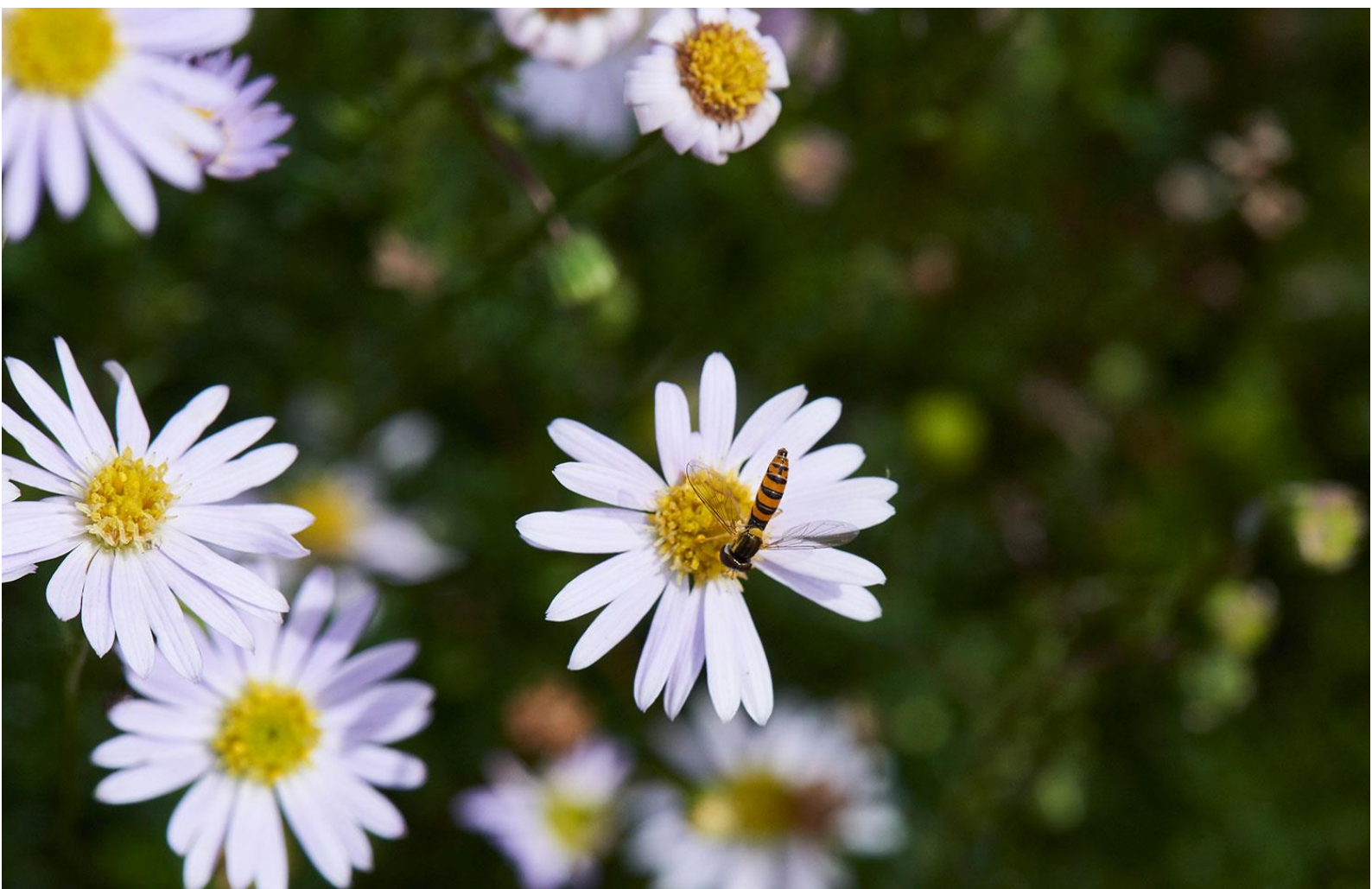


Regional Agriculture Facilitator

Planting native vegetation for beneficial insects and improving farm integrated pest management through biodiversity



The regional works on the lands, waters and seas of the Bunurong, Wathaurung and Wurundjeri peoples and acknowledges them as Traditional Owners.

