WHEEN BEE FOUNDATION

ABN 84 139 073 082

17 March 2022

Submission

To: *State Development and Regional Industries Committee*

From: *Wheen Bee Foundation (WBF)*

Prepared by:

- Dr Max Whitten AM FAA, Chairman of WBF and former Chief, CSIRO Division of Entomology; and
- Rex Carruthers, Board member of WBF and former President, Queensland Beekeepers Association.

Re: *Nature Conservation and Other Legislation Amendment Bill 2022*

Recommendations.

The Wheen Bee Foundation supports:

1) *the proposed amendment to the Nature Conservation Act 1992 which would allow commercial beekeeping continued access from 2024 until 2044 to those 49 national parks, gazetted in 2004, which were previously State Forest Reserves;*
2) *research be encouraged over the next 20 years to assess the impact on native flora and fauna of commercial beekeeping practices operating from apiary sites that will continue to be used by beekeepers in the 49 relevant national parks, with an emphasis on those sites deemed to be the most valuable from a conservation perspective; and*
3) *Bee Friendly Farming practices be promoted, and plantings of suitable floral resources be encouraged on farming land to generally enhance pollination services by honeybees and other pollinators, thereby reducing dependency on public lands for pollination services.*

[redacted]

Objectives of the Wheen Bee Foundation:

- The *Wheen Bee Foundation* is an Australian not-for-profit charity that promotes awareness of the importance of bees for food security, biodiversity and ecosystem health; and raises funds for research that addresses the national and global threats to bees.
- WBF engages with all levels of government, the apiculture industry, bee-reliant food industries, universities, research organisations and community.
- WBF funds vital strategic research and education initiatives that strengthen honey & native bees, improve pollination efficiency and increase food security.

Background in support of the WBF recommendation:

When the Nature Conservation Act 1992 was amended in 2004 to exclude commercial beekeeping from some 1100 traditional apiary sites in the 49 newly established National Parks after 2024, it was predicated by the belief that the economic impacts would largely relate to a decline in honey production. It did not take into account:

- the value of pollination services that support primary production worth over $2billion pa in Queensland and some $14billion nationally.
- the additional value of the pollination services provided by Queensland beekeepers to major crops such as almonds and canola in southern states; or interstate beekeepers providing pollination services in Queensland. Or,
- the impracticality that alternative pollen and nectar sources could be found, or created, during the two decades leading up to 2024.

That these viewpoints, namely that the strategic value of commercial beekeeping is a function of honey production, AND that alternative floral resources would be in play by 2024, at least with the benefit of hindsight, are demonstrably unrealistic.

The real value of pollination services provided by commercial beekeepers is reliably established by studies such as John Karasinski (*The Economic Valuation of Australian Managed and Wild Honey Bee Pollinators*. 2018). There is no reason to suppose the value of pollination services provided by commercial beekeepers will decline in real terms over the next 20 years. Nor is there little doubt about the critical importance of continued access to the 49 relevant national parks to ensure there is no disruption to pollination services provided by commercial beekeeping. Finally, the notion that

suitable land will be found that can be dedicated to creating alternative equivalent floral resources over the next 20 years remains as fanciful as it was over the past 20 years.

This submission does not address either of these 2002 viewpoints since it is now widely accepted that they are both erroneous. Instead, it asks the question:

"*What can we do between now and 2044 so that beekeepers and the Queensland Government are not facing the same predicament approaching 2044*?"

So, what can be done?

1. Understanding and managing impact of commercial beekeeping in National Parks; an opportunity to generate knowledge to improve decision making

The most authoritative meta-study of the impact of *Apis mellifera*, particularly commercial beekeeping as distinct from feral colonies of the same species, was commissioned by Queensland National Parks, carried out by Dr Nadine Chapman and Profession Ben Oldroyd from Sydney University, and then made publicly available at the urging of the WBF.

