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.

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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 mango, papaya, chili and capsicum, as well as crops grown for seed production.

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 Beach Bean, Cabbage Palm, Geebung 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.

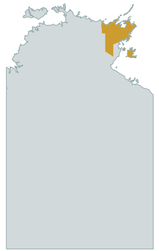
When chemical pest control is unavoidable, select products that are least harmful for pollinators and apply insecticides in the evening or at night when pollinators are not active.

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 North East Arnhem Land region, Northern Territory



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.

North East Arnhem Land sits within the Arnhem Coast bioregion in northeast Northern Territory. The region contains a diverse range of plant communities on sandstone and mudstone derived sedimentary soils with scattered granite outcrops. Near the coast, mangroves, vine thickets and monsoon forests are common, while eucalypt woodlands and savannas are dominant in the hinterlands. The monsoonal tropical climate sees high temperatures throughout the year with a distinct wet (Nov to Apr) and dry season (May to Oct). The diverse landscapes of this region provide a rich array of bush tucker that are important for local communities and wild plant species of cultural and medicinal value.

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	Uses	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	Ginger	*Alpinia galangal*	Zingiberaceae	Commercial crop, Garden crop	Cultivated	1–2 m	Greenish White		Semi-shade to shade	Moist to dry	●	●	●							
Forbs / Herbs	Chili	*Capsicum annuum*	Solanaceae	Garden crop	Cultivated	< 1 m	White		Full sun to semi-shade	Moist to dry	●	●	●	●						
Forbs / Herbs	Banana	*Musa* spp.	Musaceae	Commercial crop, Garden crop	Cultivated	> 5 m	Red, White, Yellow		Full sun	Moist to dry		●		●		●	●			●
Forbs / Herbs	Snake Bean	*Vigna unguiculata*	Fabaceae	Commercial crop, Garden crop	Cultivated	< 1 m	Lavender		Full sun	Moist to wet	●	●	●	●			●			
Tree (Small)	Papaya	*Carica papaya*	Caricaceae	Garden crop	Cultivated	2–4 m	White, Yellow		Semi-shade to full sun	Moist to dry	●	●	●	●				●		
Tree	Mango	*Mangifera indica*	Anacardiaceae	Commercial crop, Garden crop	Cultivated	> 10 m	White, Pink		Full sun	Dry to moist	●	●	●		●				●	●
Forbs / Vine	Sweet Potato	*Ipomea batatas*	Convolvulaceae	Garden crop	Cultivated	> 4m Long	Lavender		Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Bush tucker plants																				
Forbs / Herbs	Wild Cucumber	*Cucumis melo*	Cucurbitaceae	Bush tucker, Traditional medicine	Widespread	< 0.5 m	Yellow		Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Forbs / Herbs	Beach Bean	*Canavalia rosea*	Fabaceae	Bush tucker	Coastal	0.5 m	Pink		Sun to semi-shade	Dry	●	●	●	●			●			
Palm	Cabbage Palm	*Livistona humilis*	Arecaceae	Bush tucker, Traditional medicine	Woodlands	< 7 m	Yellow, Cream		Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●		●	●
Shrub (Large)	Geebung, Wild Pear	*Persoonia falcata*	Proteaceae	Bush tucker, Traditional medicine	Woodlands	< 8 m	Yellow		Sun to semi-shade	Dry	●		●							
Shrub (Large)	Wild Prune, Mangarr	*Sersalisia sericea*	Sapotaceae	Bush tucker, Fire wood	Vine thickets, Forest	2–6 m	Cream		Sun to semi-shade	Moist to dry	●	●	●						●	
