Regional Agriculture Facilitator

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

Australian Government | National Landcare Program

Port Phillip & Westernport CMA

agribusiness YARRA VALLEY

THE UNIVERSITY OF MELBOURNE

PEARG Pest & Environmental Adaptation Research Group

The regional works on the lands, waters and seas of the Bunurong, Wadawurrung 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 trial 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 a combination of abundance and diversity of beneficial insects.

To achieve good land management outcomes, we need to demonstrate success and the results gathered at the trial site to date 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
- Bush food production - income diversification

What is an insectary?

An insectary is a group of plants that provide a protective niche for natural predators by providing shelter, a regular supply of pollen and nectar and a water source for a range of beneficial arthropod species. A good insectary follows the SNAP method:

S shelter for overwintering and safety from weather and higher order predators

N nectar to provide a source of carbohydrate energy

A alternative source of prey to maintain beneficial populations until needed in-crop

P pollen which provides the protein necessary for egg production

(Retallack Viticulture, 2011)

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
- **Parasioid 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. A pretty handy partner to collaborate with!

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 trial has 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. In fact, 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". With limited control options for this insect, why not encourage insectivorous bats which have Rutherglen Bug on their preferred menu!

It is also important to select the right plant species to ensure they are in fact habitat for the beneficials you are trying to attract. For example, brown lacewings prefer to lay their eggs in

native grasses. If you check native greases such as Wallaby grass over spring/summer you will find the lacewings around the crowns. If you don't look closely into the grasses, you won't see them.

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.

Research in South Australian Vineyards - Hero Plants

An excellent resource which has collated many sources of research is a booklet written by Mary Retallack (2011) from Retallack Viticulture in South Australia titled *Vineyard Biodiversity and Insect Interactions Booklet.*

Since this publication, Mary has gone on to commence her PhD researching the use of native insectary plants to boost beneficial arthropod populations in vineyards.

It is this research which has greatly informed the on-farm trials conducted in the Port Phillip and Westernport catchment.

Mary has identified three key native plants which are low risk to Light Brown Apple Moth (LBAM) and Grapevine Moth infestation whilst highly attracting to beneficial insects:

1. *Bursaria spinosa* (Sweet Bursaria in Victoria)
2. Leptospermum *continentale* (Prickly Tea-tree)
3. Austrodanthonia sp (Wallaby Grass)

For detailed information, see the guide on page 6.

Images by PPWCMA, Marilyn Gray and Emma Campbell. Supplied by Yarra Ranges Shire Council.

Bursaria spinosa (Sweet Bursaria in Victoria)

- Only vegetation type were orange assassin bugs found (most abundant bug species)
- Excellent host for a range of spiders (including active hunting predators Salticidae 'jumping' and ambush hunters Thomisidae 'flower' species)
- Excellent host for Brown and Green Lacewings
- Good host for shield bugs (Predatory Shield Bugs in particular)
- Good host for Common Spotted Ladybird and Damsel Bugs
- No Grapevine Moth observed

Leptospermum *continentale* (Prickly Tea-tree)

- Excellent host of a range of spiders (including active hunting predators Salticidae 'jumping', some Lycosidae 'wolf' spiders and ambush hunters Thomisidae 'flower' spiders)
- Excellent host for Brown Lacewings and good host for Green Lacewings
- Good host for shield bugs (Predatory Shield Bug in particular)
- Good host for Common Spotted Ladybird and Damsel Bugs
- No Grapevine Moth observed
- Low number of Elephant Weevil observed (n=11 at one site, on one date = average 1 per sample)
- Very few LBAM observed (n=6 instars total)

Austrodathonia sp (Wallaby Grass)

- Three species of assassin bug predominantly found in Wallaby Grass, *Coranus granosus*, Brown Assassin Bug and Black Ground Assassin Bug
- Excellent host of Lycosidae 'wolf' spiders, earwigs, Brown Lacewings and Glossy Shield Bugs)
- No LABM or Grapevine Moth observed
- *Lepidoptera: Agrotis* sp (army and herringbone cut worms) (n=230) were found early in the season at a single site (may present an issue if planting young vines)

Extracted from 'Creating Native Vegetation Insectariums' workshop in Port Phillip & Westernport region, presentation by Mary Retallack, Retallack Viticulture Pty Ltd., September 2016

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 insect habitat to support an abundance of beneficial insects and the likelihood of these predators to interact with pest incursions.

This needs to be worked out first. For an example template to use when designing an insectary, **visit ppwcma.vic.gov.au.**

The main consideration is that you have a good mix of 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.