Chapman and Oldroyd make two key observations:

- *On the balance of probabilities, the presence of commercial colonies is unlikely to pose additional stresses on ecosystems beyond those caused by feral bees. Therefore, there is no compelling reason to exclude beekeeping on the basis of the available ecological data.* ***Again, we emphasise an absence of evidence rather than evidence of absence****.*

- *If a decision is made to exclude beekeeping as a result of the precautionary principle or concerns about commercial activity in parks, then* ***we recommend that the opportunity be taken to assess the effects of commercial beekeeping on native flora and fauna in a rigorous way.***

A corollary of the Chapman and Oldroyd Report is that relevant research be encouraged over the next 5-10 years, and involving beekeepers, to assess the impact of commercial beekeeping practices on select apiary sites that will continue to be used by beekeepers in the 49 national parks - with an emphasis on those sites deemed to be the most valuable from a conservation perspective, or at risk of biodiversity decline due to the short-term presence of commercial hives. There may be scope to surrender some sites and gain others on a range of criteria such as accessibility or floristic values for growing healthy hives. With good will and shared values between preserving ecosystem services and pollination services, as well as biodiversity conservation, we have a 20 year window of

opportunity to bed down, but in good time, new arrangements that balance economic and ecological considerations for optimising food security in an uncertain world.

2. Reducing dependency on national parks to maintain ecosystem services; an opportunity to build alternative floral resource availability

As already noted, the concept of dedicating public lands to provide alternative floral resources to underpin commercial beekeeping following the loss of access to existing public lands, is simply not economically viable. Nothing of value happened in the past 20 years; and the same can be expected during the next two decades.

However, two initiatives, both promoted by the WBF, will help reduce dependency on floral resources in our national parks for adequate pollination services to ensure food security. These are:

- **Bee Friendly Farming.**

  Bee Friendly Farming (BFF) is a certification program that works with land managers to help protect, preserve and promote pollinator health. BFF provides guidelines for farmers and gardeners to promote pollinator health on their lands. BFF helps farmers incorporate affordable, simple, science-based guidelines, like offering nutrition and habitats for bees, and integrated pest management strategies. Program members are an essential part of keeping our pollinators healthy and food supply abundant. BFF Australia is part of a global network led by Pollinator Partnership (P2) in the USA. The WBF partners with P2 to bring the BFF program to Australia. The Almond Board of Australia is a strong advocate of this initiative. [https://www.wheenbeefoundation.org.au/our-work/projects/bee-friendly-farming/]

- **Powerful Pollinators**

  Powerful Pollinators is a program designed to increase the prevalence, health and diversity of pollinators in the landscape. The Program encourages the strategic planting of '*trees for bees*' and other pollinators and provides Pollinator Planting Guides developed by experienced botanists and field ecologists for use by landholders.

  The Guides specify relevant information about pollinator habitat and floral resources to enable users such as land managers, Landcare groups, nurseries and gardeners to select the most appropriate indigenous species that provide value for pollinators. Currently, 13 Guides are freely available for the southern states; and additional 20 under development for other states including Queensland. [https://www.wheenbeefoundation.org.au/our-work/projects/powerful-pollinators/]

  However, while programs such as *Bee Friendly Farming* and *Powerful Pollinators* are worthy initiatives that will improve profitability and sustainability of farming systems generally, they are not

a substitute for access to native flora for building up hives capable of providing pollination services for crops like almonds, canola, macadamia, apples, pears and *so on.*

3. Increasing availability of alternative pollinators in the landscape; an opportunity to strengthen biodiversity outcomes on farms

Further, to enable informed decisions about how best to appreciate, conserve, manage, enjoy and capitalise on Australia's rich and diverse flora and fauna, as custodians of these natural assets, we need to know and understand our biota. For example, an estimated 1650 species of native bees have been discovered and named in Australia in the last 200 years. Bee taxonomists estimate that another 1,000 species have not yet been discovered, named or documented. A fund has been established to support an ambitious campaign by Taxonomy Australia to discover and describe all remaining Australian bee species over six years. And bees are not the only critters supplying pollination services; moths, beetles, thrips, bats and birds all play valuable roles.

Australia is blessed with a strong and relevant bee research capability in our universities, museums State Departments and CSIRO. Shared funding arrangements between Governments and primary industries, administered by agencies such as AgriFutures and Horticulture Innovation Australia are appreciated but inadequate. With researchers working in unison with 'citizen scientists' including hobby and professional beekeepers, valuable knowledge can be gained over the next two decades to allow informed decisions to be made about using yet preserving and enjoying our native biota. The proposed amendment to the Nature Conservation Act to allow continued access to the relevant national parks until 2044 provides a window of opportunity to achieve that happy outcome. We should not forfeit this unique opportunity.

