Pollinators in SPAs

Ensuring sex happens for seed production

Why are pollinators important in seed production areas?

Seed production areas (SPAs) are areas dedicated to growing native plants for the harvesting of seed and are crucial for achieving ecological restoration targets.

But to ensure both the quantity and quality of seed produced for many species, we need pollinators – animals that will visit our focal plant and carry pollen from one plant to another of the same species. This cross-pollination (plant sex) means the plant receives enough pollen to produce seed.

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Who are the pollinators and what are their needs?

Flowering plants can be visited by a range of species that act as pollinators, including bees, flies, wasps, butterflies, moths, beetles, birds and mammals.

Determining what species visit a given plant species is a first, vital, step – yet for many plant species we currently don't have this knowledge.

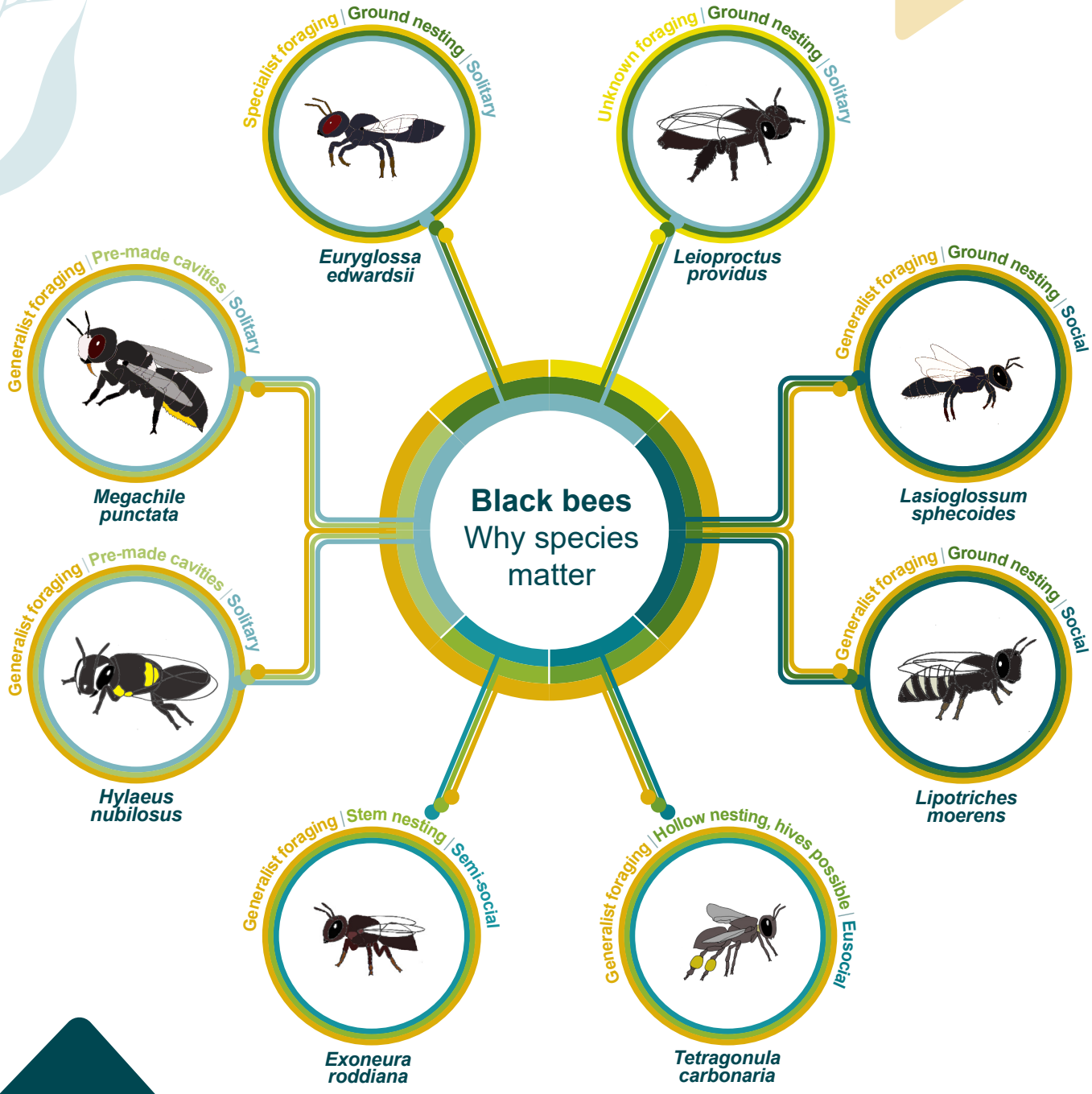
If we want pollinators to reliably visit a given plant species, and provide the vital service of pollination for seed production, then it's also very important to understand their habitat requirements.

