry Sclerophyll Forest, Woodland	0.6–1 m	White, Pink, Purple, Mauve													Light shade	Dry	●	●	●	●			●	●		
Lilies + Irises	Cunjevoi, Spoon Lily	*Alocasia brisbanensis*	Araceae	Rainforest	1–1.8 m	Green, Cream													Semi-shade to shade	Moist	●		●						●	●
Palm	Picabeen Palm	*Archontophoenix cunninghamiana*	Arecaceae	Rainforest	6–25 m	Pink													Sun	Moist	●	●	●	●	●	●	●		●	●
Shrub	Weeping Baeckea	*Baeckea frutescens*	Myrtaceae	Wood & Heathland, Dry Sclerophyll Forest	1–3 m	White													Sun	Dry	●	●	●	●	●	●	●	●	●	●
Shrub	Sweet Bursaria	*Bursaria spinosa*	Pittosporaceae	Dry Sclerophyll Forest, Woodland	< 10 m	Cream													Sun to semi-shade	Dry to moist	●	●	●	●	●	●	●	●	●	●
Shrub	Heathy Parrot Pea	*Dillwynia retorta*	Fabaceae	Heath, Dry Sclerophyll Forest	3 m	Yellow													Sun	Dry	●	●			●		●			
Shrub	Prickly Tea-Tree	*Leptospermum juniperinum*	Myrtaceae	Forest, Heath, Swampy Ground	2–3 m	White													Sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrub	Jellybush	*Leptospermum polygalifolium*	Myrtaceae	Woodland	1–7 m	White													Sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrub	Small-Leaved Geebung	*Persoonia virgata*	Proteaceae	Heath, Forest	3 m	Yellow													Sun	Moist	●	●	●	●						
Shrub	Hairy Bush Pea	*Pultenaea villosa*	Fabaceae	Heath, Dry Sclerophyll Forest	2 m	Yellow													Sun	Moist to dry	●	●	●	●			●			
Shrub	Baeckea	*Sannantha bidwillii*	Myrtaceae	Wet & Dry Sclerophyll Forest	2–4 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Shrub	Flannel Weed	*Sida cordifolia*	Malvaceae	Woodland, Dry Sclerophyll Forest	1 m	Yellow, Orange													Sun	Dry to moist	●	●	●	●			●		●	●
Shrub	Kangaroo Apple	*Solanum aviculare*	Solanaceae	Wet & Dry Sclerophyll Forest	1–4 m	Mauve, Blue, Purple													Sun to semi-shade	Moist to dry	●*		●							
Shrub	Banana Bush	*Tabernaemontana pandacaqui*	Apocynaceae	Wet Sclerophyll Forest, Rainforest	1–3 m	White													Semi-shade to shade	Moist	●	●					●			
Shrub to tree	Logan Apple	*Acronychia imperforata*	Rutaceae	Coastal, Rainforest	6–10 m	Cream, Yellow													Sun to semi-shade	Dry to moist	●	●	●				●			
Shrub to tree	Lemon Myrtle	*Backhousia citriodora*	Myrtaceae	Rainforest	3–8 m	White													Sun to semi-shade	Dry	●	●	●	●	●	●	●	●	●	●
Shrub to tree	Wallum Banksia	*Banksia aemula*	Proteaceae	Heathland, Woodland, Coastal	3–6 m	Yellow, Green													Sun	Dry	●	●	●	●	●	●	●		●	●
Shrub to tree	Finger Lime	*Citrus australasica*	Rutaceae	Rainforest	4–10 m	White, Cream, Pink, Yellow													Sun to semi-shade	Moist to dry	●	●	●	●						
Shrub to tree	Lolly Bush	*Clerodendrum floribundum*	Lamiaceae	Coastal, Rainforest	2–10 m	White													Sun to semi-shade	Dry	●	●	●				●	●	●	
Shrub to tree	Flax-Leaved Paperbark	*Melaleuca linariifolia*	Myrtaceae	Variable	6–10 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Shrub to tree	Brush Cherry	*Syzygium australe*	Myrtaceae	Rainforest	3–10 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●		
Shrub to tree	Riberry	*Syzygium luehmannii*	Myrtaceae	Rainforest	2–15 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●		
Shrub to tree	Blue Lilly Pilly	*Syzygium oleosum*	Myrtaceae	Rainforest, Wet & Dry Sclerophyll Forest	4–7 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●		
Tree	Hollywood, White Holly	*Auranticarpa rhombifolia*	Pittosporaceae	Rainforest	9–15 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree	Coast Banksia	*Banksia integrifolia*	Proteaceae	Coastal	4–10 m	Yellow, Cream													Sun to semi-shade	Dry	●	●	●	●	●	●			●	●
Tree	Red Bloodwood	*Corymbia gummifera*	Myrtaceae	Dry Sclerophyll Forest, Woodland	30 m	White													Sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree	Pink Bloodwood	*Corymbia intermedia*	Myrtaceae	Dry Sclerophyll Forest	30 m	White													Sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree	Green Tamarind	*Elattostachys nervosa*	Sapindaceae	Rainforest	10–20 m	Yellow, Pink													Sun	Moist to dry	●	●	●	●						
Tree	Narrow-Leaved Ironbark	*Eucalyptus crebra*	Myrtaceae	Dry Sclerophyll Forest, Woodland	25–35 m	White													Sun	Dry to moist	●	●	●	●	●	●	●	●	●	●
Tree	Scribbly Gum	*Eucalyptus racemosa*	Myrtaceae	Dry Sclerophyll Forest	15–20 m	White													Sun	Dry	●	●	●	●	●	●	●	●	●	●
Tree	Forest Red Gum	*Eucalyptus tereticornis*	Myrtaceae	Dry Sclerophyll Forest, Woodland	18–45 m	White													Sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree	Cheese Tree	*Glochidion ferdinandi*	Phyllanthaceae	Wet Sclerophyll Forest, Coastal	10–25 m	Green, Yellow													Sun	Moist	●	●	●		●					
Tree	Silky Oak	*Grevillea robusta*	Proteaceae	Wet Sclerophyll Forest, Rainforest	30 m	Yellow, Orange													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	
Tree	Brush Box	*Lophostemon confertus*	Myrtaceae	Wet Sclerophyll Forest, Rainforest	10–25 m	White													Sun	Moist to dry	●	●	●	●	●	●	●			
Tree	Swamp Box	*Lophostemon suaveolens*	Myrtaceae	Swampy Ground	10–25 m	White													Sun	Moist	●	●	●	●	●	●	●			
Tree	Broad-Leaved Paperbark	*Melaleuca quinquenervia*	Myrtaceae	Swampy Ground	10–15 m	White													Sun	Moist	●	●	●	●	●	●	●	●	●	●
Tree	Euodia, Pink Doughwood	*Melicope elleryana*	Rutaceae	Rainforest	10–25 m	Pink													Semi-shade to shade	Moist to dry	●	●	●			●	●		●	
Tree	Green Bolly Gum	*Neolitsea australiensis*	Lauraceae	Rainforest	15 m	Cream													Sun to semi-shade	Moist to dry	●		●	●						
Tree	Celerywood	*Polyscias elegans*	Araliaceae	Rainforest	10–25 m	Purple													Sun	Moist	●	●	●	●		●	●			
Tree	Turpentine	*Syncarpia glomulifera*	Myrtaceae	Wet Sclerophyll Forest	25–60 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●		●	●		●
Tree	Water Gum	*Tristaniopsis laurina*	Myrtaceae	Rainforest, Wet Sclerophyll Forest	10–15 m	Yellow													Sun to semi-shade	Moist	●	●	●	●	●	●	●		●	●
Vines & Climbers	Blood Vine	*Austrosteenisia blackii*	Fabaceae	Rainforest	Climber	Mauve, Red, Pink													Sun to semi-shade	Moist to dry	●	●	●				●			
Vines & Climbers	Native Grape	*Cissus hypoglauca*	Vitaceae	Wet Sclerophyll Forest	Climber	Yellow													Semi-shade to shade	Moist to dry	●	●	●	●	●	●	●		●	●
Vines & Climbers	Headache Vine	*Clematis glycinoides*	Ranunculaceae	Forest, Woodland	Climber	White													Light shade	Moist	●	●	●	●	●	●	●	●	●	●
Vines & Climbers	Wombat Berry	*Eustrephus latifolius*	Asparagaceae	Variable	Climber	Pink, Mauve, White													Semi-shade to shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Vines & Climbers	Twining Glycine	*Glycine clandestina*	Fabaceae	Dry Sclerophyll Forest	Scrambler	Blue, Mauve, White													Sun to semi-shade	Moist to dry	●	●	●	●						
Vines & Climbers	Woolly Glycine	*Glycine tomentella*	Fabaceae	Coastal	Scrambler	Purple													Sun to semi-shade	Moist to dry	●	●	●	●						
Vines & Climbers	Sweet Morinda	*Gynochthodes jasminoides*	Rubiaceae	Rainforest, Wet & Dry Sclerophyll Forest	Climber	White, Cream, Pink, Yellow													Semi-shade to shade	Moist to dry	●	●	●				●	●		
Vines & Climbers	Wonga Vine	*Pandorea pandorana*	Bignoniaceae	Rain & Dry Sclerophyll Forest, Woodland	Climber	White, Cream, Purple													Sun to semi-shade	Moist to dry	●	●	●	●			●	●		
Vines & Climbers	Monkey Rope Vine	*Parsonsia straminea*	Apocynaceae	Rainforest	Climber	Cream													Semi-shade to shade	Moist to dry		●	●	●		●	●	●		