Yours sincerely

Dr Max Whitten, AM FAA
Chairman, WBF

Rex Carruthers
Director, WBF

cc. Jo Martin, Secretary, QBAbees
cc. Fiona Chambers, CEO Wheen Bee Foundation
cc. Andrew Powell MP, Member for Glasshouse

Attachment: North Coast NSW Powerful Pollinator Planting Guide (PDF file)

North Coast: New South Wales

Powerful pollinators

Encouraging insect pollinators in farm landscapes

Pollinators are an essential component of agricultural production and of healthy, biodiverse landscapes. Protecting and enhancing pollinator resources on farms will help support a diverse range of pollinators. This brochure provides an introduction to encouraging insect pollinators on farms, including a guide to choosing plants that will support diverse pollinators throughout the year.

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The power of pollinators

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

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

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 and flowers grown in backyard gardens would be severely restricted. Many of the foods we eat, from gardens and farms, benefit from pollination.

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

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

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

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

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

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

Backyard biodiversity

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

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

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

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

Diapause or diet? Where are the insects?

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

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

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

Encouraging pollinators in your garden

Create pollination reservoirs

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

Improve on what you have

Enhance and improve 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 lilly-pilly and yam daisy.

Reduce chemical use

Insecticides, fungicides and herbicides all affect bee, colony and wild pollinator health. 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 bacteria in the insect gut. Insecticides are an obvious threat to pollinators, yet many pollinators will, in healthy numbers, help control pest insects, ultimately reducing the need for insecticide use.

Many crops are dependent on pollination by bees. 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.

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 NSW North Coast

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

This Guide will help you select plant species to attract and sustain pollinators in agricultural areas and gardens throughout the year.

The New South Wales North Coast bioregion extends from north of Newcastle, south to Woolgoolga, and west to the Great Escarpment. The region features sandy coastal plains, interspersed with numerous peaks, and lush mountain ranges in the west. The warm, high rainfall region supports diverse vegetation communities, from coastal woodlands, heathlands and wetlands to tall sclerophyll forests and dense rainforests. Bees, including native stingless bee, are active all year. Horticulture crops include blueberry, raspberry, cucumber, banana, and macadamia.

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.

Garden centres sell many common pollinator-attracting ornamental flowers and herbs labelled as 'bee-friendly'.

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

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 wholesale nursery suppliers and plant growers listed online. See the reverse of the Guide for details.