As a core requirement, animals need food over their activity season, and nesting/habitat resources.

Understanding the specific requirements of each pollinator is important so SPA managers can ensure these pollinators have everything they need to continue providing pollination services in SPAs.

Photo: Jennifer Goldsworthy

Understanding pollinator needs: A case study of black bees



In this figure, each of the circles represents a species of native bee.

These all look similar and are sometimes described as 'black bees', but they vary in their **food needs (orange)**, **nesting requirements (green)** and **social behaviour (blue)**.

This is important to know so we can provide the most appropriate resources to support the specific native bees required for the plant species in a SPA.

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How can we promote pollinators and biodiversity in SPAs?

Supporting pollinators in SPAs has two benefits: *ensuring effective pollination* and *promoting biodiversity.*

The steps to take for supporting pollinators in SPAs are outlined here and in the decision tree on the next page in relation to insect pollination.

1. We first need to know which pollinator species visit the specific plants in our SPA. If this information is currently unavailable, it can be inferred from related species (i.e. species in the same genus) or we can survey the plants to assess potential pollinators.

2. We then need to know if these potential pollinators are present in the area, what food resources they need, and how their activity season overlaps with that of the flowering plant. For pollinators that are active across the season, it is especially important to ensure that there are food resources available when the focal plant is not in flower.

3. Knowing if the pollinator is a generalist (can feed on a variety of species) or a specialist (requires specific food resources) is important so we can provide the right food resources across the season. For example, some generalist pollinators will require a larger diversity of flowers, or nectar resources if the plant only offers pollen (e.g. many buzz-pollinated plants).

4. We then need to know if the activity season of the pollinator aligns with the focal plant in the SPA. If the pollinator is active outside the flowering time of the plant, we need to make sure there are additional resources available. This can be done by using companion planting.

5. We then need to consider nesting habitat. Each pollinator will have different requirements and this can vary with pollinator type. Bees, for example, may nest in ground-based substrates or pre-made cavities in woody trees, make their own cavities in specific types of wood, or nest in pithy stems. Whereas beetles may require woody debris and butterflies will require certain species for their larvae.

1. **Are the pollinators of this plant species in the region known?**

2. **Are the other flowering plant species visited by the pollinator known?**

3. **Is the pollinator species a specialist (to a species/genus/family)?**

4. **Is there complete overlap between focal plant flowering and the activity season of the pollinator?**

5. **Are the nesting requirements for this pollinator species known?**

FOCAL PLANT SPECIES

Are the pollinators of this plant species in the region known?

- **No** → Identify focal pollinator/s through research
  - **Results** → Are the pollinators of the plant species in other regions known?
    - **No** → Infer from related species
    - Infer from related species → **Yes**
  - Identify focal pollinator/s through research → **Yes**
- **Yes**

POLLINATOR SPECIES INFORMATION

Are the other flowering plant species visited by the pollinator known?

- **No** → Conduct research, infer from related species
  - **Results** → **Yes**
- **Yes**

Is the pollinator species a specialist (to a species/ genus/family)?

- **Yes** → Plant high densities of the focal plant species
- **No** → Ensure there are other pollen and nectar sources available, especially when focal plant is not in flower

Is there complete overlap between focal plant flowering and the activity season of the pollinator?