It recognises and respects the diversity of their cultures and the deep connections they have with Country. It values partnerships with communities and organisations to improve the health of Indigenous people and Country.

The PPWCMA Board and staff pay their respect to Elders, past and present, and acknowledge and recognise the primacy of Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands, water and sea.



Background – putting research into practice

In an effort to find ways to combine productive agriculture with on-farm natural resource management (NRM), research from Retallack Viticulture in South Australia was used to design a simple on-farm demonstration that could be easily replicated by growers in our region.

The concept of planting flowering native vegetation to provide nectar and habitat for beneficial insects is a simple farm practice that can be achieved at relatively low cost.

The potential economic gain easily counteracts the short-term outlay with long term financial advantages including reduced labour and pesticide inputs.

The following fact sheet outlines the process used to establish farm insectary plantings without impeding on production.

A key point to be raised is that insectary plantings are not necessarily 'tree planting'; there are much more complex interactions occurring which need to be considered when planting an insectary and crucial to this is to use a diversity of flowering plants to achieve close to year round nectar source for beneficial insects.

To achieve good land management outcomes, we need to demonstrate success and the results gathered at the demonstration sites are very promising.



The benefits of having native vegetation on your farm

- Pollination
- Habitat and food source for insects (insectaries, beetle banks, insect corridors)
- Shelterbelts/windbreaks
- Perennial groundcover
- Biodiversity values (consider offsets in planning applications)
- Meet obligations in environmental assurance programs
- Wildflower production - income diversification

What is an insectary?

An insectary is an area planted with year round flowering plants to provide shelter, pollen and nectar for natural populations of beneficial invertebrates. It can also provide:

- Overwintering and ground habitat (mulch, rocks etc)
- Bee hotels (native bees) can be installed (as with faunal nesting boxes, correct design is important).



Top (left to right): *Bursaria spinosa*, *Grevillea rosmarinifolia*, *Styliidium* sp, *Thyptomene* sp, *Correa reflexa* (green).
Bottom (left to right); *Leptospermum continentale*, *Brachyscome multifida*, *Melaleuca squarrosa*, *Grevillea alpine*.



Key beneficial insects for horticulture

Some examples of beneficial insects include:

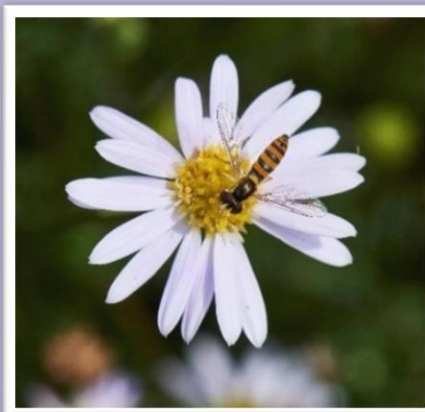
- **Ladybird beetles** - both adults and larvae are generalist predators
- **Lacewings** - green lacewing adults feed on nectar, pollen, aphids and honeydew, larvae feed on thrips, mites, LBAM, moth eggs and larvae and mealybugs. Brown lacewing adults and larvae are generalist predators
- **Hoverflies** - larvae feed on aphids
- **Spiders** - generalist predators that live in both plant canopies and ground dwelling
- **Parasitoid wasps** - parasitise eggs or larvae
- Plus many more such as predatory flies, mites and thrips, predatory shield bugs and rove beetles.

An example – hoverflies

Adult hoverflies feed on nectar before laying eggs near aphid populations. The larval stage are predatory.