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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																														
Trees / Small	Peach	*Prunus persica*	Rosaceae	Orchard	7 m	Pink													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Blueberry	*Vaccinium* spp.	Ericaceae	Orchard	0.5–3 m	White													Full sun	Moist	●*	●	●	●	●	●	●			●
Shrubs / Small	Raspberry	*Rubus idaeus*	Rosaceae	Orchard	2 m	White													Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Avocado	*Persea americana*	Lauraceae	Orchard	5–20 m	Green													Full sun	Moist	●	●	●	●	●	●	●		●	●
Indigenous plants																														
Forbs	Flannel Flower	*Actinotus helianthi*	Apiaceae	Forest, Woodland, Heathland	0.3–0.9 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Forbs	Australian Bugle	*Ajuga australis*	Lamiaceae	Grassland, Woodland	0.1–0.3 m	Blue to Purple													Sun to semi-shade	Moist to dry	●	●	●	●						
Forbs	Common Everlasting	*Chrysocephalum apiculatum*	Asteraceae	Grassland, Open Woodland	0.4 m	Yellow													Full sun	Moist to dry	●	●	●	●	●	●	●		●	●
Forbs	Slender Knotweed	*Persicaria decipiens*	Polygonaceae	Wetland	0.3 m	Pink													Full sun	Wet to moist	●	●	●	●	●	●	●	●	●	●
Forbs	Bush Basil	*Plectranthus graveolens*	Lamiaceae	Forest, Woodland, Heathland	1 m	Purple													Full sun	Moist to dry	●	●	●	●	●		●			●
Forbs	Variable Groundsel	*Senecio pinnatifolius*	Asteraceae	Woodland, Herbland, Grassland	1 m	Yellow													Sun to semi-shade	Moist to dry	●	●	●	●	●		●		●	
Forbs	Grass Trigger-plant	*Stylidium graminifolium*	Stylidiaceae	Open Forest	0.3 m	Pink													Sun to semi-shade	Moist to dry		●	●	●	●	●				●
Forbs	Australian Bluebell	*Wahlenbergia stricta*	Campanulaceae	Woodland, Herbland, Grassland	0.1–0.9 m	Blue													Sun to semi-shade	Moist to dry	●	●	●				●			
Forbs	Golden Everlasting	*Xerochrysum bracteatum*	Asteraceae	Forest, Woodland, Grassland	0.2–0.8 m	Yellow													Full sun	Moist to dry	●	●	●	●	●	●	●		●	●
Forbs	Cunjevoi	*Alocasia brisbanensis*	Araceae	Forest	1–1.8 m	White													Semi-shade	Moist	●								●	●
Lilies & Irises	Stream Lily	*Crinum pedunculatum*	Amaryllidaceae	Forest, Wetland	0.5 m	White													Sun to semi-shade	Moist	●	●	●		●			●	●	
Lilies & Irises	Blue Flax-Lily	*Dianella revoluta*	Asphodelaceae	Woodland, Heathland	1 m	Purple													Sun to semi-shade	Moist to dry	●*		●							
Lilies & Irises	Many-flowered Mat-rush	*Lomandra multiflora*	Asparagaceae	Forest, Woodland	0.2–0.9 m	Cream													Sun to semi-shade	Moist to dry	●	●	●	●		●			●	●
Palms	Bangalow Palm	*Archontophoenix cunninghamiana*	Arecaceae	Forest	25 m	Pink													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrubs / Large	Golden Wattle	*Acacia longifolia*	Fabaceae	Open Forest, Heathland	8 m	Yellow													Sun to semi-shade	Moist to wet	●		●	●					●	
Shrubs / Large	Blackthorn	*Bursaria spinosa*	Pittosporaceae	Forest, Woodland	10 m	Cream													Sun to semi-shade	Dry to wet	●	●	●	●	●	●	●	●	●	●
Shrubs / Large	River Bottlebrush	*Callistemon sieberi*	Myrtaceae	Forest, Woodland	8 m	Cream-pink													Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Shrubs / Large	Golden Pea Tree	*Daviesia arborea*	Fabaceae	Forest	14 m	Yellow & Red													Sun to semi-shade	Moist	●	●	●							
Shrubs / Large	Native Rosella	*Hibiscus heterophyllus*	Malvaceae	Forest	3–6 m	Yellow-Pink													Full sun	Moist	●	●	●	●	●				●	●
Shrubs / Medium	Sunshine Wattle	*Acacia terminalis*	Fabaceae	Open Forest, Heathland	6 m	Cream-Yellow													Sun to semi-shade	Dry to moist	●		●						●	
Shrubs / Medium	Common Fringe-myrtle	*Calytrix tetragona*	Myrtaceae	Woodland, Heathland, Forest	0.5–2 m	Cream-pink													Sun to semi-shade	Dry to moist	●	●	●	●	●		●			
Shrubs / Medium	Cassinia	*Cassinia telfordii*	Asteraceae	Forest	1.5–5 m	Yellow													Semi-shade	Moist	●	●	●	●	●	●			●	●
Shrubs / Medium	Gorse Bitter Pea	*Daviesia ulicifolia*	Fabaceae	Dry Open Forest	2 m	Yellow & Red													Semi-shade	Dry to moist	●	●	●	●						
Shrubs / Medium	Slender Tea-tree	*Leptospermum brevipes*	Myrtaceae	Woodland, Shrubland, Forest	4 m	White													Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Prickly Tea-tree	*Leptospermum juniperinum*	Myrtaceae	Forest, Heathland, Sedgeland	2–3 m	White													Full sun	Moist to wet	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Jellybush	*Leptospermum polygalifolium*	Myrtaceae	Woodland, Shrubland	1–7 m	White													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Flaky-barked Tea-tree	*Leptospermum trinervium*	Myrtaceae	Woodland, Forest, Heathland	2–5 m	White													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Lance Beard-heath	*Leucopogon lanceolatus*	Ericaceae	Forest, Woodland	0.7–3 m	White													Semi-shade	Moist		●					●			
Shrubs / Medium	Tea-tree	*Melaleuca sieberi*	Myrtaceae	Heathland	5 m	White-Pink													Full sun	Moist to wet	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Thyme Honey-myrtle	*Melaleuca thymifolia*	Myrtaceae	Heathland	1–2 m	Pink													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Shrubs / Medium	Needle Shaggy Pea	*Podolobium aciculiferum*	Fabaceae	Forest	1–3 m	Yellow & Orange													Semi-shade	Moist	●	●	●	●					●	