- **Yes** → Provide other complementary resources at low densities
- **No** → Ensure there are preferred nectar and pollen sources outside the focal plant flowering period

Are the nesting requirements for this pollinator species known?

- **No** → Conduct research, infer from related species → **Nesting / Pollinator type**
- **Yes** → **Nesting / Pollinator type**

Nesting / Pollinator type

- **Ground nesting bees** — Ensure suitable nesting substrate (soil type/cover) and/or create nesting pots
- **Cavity nesting bees** — Ensure trees within 350m, install bee hotels with suitably sized holes
- **Butterflies** — Ensure larval host plants are present
- **Beetles** — Ensure adequate areas of soil/ debris/trees
- **Wasps** — Varies depending on the species (e.g. suitably sized holes, pithy stems)

Case study: *who, what, when* of pollinators in a WA SPA

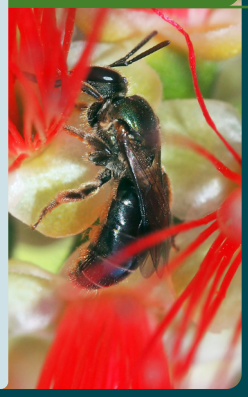
Focal plant: *Hakea prostrata*

Potential pollinators	Overlap with SPA	Food	Nesting
Eleale aulicodes	Yes	Adult: nectar (Proteaceae, Myrtaceae); larvae: predatory on wood-boring beetle larvae	Wood
Diphucephala sp.	Yes (likely)	Adults: diverse nectar sources; larvae: roots and humus	Soil
Coleoptera sp	Yes (likely)	Adults: nectar; larvae: unknown	Ground-nesting, nests communally. Burrows in bare earth patches in eucalypt woodland. Will re-use nests.
Dimorphothynnus apicalis	Unknown	Adults: nectar (Hakea, Myrtaceae); larvae: parasitoids	Burrows in ground, parasitoids of beetle larvae
Thynnid wasps	Yes (likely)	Adults: nectar (Hakea, Myrtaceae); larvae: parasitoids	Burrows in ground, parasitoids of beetle larvae
Dilophus sp.	Yes (likely)	Adults: nectar; larvae: decaying matter	Eggs laid in decaying matter
Diptera sp.	Yes (likely)	Adults: nectar; larvae: decaying matter	Eggs laid in decaying matter
Apis mellifera	Yes	Highly polylectic – supergeneralist	Tree hollows
Euhesma_J1 [undescribed sp.]	Unknown	Oligolectic – specialist on Hakea	Solitary, ground-nesting
Euhesma sp.J2_ Euhesma banksia?	Unknown	Oligolectic – specialist on Hakea	Solitary, ground-nesting
Lasioglossum urbanum	Yes	Polylectic – generalist	Social, ground-nesting

USING POLLINATOR INFORMATION

Are the pollinators of this plant species in the region known?

YES 10 recorded visitors of ***Hakea prostrata***. One example is ***Lasioglossum urbanum***



Are the other flowering plant species visited by the pollinator known?

YES This pollinator visits a wide range of species including ***Leptospermum, Melaleuca, Eucalyptus, Jacksonia, Conostylis***

Is the pollinator species a specialist (to a species/genus/family)?

NO It is a generalist

Is there complete overlap between focal plant flowering and the activity season of the pollinator?

NO Some overlap between the focal plant flowering and activity season; but other resources or companion plants are needed over the summer and early autumn when Hakea is not in flower

Are the nesting requirements for this pollinator species known?

YES Ground nesting bee; ensure suitable nesting substrate

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How can we support pollinators through companion planting?