So, attracting hover flies in abundance requires nectar producing flowers, ideally in early spring and summer just before the warmer weather leads to aphid incursions.

A secondary ecosystem service benefit is they are also pollinators.



Food for thought

It is important to select the right plant species to ensure they are not a host for large numbers of pest species. Most natives don't attract introduced pests but keep it in mind when planting. Monitoring is important.

The demonstration sites have not yet found any pest insect on native vegetation in numbers worth worrying about. Rutherglen Bug (native insect) may, however, feed on native plants so monitor for these but we have not had a problem to date.

Having good biodiversity, including tree hollows, allows habitat for insectivorous birds and bats which will also feed on pest insects. Research from Arthur Rylah Institute by Dr Linda Lumsden (2001) has found that "the diet of insectivorous bats such as the Southern Freetail Bat comprises 80% Rutherglen Bug".

It is also important to select the right plant species to ensure they are in fact habitat for the beneficial insects you are trying to attract. For example, brown lacewings prefer to lay their eggs in native grasses. If you check native grasses such as Wallaby grass over spring/summer you will find the lacewings around the crowns.

Having a good Integrated Pest Management Program (IPM)

A good IPM program also has other management strategies in place, cultural control methods and regular monitoring for pest and beneficial insects are extremely important and a necessary part of good farm management.

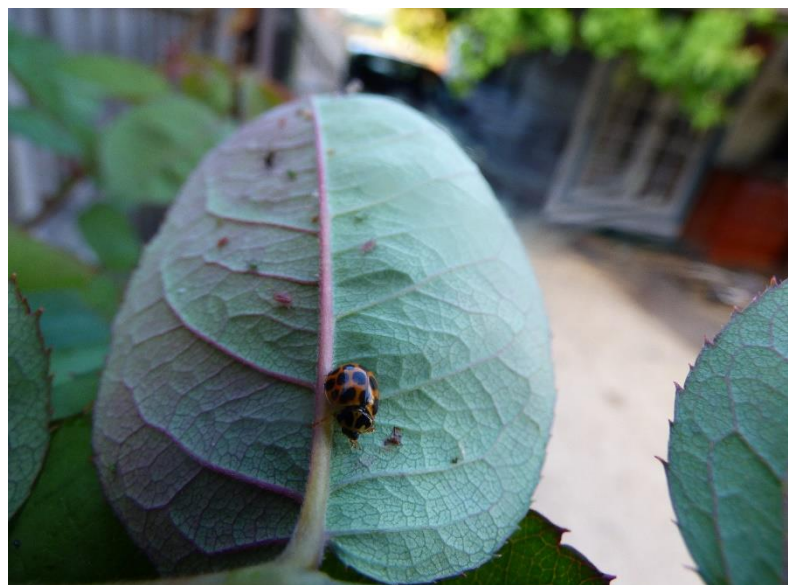
A good strategy will list the key pests that impact your crop/s, the beneficial insects which prey on these pests, followed by cultural control options to:

1. Reduce pest numbers (ie: control host broadleaf weeds, mow alternate rows, inter-row cover crops) and
2. Favour the abundance and diversity of beneficial insects (ie: provide a nectar source)



Sample of pest and beneficial insects from pastures. The red invertebrates are predatory mites.

Ladybird eating aphids



Designing an insectary - planting without imposing on production areas

“Where to plant” an insectary and “how far away is too far” is a question always raised at events. Melbourne University research suggests native vegetation within 50 metres of production is suitable proximity for flowering habitat to support an abundance of beneficial insects and the likelihood of these predators to interact with pest incursions.

The main consideration is that you have a good mix of flowering species and strata. Flowering time is also important. The more ‘year round’ flowering you can achieve the greater success of always having a nectar source available.

As a minimum, September/October flowering is crucial if hoverflies are a desirable insect to have in large numbers.

Also consider how you could plant an understory to an existing windbreak or re-vegetation area. Trees have on-farm benefits but they are not necessarily the right habitat for beneficial insects.