Shrubs / Medium	Victorian Christmas Bush	*Prostanthera lasianthos*	Lamiaceae	Forest, Woodland	1–6 m	White-Mauve													Semi-shade	Moist	●	●	●	●	●				●	●
Shrubs / Medium	Fragrant Senna	*Senna barronfieldii*	Fabaceae	Forest	2.5 m	Yellow													Sun to semi-shade	Moist	●		●	●						
Shrubs / Medium	Kangaroo Apple	*Solanum aviculare*	Solanaceae	Forest	4 m	Purple													Semi-shade	Moist	●*				●					
Shrubs / Medium	Banana Bush	*Tabernaemontana pandacaqui*	Apocynaceae	Forest	3 m	White													Semi-shade	Moist	●	●	●			●	●			
Shrubs / Small	Shrubby Baeckea	*Baeckea frutescens*	Myrtaceae	Woodland, Heathland	1 m	White													Sun to semi-shade	Moist	●	●	●	●	●	●	●		●	●
Shrubs / Small	Hairy Bush-pea	*Pultenaea villosa*	Fabaceae	Forest, Heathland, Grassland	1.5 m	Yellow													Sun to semi-shade	Moist to dry	●	●	●	●						
Shrubs / Small	Native Raspberry	*Rubus parvifolius*	Rosaceae	Forest, Woodland	1 m	Pink-Red													Semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Shrubs / Small	Rose-leaf Bramble	*Rubus rosifolius*	Rosaceae	Forest	2 m	White													Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Shrubs / Small	Coastal Grasstree	*Xanthorrhoea macronema*	Asphodelaceae	Forest	1 m	Cream													Sun to semi-shade	Moist to dry	●	●	●	●	●	●	●	●	●	●
Shrubs / Small	Sandfly Zieria	*Zieria smithii*	Rutaceae	Forest, Heathland	2 m	White													Semi-shade	Moist	●	●	●		●		●		●	●
Trees / Large	White Aspen	*Acronychia oblongifolia*	Rutaceae	Forest	27 m	Cream													Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Large	Red Bloodwood	*Corymbia gummifera*	Myrtaceae	Forest, Woodland	30 m	White													Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Trees / Large	Pink Bloodwood	*Corymbia intermedia*	Myrtaceae	Forest	30 m	White													Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Trees / Large	Flooded Gum	*Eucalyptus grandis*	Myrtaceae	Forest	50 m	White													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Large	Small-fruited Grey Gum	*Eucalyptus propinqua*	Myrtaceae	Forest	40 m	White													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Large	Sydney Blue Gum	*Eucalyptus saligna*	Myrtaceae	Forest	50 m	Cream													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Large	Forest Red Gum	*Eucalyptus tereticornis*	Myrtaceae	Forest, Woodland	50 m	Cream													Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Trees / Large	Brush Cherry	*Syzygium australe*	Myrtaceae	Forest	35 m	White													Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Trees / Large	Water Gum	*Tristaniopsis laurina*	Myrtaceae	Forest	30 m	Yellow													Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●		●	●
Trees / Large	Weeping Lilly Pilly	*Waterhousea floribunda*	Myrtaceae	Forest	30 m	White													Sun to semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Blackwood	*Acacia melanoxylon*	Fabaceae	Forest	6–30 m	Cream-Yellow													Sun to semi-shade	Moist to wet	●		●						●	
Trees / Medium	Coast Banksia	*Banksia integrifolia*	Proteaceae	Forest, Woodland, Shrubland	25 m	Yellow													Full sun	Moist to dry	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Thick-leaved Mahogany	*Eucalyptus carnea*	Myrtaceae	Forest	25 m	White													Full sun	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Broad-leaved Paperbark	*Melaleuca quinquenervia*	Myrtaceae	Forest	10–15 m	White													Full sun	Moist to wet	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Prickly-leaved Tea-tree	*Melaleuca styphelioides*	Myrtaceae	Forest, Woodland	20 m	White													Full sun	Wet	●	●	●	●	●	●	●	●	●	●
Trees / Medium	Hairy-leaved Doughwood	*Melicope micrococca*	Rutaceae	Forest	27 m	White													Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Small	Fringed Wattle	*Acacia fimbriata*	Fabaceae	Open Forest, Woodland	6 m	Yellow													Sun – semi-shade	Moist to dry	●		●	●					●	
Trees / Small	Hickory Wattle	*Acacia implexa*	Fabaceae	Forest, Woodland	5–12 m	Cream-Yellow													Sun to semi-shade	Moist to dry	●		●	●					●	
Trees / Small	Shatterwood	*Backhousia sciadophora*	Myrtaceae	Forest	10 m	White													Sun to semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Small	Dogwood	*Jacksonia scoparia*	Fabaceae	Woodland, Open Forest	12 m	Yellow													Full sun	Dry	●	●	●	●	●				●	
Trees / Small	Tea-tree	*Leptospermum brachyandrum*	Myrtaceae	Forest	6 m	White													Semi-shade	Moist	●	●	●	●	●	●	●	●	●	●
Trees / Small	Sweet Pittosporum	*Pittosporum undulatum*	Pittosporaceae	Riparian Forest, Damp Forest	15 m	Cream													Semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Vines & Climbers	Headache Vine	*Clematis glycinoides*	Ranunculaceae	Forest, Woodland	2.5 m	White													Semi-shade	Moist to wet	●	●	●	●	●	●	●	●	●	●
Vines & Climbers	Purple Coral Pea	*Hardenbergia violacea*	Fabaceae	Open Forest, Woodland	2 m	Purple													Sun to semi-shade	Dry to moist	●	●	●	●					●	
Vines & Climbers	Climbing Guinea Flower	*Hibbertia scandens*	Dilleniaceae	Forest, Woodland, Heathland	4 m	Yellow													Full sun	Moist to dry	●	●	●	●	●					
Vines & Climbers	Wonga Wonga Vine	*Pandorea pandorana*	Bignoniaceae	Forest, Woodland	> 6 m	White-Purple													Sun to semi-shade	Moist to dry	●	●	●	●	●				●	●
Vines & Climbers	Green-leaved Bramble	*Rubus nebulosus*	Rosaceae	Forest	15 m	White													Semi-shade	Moist	●	●	●	●	●	●	●	●	●	●