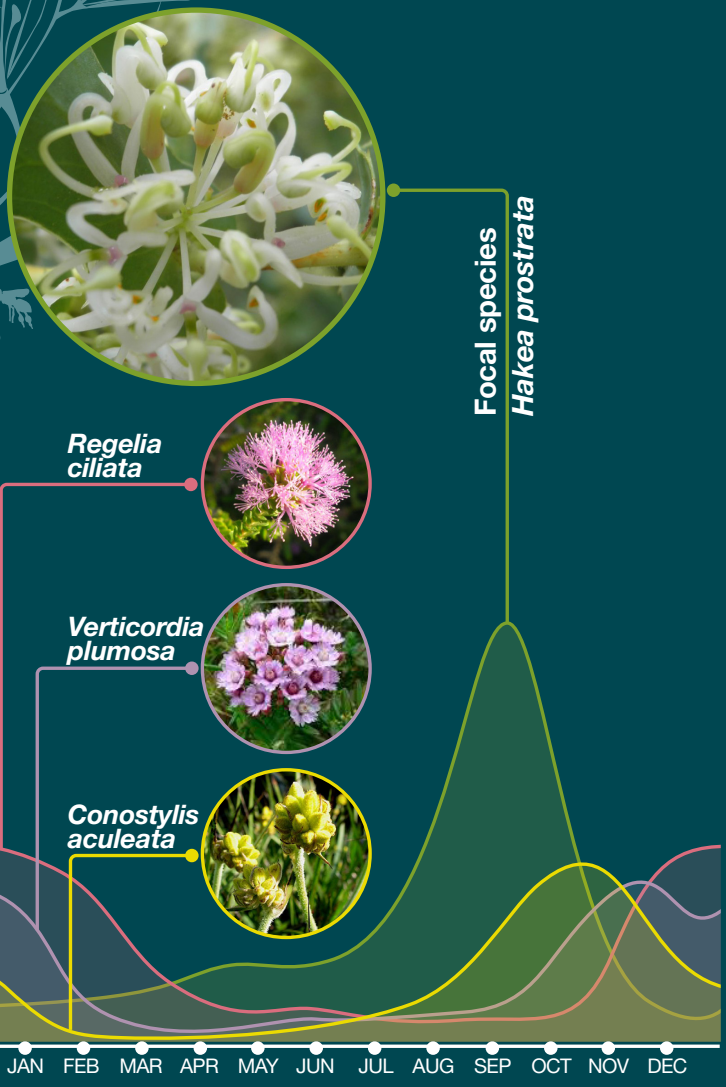

Figure A - More effective

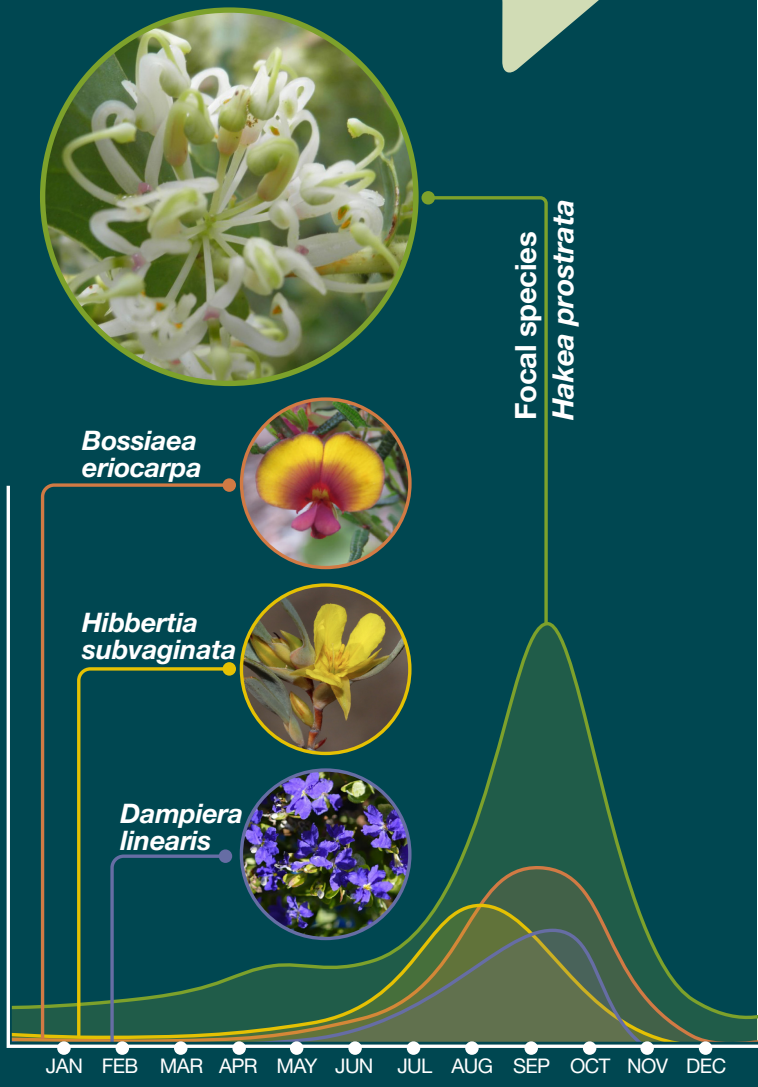

Figure B - Less effective

- Companion planting is an important tool for supporting pollinator communities and ensuring that SPAs have the resources they need.
- Companion planting involves establishing populations of species with the intention of providing habitat and resources for pollinators.
- Companion plants may or may not be used for seed production themselves.
- For companion planting to work best we need to ensure that these plants flower outside the focal plant time (Figure A) and not just when the focal plant is flowering (Figure B). This is to ensure that they provide complimentary resources for pollinators.

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Designing SPAs to support pollinators

Factor	Why is this important?	What can be done?
Landscape context	• Location of the SPA in relation to existing remnants will provide a source of pollinators and habitat resources	• SPAs should be positioned adjacent (or in close proximity – dispersal/foraging range) to remnant vegetation
Plant density and arrangement in the SPA	• Plant density and configuration will influence pollinator visitation, behaviour and pollen dispersal distances • Proximity of a species in the SPA to remnant vegetation can influence pollinator visitation and this varies with pollinator type (bird or insect pollination)	• Planting dense patches of focal species may attract a greater number and diversity of pollinators • Plan a design that is likely to facilitate cross-pollination and between-plant movement (using information on specific pollinators) • Plant bird-pollinated species as close as possible to remnant vegetation • Plant insect-pollinated species in blocks that minimise edge effects (i.e. blocks rather than narrow linear strips)
Habitat resources	• Different pollinators have specific nesting requirements	• Identify potential pollinators and consider their nesting and habitat needs
Supplementary feeding resources for pollinators	• Different pollinators have specific feeding requirements • Pollen and nectar are both important (and complementary) sources for different pollinators	• Identify potential pollinators and consider their feeding and resource needs • Consider seasonal needs and companion planting for specific requirements or resource supplementation