Tree (Small)	Blackcurrant Tree	*Antidesma ghaesembilla*	Phyllanthaceae	Bush tucker, Traditional medicine	Monsoon forests	< 8 m	Yellow-green		Sun to semi-shade	Moist	●	●	●						●	
Tree (Small)	Wild Cassava, Kapok	*Cochlospermum gillivraei*	Bixaceae	Bush tucker, Fibers & soft filling	Woodlands	3–12 m	Yellow-green		Sun to semi-shade	Dry	●	●	●	●						
Tree (Small)	Yellow Tulipwood	*Drypetes deplanchei*	Putranjivaceae	Bush tucker, Carving	Vine thickets, Forest	8–15 m	Brown-cream		Shade	Moist		●	●						●	●
Tree (Small)	Cocky Apple	*Planchonia careya*	Lecythidaceae	Bush tucker, Antiseptic	Woodlands	4–6 m	White, Pale green, Light pink		Sun to semi-shade	Moist to dry	●	●	●	●		●				
Tree (Small)	Red-Fruited Kurrajong	*Sterculia quadrifida*	Malvaceae	Bush tucker, Traditional medicine	Widespread	< 12 m	Yellow-green		Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree (Small)	Red Apple	*Syzygium suborbiculare*	Myrtaceae	Bush tucker, Traditional medicine	Woodlands, Savanna	< 14 m	Yellow-green		Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree (Small)	Bush Potato	*Vigna lanceolata*	Fabaceae	Bush tucker, Dreaming rituals	Woodlands	0.5 m	Yellow		Sun to semi-shade	Moist to dry	●	●	●	●			●			
Vines & Climbers	Wild Grape	*Ampelocissus acetosa*	Vitaceae	Bush tucker, Traditional medicine	Woodlands	< 5 m	Burgandy, Dark red		Semi-shade	Moist	●	●	●	●	●	●	●		●	●
Indigenous plants																				
Forbs / Herbs	Ditjgala	*Cartonema spicatum*	Commelinaceae		Woodlands	< 0.4 m	Yellow, Pale yellow		Full sun	Dry to moist	●	●	●						●	
Forbs / Herbs	Wild Gardenia	*Gardenia megasperma*	Rubiaceae	Traditional medicine	Woodlands	3–6 m	White		Sun to semi-shade	Moist to dry		●		●			●	●		
Forbs / Herbs	Woolly Glycine	*Glycine tomentella*	Fabaceae	Traditional & Western medicine	Woodlands, Savanna	< 0.5 m	Pink, Red		Sun to semi-shade	Dry	●	●	●	●			●			
Forbs / Herbs	Batchelors Buttons	*Gomphrena canescens*	Amaranthaceae	Cut flowers	Woodlands	< 0.5 m	Pink		Full sun	Dry	●	●	●	●	●		●	●	●	
Forbs / Herbs	Goodenia	*Goodenia pilosa*	Goodeniaceae		Widespread	< 0.5 m	Yellow		Sun to semi-shade	Moist		●	●							
Forbs / Herbs	Native Holly	*Hypoestes floribunda*	Acanthaceae	Traditional medicine	Woodlands	0.5–1 m	Pink		Shade	Moist	●	●	●	●			●			
Forbs / Herbs	Goat's Foot Convolvulus	*Ipomoea pes-caprae*	Convolvulaceae	Traditional medicine	Coastal	< 0.5 m	Pink		Full sun	Dry	●	●	●	●	●	●	●	●	●	●
Forbs / Herbs	Polycarpaea	*Polycarpaea violacea*	Caryophyllaceae		Open habitats	< 0.8 cm	Pink		Full sun	Dry	●	●	●	●		●				
Forbs / Herbs	False Buttonweed	*Spermacoce calliantha*	Rubiaceae		Widespread	0.8 m	Purple, Blue		Sun to semi-shade	Moist to dry		●	●	●	●	●	●			
Shrub (Small)	Star Boronia	*Boronia lanuginosa*	Rutaceae		Woodlands	< 1.5 m	Pink, Red, Cream		Semi-shade	Moist to dry	●	●	●	●			●	●		
Shrub (Small)	Holly-Leaved Pea Flower	*Bossiaea bossiaeoides*	Fabaceae		Woodlands	0.5–3 m	Yellow		Full sun	Moist to dry	●	●	●	●			●			
Shrub (Small)	Turkey Bush	*Calytrix exstipulata*	Myrtaceae	Traditional medicine	Widespread	1–2 m	Red, Pink, White		Sun to semi-shade	Dry	●	●	●	●	●	●	●	●	●	●
Shrub (Small)	Caustic Vine	*Cynanchum viminale*	Apocynaceae	Traditional medicine	Rocky habitats	< 1.5 m	White		Full sun	Dry	●	●	●	●		●	●	●		