*Buzz Pollinated

Know your pollinators

European honey bee
(Apis mellifera) © iStock

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

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

Leafcutter bee
(Megachile maculariformis) © Karen Retra

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, they have very small, clubbed antennae at the front of their head. Flies, including blowflies, are often attracted to flowers that smell like carrion; they generally have hairy bodies that easily collect pollen while they are feeding. Flies provide a range of services in the garden, including pollination, decomposition and predation.

Hoverfly
(Family *Syrphidae*) © Karen Retra

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

Horned beetle
(Rhipicera femorata) © J. Hort

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

Meadow argus
(Junonia villida) © J. Hort

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

Beautiful leaf moth
(Gastrophora henricaria) © Karen Retra

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

Flower forms

© Meredith Cosgrove

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

© Meredith Cosgrove

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

Pollinator rewards

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

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

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

Buzz pollination

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

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

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

Nectar feeding

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

Wholesale Nurseries

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

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

Wheen Bee Foundation

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

WheenBeeFoundation.org.au

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

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

Front cover:
1. Australian native stingless bee, *Tetragonula carbonaria,* on a water lily, *Nymphaea* sp. (Photo: Jeremy Jones)
2. Blueberry fields, pastures, and forests of the NSW North Coast bioregion. (Photo: Jeremy Jones)
3. European honey bees, *Apis mellifera.* (Photo: Kirrily Hughes)

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