The great thing about Australian natives is their long flowering cycle. Many exotic flowers have a much shorter flowering window and are also more likely to succumb to dry conditions and require watering.



The berry farm has a u-pick gazebo area which had no garden beds so we added them. 10 metres to production area. Used low shrubs and groundcovers

Example locations

Here are some examples of where native vegetation has been planted as part of the demonstration sites, remembering it is based on planting the right species to attract the right beneficial insects.

Locations for insectary plantings can include:

- Grasses under vine or inter-row, small shrubs at end of row strainer posts
- Surrounding a dam
- Land class zoned unsuitable for production
- Garden beds
- Headlands, buffers and re-vegetated shelterbelts (create understory)
- Riparian planting.



Top left: internal roadside on a vineyard, approx 10m from vine area;

Top right: grassy buffer area near a farm dam;

Bottom left: containerised planting in a nursery- portable insectary that can be moved about.

Working out your Ecological Vegetation Class - what are my local plants?

Obtaining a list of native plants relevant to your farm is quite easy. Visit a local community nursery as they only grow local indigenous stock.

Local councils will have resources on their websites to access local indigenous plant lists.

Generic information is available at:

<http://www.spiffa.org/evcs.html>

<https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks>

The Port Phillip & Westernport CMA has developed a generic plant list with common species to SE Australia and readily found plants in community and commercial nurseries. Avoid using hybrid plants as they may not have the nectar content of their parent species.

Cross check this list with your local plant list obtained from council or a community nursery and select the plants that most suit your requirements and provide as much year-round flowering as possible.

The list and a flowering calendar can be downloaded from ppwcma.vic.gov.au.



Monitoring- what did we find out at the demonstration sites?

Year 1 monitoring results at the berry farm demonstration site.

An insectary windbreak planted at the demonstration site in August 2016 had an array of beneficial insects monitored in it within six weeks. Quick flowering plants such as the lilies, cut leaf daisy, bush pea, river mint and round leaf mint bush provided an early nectar source even though plants were still not much bigger than tubestock.

- 232 hover flies were counted in the new insectary planting in October 2016 (8 weeks after planting) compared to a total of 17 hover flies on the other seven traps located around the farm at the same time. This demonstrates their need for a source of nectar.
- A total of 11,292 insects counted in traps from October-January, majority in Dec/Jan
- Predatory insects (lady beetles, brown lacewings, predatory mites and predatory thrips found in higher numbers in the insectary than in-crop
- A high number of parasitoids living in the insectary and remnant vegetation. *Trichogramma* was almost exclusively found in the insectary (adults require nectar)
- Key pests found in both the insectary and in-crop: 'other thrips' aphids, leaf hoppers and Rutherglen bug. Not in significant numbers, especially in comparison to the abundance and diversity of beneficial insects to prey on them.



Sticky trap from October 2016 covered in hover flies. Adults feed on nectar and larvae prey on aphids. In October the hover flies are seeking early spring flowers to feed on the nectar as aphid populations start to build in crops. Hover flies can move from the new insectary planting into the crop to lay eggs near aphid incursions.

Monitoring results over three seasons at the 4 Yarra Valley sites

Monitoring analysis undertaken by Dr Linda Thomson of Melbourne University.

Findings:

- Abundance of ladybirds increased by a factor of five
- Predatory ground beetles doubled
- Predatory rove beetles doubled
- Four times as many brown lacewings
- Four times as many predatory bugs
- 5,500 beetles collected from 26 families.
- Over 12,000 parasitoids
- Increased predatory wasps, thrips and mites
- Increased predatory flies



Strawberry springs: March 2019 trapping- 221 ladybirds in insectary and existing windbreak area. Traps were out for 7 days. Flowered for the first year since planting in 2016.