Shrub (Small)	Bitter Pea	*Daviesia reclinata*	Fabaceae		Woodlands	1–2 m	Yellow		Full sun	Dry	●	●	●	●			●			
Shrub (Small)	Flame Grevillea	*Grevillea pungens*	Proteaceae		Woodlands, Savanna	< 3 m	Pink, Orange		Full sun	Dry	●	●	●	●						
Shrub (Small)	Dysentry Bush, Dog's Balls	*Grewia savannicola*	Malvaceae	Traditional medicine	Open habitats	< 2 m	White		Full sun	Dry	●	●	●	●	●	●	●	●	●	●
Shrub (Small)	Helicteres	*Helicteres cana*	Malvaceae	Traditional medicine	Woodlands	2 m	Pale pink		Sun to semi-shade	Dry to moist		●	●				●	●		
Shrub (Small)	Guinea Flower	*Hibbertia complanata*	Dilleniaceae		Savanna	1.5 m	White, Pale pink		Sun to semi-shade	Dry	●		●						●	
Shrub (Small)	Guinea Flower	*Hibbertia dealbata*	Dilleniaceae		Woodlands	2 m	Yellow		Sun to semi-shade	Moist to dry	●		●	●					●	
Shrub (Small)	Jasmine	*Jasminum didymum*	Oleaceae	Tea	Rainforests, Woodlands	< 3 m	White, Cream		Sun to shade	Moist to dry		●	●	●			●	●		
Shrub (Small)	Native Jasmine	*Jasminum elongatum*	Oleaceae	Traditional medicine	Vine thickets, Forest	< 1.5 m	White, Cream		Sun to shade	Moist to dry		●	●	●			●	●		
Shrub (Small)	Tea Tree	*Melaleuca acacioides*	Myrtaceae	Fire wood; Building material	Salt flats, Mangroves	2–5 m	White, Cream		Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Shrub (Small)	Strychnine Bush	*Petalostigma quadriloculare*	Picrodendraceae	Traditional medicine	Woodlands, Savanna	1 m	Cream		Full sun	Moist to dry	●		●		●					●
Shrub (Small)	Bootlace Plant	*Wikstroemia indica*	Thymelaeaceae	Traditional medicine	Forests	< 2 m	Yellow-green, White		Sun to semi-shade	Moist	●	●	●				●	●		
Shrub (Small)	Mile-A-Minute	*Wollastonia biflora*	Asteraceae	Traditional medicine	Coastal	< 2 m	Yellow-green		Full sun	Dry	●	●	●	●	●	●	●		●	●
Shrub (Large)	Enindurrkwa	*Banksia dentata*	Proteaceae	Firebrands, Nectar, Medicine	Sandy habitats	< 6 m	Cream, Pale yellow		Sun to semi-shade	Moist to dry	●	●	●	●						
Shrub (Large)	Dwarf's Apple	*Breynia cernua*	Phyllanthaceae	Traditional medicine	Widespread	< 4 m	White		Sun to semi-shade	Moist		●	●	●	●			●	●	●
Shrub (Large)	Caperbush	*Capparis quiniflora*	Capparaceae		Vine thickets, Forest	< 15 m	White		Sun to semi-shade	Moist to dry		●	●	●			●	●		●
Shrub (Large)	Lolly Bush	*Clerodendrum floribundum*	Lamiaceae	Traditional medicine	Widespread	4 m	White, Cream		Full sun	Dry to moist	●	●	●				●	●	●	
Shrub (Large)	Ebony	*Diospyros rugosula*	Ebenaceae		Vine thickets, Forest	< 7 m	White, Cream		Semi-shade	Moist		●	●	●		●				●
Shrub (Large)	Pin Flower Tree	*Glochidion xerocarpum*	Phyllanthaceae		Forests	< 6 m	Yellow-cream		Sun to semi-shade	Dry		●						●	●	●
Shrub (Large)	Dryanders Grevillea	*Grevillea dryandri*	Proteaceae		Woodlands	< 4 m	Pink, Red, Orange, White		Full sun	Dry	●	●	●	●						
Shrub (Large)	Blush Plum	*Grewia oxyphylla*	Malvaceae		Vine thicket	3–4 m	White		Semi-shade to shade	Moist	●	●	●	●	●	●	●	●	●	●
Shrub (Large)	Sea Randia	*Guettarda speciosa*	Rubiaceae	Traditional medicine	Coastal	2–6 m	White		Full sun	Dry		●					●			
Shrub (Large)	Native Ixora	*Ixora timorensis*	Rubiaceae		Monsoon forests	4–8 m	White		Semi-shade	Moist to dry		●	●	●	●	●	●	●	●	●
Shrub (Large)	Jacksonia	*Jacksonia dilatata*	Fabaceae		Open habitats	< 4 m	Yellow		Full sun	Dry	●	●	●	●			●			
Shrub (Large)	Bastard Guelder	*Premna serratifolia*	Lamiaceae	Traditional medicine	Mangroves	< 7 m	Cream, White		Sun to semi-shade	Moist	●	●	●				●	●	●	