Species choice for companion planting	• Companion plants may either facilitate or compete for pollinators • This balance will depend on the timing of flowering and types of resources provided	• Avoid planting companion plants that flower at the same time and provide similar resources • If the pollinator of the focal plant is a specialist, ensure that there are adequate pollen and nectar sources when the focal plant is not in flower • If the pollinator is active outside the flowering time of the focal plant, then ensure that there are preferred nectar and pollen sources available across its full activity season
Supporting native vs exotic bees	• For many native plants, European honeybees may not be effective pollinators • European honeybees behave differently to native bees – pollination by native bees can result in greater cross-pollination among plants • European honeybees compete for resources and habitat with native bees • Supporting native bee and insect communities can improve biodiversity	• Know the native pollinators that occur in the local area • Build habitat and floral resources to support these communities • Avoid the active use of European honeybee hives in SPAs

Take home messages

- **It is essential to consider pollinators when designing and planning native seed production.**
- **For many plants we have limited data on visitation and pollination, and for many potential pollinators we have limited data on their food and nesting requirements. While this information is being gathered, we can infer this from related species in the same genus.**
- **Understanding what pollinates each plant, when the pollinator is active and what resources and habitat it requires will ensure that SPAs are set up for success.**
- **Considering the location, density, arrangement and composition of focal and companion plants in native seed production can help facilitate pollinators to come and stay in SPAs.**

This factsheet has been produced by Dr Melinda Pickup and Dr Kit Prendergast as part of a five-year collaborative research project led by Greening Australia and funded by The Ian Potter Foundation to address key knowledge gaps about establishing and managing SPAs.

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