Observations

- Seasonal conditions throughout the monitoring season influence the abundance of beneficial insects so using sticky traps alone to demonstrate increases is difficult due to these fluctuations.
- Overall, regardless of the seasonal conditions, there is certainly a diversity of beneficial insects to predate on pest insects which could be one reason why there is low pest pressures.
- It is this diversity that will help with the resilience of the farm during seasonal variations.
- The diversity is supported by providing nectar and habitat for these insects to flourish close to the production areas.
- An improvement in monitoring would be to correlate pest pressures with evidence of parasitism and predator-prey. Parasitised aphids, caterpillars and scouting for egg and larval stages of beneficial insects to aid IPM programs.
- Farm management practices do have an impact on beneficial insects, evidenced by limited counts in-crop compared to re-vegetated areas on high input farms.
- Increased pest control is a tangible and measurable benefit of biodiversity
- Having an insectary as stable habitat offers resilience against these input practices and allows populations to bounce back quicker.

Commercial value of improved natural enemy biodiversity

Back of the envelope financial benefit of ladybirds (based on sticky trap data which is only a proportion of what is *actually* present!

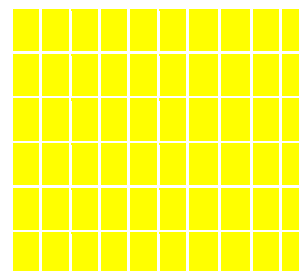
	Year 1	Year 2	Year 3		# traps
Nursery	4	3	17	24	96
Vineyard	26	198	189	413	120
Orchard	46	345	325	716	108
Strawberries	72	614	451	1137	120
				2290	444
	2290/444	5 LB/trap			



Sticky trap is 10cm x 17cm

10 traps across x 6 down = 1m
coverage (60 traps)

Think of this as 1m vegetation (flat)



60 traps x 5Ladybirds (LB)/trap=300LB for every metre of flowering vegetation over Spring/Summer. OR

300LB x \$1.10/LB commercial value = \$330 ecosystem value per metre of native vegetation

Multiply this by the area you have flowering vegetation and the benefits increase significantly.

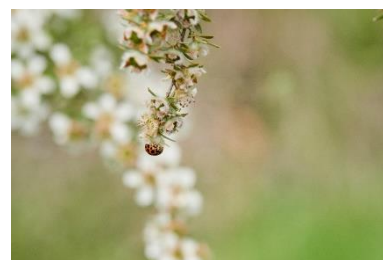
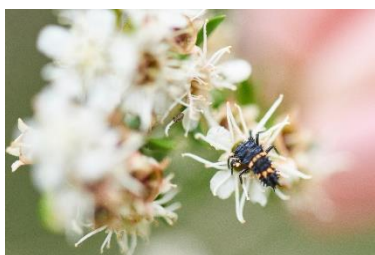
Cost to plant 1 m vegetation= (\$1.70 tubestock, tree guards, fencing, maintenance).

\$7 for 4 shrubs, \$8 for 4 tree guards, \$10 fencing/m, \$30/hr maintenance

Approx: \$55/m

Now add in the ecosystem services from all the other beneficial insects also using the vegetation for nectar and predating on aphids (hover flies, lacewings, parasitic wasps).

Highly valuable biodiversity hotspot!!



Before and After



Further information

Video

A video from the trial site has been created to provide more information to growers on the benefits of planting flowering native plants. This video compliments the information in this fact sheet and associated documents.

Visit youtube.com/ppwcma to view the video.



Useful references

- ppwcma.vic.gov.au
- facebook.com/PPWCMAgrowsAgriculture
- viti.com.au/pdf/Rmjr0811VineyardBiodiversityandInsectInteractionsBookletFINAL.pdf
- [Thomson, L.J. & Hoffman, A.A. \(2006a\). The influence of adjacent vegetation on the abundance and distribution of natural enemies in vineyards. Australian and New Zealand Grapegrower and Winemaker, 514, 36-42.](#)
- <http://goodbugs.org.au/chemicals.html>

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