Example locations

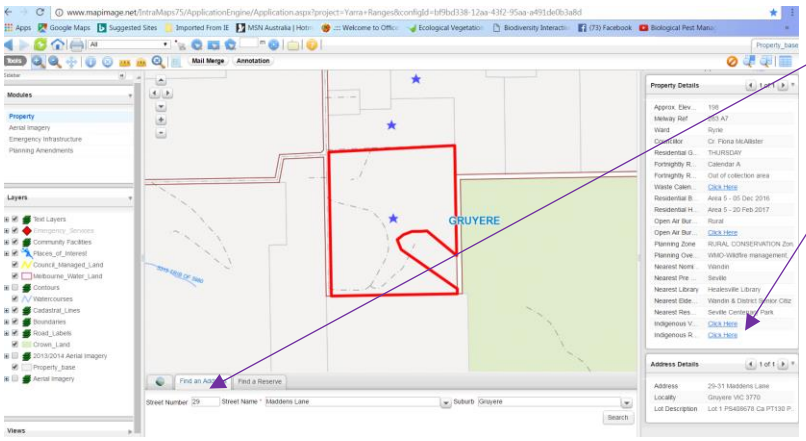
Here are some examples of where native vegetation has been planted as part of the trial, remembering it is based on planting the right species to attract the right beneficial insects.

Remember the Brown Lacewing prefers native grasses. So, locations for insectary plantings can include:

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

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. If you live in the Yarra Valley, Yarra Ranges Council Shire has a great mapping tool you can use. Here is an outline of how to use it.



Type in an address then click on the Indigenous Vegetation Community List to obtain EVC plant lists specific to that address.

Other local councils will have their own resources for working out local indigenous pant 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 a template that you can use to match local vegetation with planting the right insect habitat. The template can be downloaded from **ppwcma.vic.gov.au.**

How to use the template

- Use the plant list you have obtained to highlight those which you know produce pollen and nectar and are suitable to your planned planting locations.
- Next, write a list of your key 3 or 4 pests and the beneficial insects you know predate on them. Lastly, consider the habitat those beneficial insects need - pollen, nectar, shelter, groundcover or shrub habitat.
- Go back you your plant list with highlighted plants and create a match between those on your list and ones which form the beneficial habitat.

Monitoring

A combination of monitoring options should be used to gather accurate data on the range of insects visiting your farm. Through the trial, the Regional Landcare Facilitator monitored in-crop, insectary plantings and remnant or old re-vegetated areas to gain an insight into where the highest number of beneficial insects seem to be living or visiting over spring/summer.

A combination of yellow sticky traps, vacuum sucking, pit fall traps and crop monitoring can be done each week from September – December. For the purpose of your own monitoring, sticky traps and crop monitoring would suffice.

A monitoring template is available at **ppwcma.vic.gov.au.**

Year 1 monitoring results at the berry farm trial site

An insectary windbreak planted at the trial 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 compared with a total of 17 hover flies across the other seven traps at the same time. Demonstrating their need for a nectar source.
- A total of 11,292 insects counted in traps from October-January, majority in Dec/Jan
- Predatory insects (lady beetles, brown lacewings, mites and 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

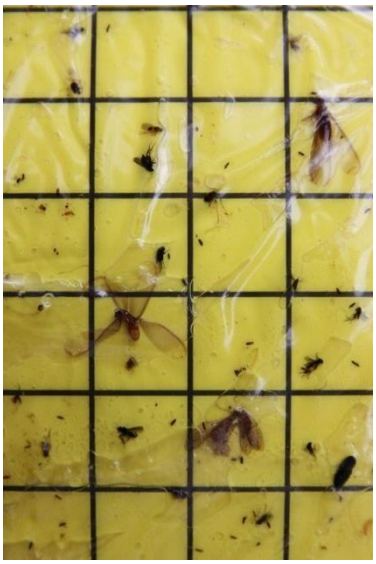
The abundance of beneficial insects found in the main insectary planting did not exist there the previous summer. Insects will move in quickly if the right habitat is available for them.

Monitoring results over two seasons

Monitoring analysis undertaken by Dr Linda Thomson of Melbourne University.

Findings:

- The abundance of ladybirds tripled
- Predatory ground beetles doubled
- Predatory rove beetles doubled
- Four times as many brown lacewings
- Four times as many predatory bugs
- 3,500 beetles collected from 24 families. 2648 of these in the second year with 7 new families monitored
- Increased predatory wasps, thrips and mites
- Increased predatory flies
- Low numbers of weevils (mainly white fringed) collected
- Small increase in aphids



Observations

- Seasonal conditions throughout the monitoring season influence the abundance of beneficial insects so using sticky traps 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 in the trials.
- Increased pest control is a tangible and measureable 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

If we take in to consideration the increased numbers of natural enemies and put a value on this using ladybeetles as a measure, it would look like this:

- Cryptoleamus 64 cents each
- Spotted ladybird beetles 66 cents each
- Chilocorus 64 cents each
- **In season 2 the (1400) ladybirds captured on site represented $900 eco-system service value**

Given that sticky traps are 10cm wide and only capture a proportion of what flies past or crawls over the trap in the 5 day period they are out, the potential natural abundance of ladybird beetles equates to 70 ladybird beetles for every metre of vegetation.

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, LJ. & 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.

Acknowledgements

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