*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

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 *Austroplebeia* 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, many flies (Brachycera) have very small, clubbed antennae at the front of their head. Flies, including blowflies, are often attracted to flowers that smell like carrion. Some flower-flies, 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 excellent biocontrol agents.

Fiddler Beetle
(Eupoecila australasiae) © Erica Siegel

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. Some 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

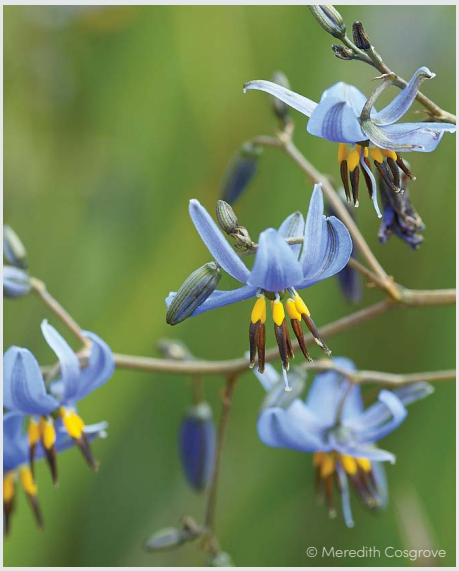
Some flowers do not produce any nectar; they specifically target pollen-collecting bees, and only offer pollen rewards. To limit pollen loss and ensure effective pollination, some plants produce flowers with specialised, tubular anthers, that only open at the tip. To extract pollen, bees use vibrations 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, 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.



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 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.

SCAN ME

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. *Lasioglossum* bee on *Solanum melongena* (eggplant) flower. (Photo: Adli Wahid)
2. Brisbane CBD seen from Mount Coot-tha Lookout. (Photo: Kgbo)
3. European honey bees, *Apis mellifera*. (Photo: Kirrily Hughes)

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