Tree (Small)	Northern Kurrajong	*Brachychiton diversifolius*	Malvaceae		Woodlands	< 15 m	Red, Brown, Burgandy		Full sun	Dry to moist	●	●	●	●	●	●				●
Tree (Small)	Red Flowered Kurrajong	*Brachychiton paradoxus*	Malvaceae	Fibre	Woodlands	< 15 m	Red		Sun to semi-shade	Moist to dry	●	●	●	●	●	●				
Tree (Small)	Rusty Bloodwood	*Corymbia ferruginea*	Myrtaceae		Woodlands	< 12 m	Cream		Sun to semi-shade	Dry	●	●	●	●						
Tree (Small)	Weeping Denhamia	*Denhamia obscura*	Celastraceae	Analgesic	Woodlands, Savanna	< 9 m	Green		Sun to semi-shade	Dry		●	●	●	●					●
Tree (Small)	Australian Ebony	*Diospyros humilis*	Ebenaceae		Widespread	< 15 m	White, Cream		Sun to semi-shade	Moist to dry		●	●	●		●				●
Tree (Small)	Sea Ebony	*Diospyros maritima*	Ebenaceae	Fire wood; carving	Vine thickets	< 13 m	White, Cream		Semi-shade	Moist		●	●	●			●	●		
Tree (Small)	Darwin Silky Oak	*Grevillea pteridifolia*	Proteaceae	Cooking herb; Pillow stuffing	Woodlands, Savanna	< 6 m	Red, Orange		Full sun	Dry	●	●	●	●						
Tree (Small)	Tulipwood	*Harpullia leichhardtii*	Sapindaceae		Rainforests	< 8 m	Pale yellow		Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●		●	●
Tree (Small)	Yellow Ball Flower	*Mallotus nesophilus*	Euphorbiaceae		Vine thickets	< 8 m	Pale yellow		Semi-shade to shade	Moist		●	●							
Tree (Small)	Blue Tongue	*Melastoma affine*	Melastomataceae		Widespread	< 3 m	Pink		Sun to semi-shade	Moist to wet	●	●	●	●			●	●		
Tree (Small)	Paperbark	*Melaleuca viridiflora*	Myrtaceae	Multiple uses	Widespread	2–16 m	Pale green, White		Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Tree (Small)	Quinine Tree	*Petalostigma pubescens*	Picrodendraceae	Traditional medicine	Woodlands	< 6 m	Creamy-fawn		Sun to semi-shade	Dry	●		●		●					●
Tree (Small)	Lamboto	*Psydrax odorata*	Rubiaceae		Vine thickets, Forest	< 8 m	Green, White		Sun to semi-shade	Moist to dry		●	●	●	●		●		●	●
Tree (Small)	Tarenna	*Tarenna pentamera*	Rubiaceae		Vine thickets	< 6 m	White, Cream		Sun to shade	Moist to dry		●	●				●	●		
Tree (Large)	Woollybutt	*Eucalyptus miniata*	Myrtaceae	Fire wood	Woodlands	15–25 m	Orange, Red		Sun to semi-shade	Dry	●	●	●	●	●	●	●	●	●	●
Tree (Large)	Stringybark	*Eucalyptus tetrodonta*	Myrtaceae	Traditional medicine	Woodlands	15–25 m	White		Sun to semi-shade	Dry	●	●	●	●	●	●	●	●	●	●
Tree (Large)	Cajuput Tree	*Melaleuca cajuputi*	Myrtaceae	Traditional medicine	Widespread	< 20 m	White		Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Water Lily	Blue Water Lilly	*Nymphaea violacea*	Nymphaeaceae	Bush tucker, Traditional medicine	Wetlands	NA	Purple, Mauve		Full sun	Wet	●	●	●	●						
Vines & Climbers	Crab's Eye Vine	*Abrus precatorius*	Fabaceae	Traditional medicine; Deadly seeds	Vine thickets	< 10 m	Pink, Purple		Sun to semi-shade	Moist to dry	●	●	●	●			●			
Vines & Climbers	Chain Fruit	*Alyxia spicata*	Apocynaceae	Traditional medicine	Widespread	< 5 m	Creamy-yellow		Sun to semi-shade	Moist to dry	●	●	●	●		●	●	●		

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.

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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. *Austroblebia australis* bees. (Photo: Tobias Smith)
2. Typical bushland near Nhulunbuy, NT. (Photo: Margie Mayfield)
3. European honey bees, *Apis mellifera.* (Photo: Kirrily Hughes)

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