ECO VINEYARDS
GROWING RESILIENCE NATURALLY

CASE STUDY

MANAGING PLANT PATHOGENIC NEMATODES NATURALLY AND ESTABLISHING BIO-HEDGES AT TYRRELL'S WINES, HUNTER VALLEY, NSW

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Wine Australia

retallack viticulture

DIFFERENT WAYS OF ESTABLISHING INSECTARY

Background

The location of the EcoVineyards demonstration site was originally known as the Long Flat Vineyard and was renamed Johnno's Vineyard after the sale of the Long Flat Label.

Located on Ekerts Rd, Pokolbin, planted in 1908, the own rooted vines consist of 1.92 Ha of Semillon and 0.65 Ha of Shiraz.

> ***"The EcoVineyards program has been invaluable. The knowledge gained through this program has reinforced, whilst expanding, my wholistic approach to vineyard management."***
>
> **Louise Eather, Viticulturist, Tyrrell's Wines**

Project description

Our project aimed to assess the effectiveness of brassica cover crops in reducing populations of parasitic nematode species in the Johnno's Vineyard, specifically within the old Semillon and Shiraz blocks.

In addition, we sought to establish an insectary hedge to serve a dual purpose:

- to deter tourists from walking through the Old Hut Vineyard near the cellar door, and
- to attract beneficial insects to the area.

Figure 1: EcoGrowers Louise Eather and Chris Tyrrell, Tyrrell's Wines 2023 [Photo: Mary Retallack].

What did you do?

Insectary hedge establishment

A Nemcon *Brassica napus* (rape or fodder mustard) cover crop was sown in the old Semillon and Shiraz blocks of Johnno's Vineyard over three consecutive years in April 2023, May 2024, and April 2025.

Before the first sowing, a baseline soil and root sample was collected and sent to Metagen Australia for analysis.

The initial soil test results revealed high populations of both root-knot and lesion nematodes. In response, the Nemcon cover crop was sown and later incorporated at budburst as part of our integrated nematode management strategy.

Following the second sowing in May 2024, a new round of soil and root sampling was undertaken. This time, samples were separated by location under-vine and mid-row.

The results showed a notable difference:

- The mid-row samples revealed a significant reduction in root-knot nematodes, but no reduction in lesion nematodes.
- In contrast, the under-vine area saw increases in both root-knot and lesion nematode populations, with numbers more than doubling.

Interestingly and somewhat concerning the number of free-living (non-parasitic) nematodes in the mid-row had dropped by over 50%. This suggests that the biofumigant properties of the brassica cover crop may also impact beneficial soil nematode communities.

A multispecies cover crop may provide a diversity of microbial life including bacteria, protozoa, fungi and predatory nematodes, which may help keep the plant pathogenic nematode population 'in check' with less impact on predatory populations and the level of intervention required to maintain the annual brassica cover crop.

NB: Brassicas are the only major plant group that do not typically form symbiotic relationships with mychorrizal fungi which are important to produce glomelin (soil super glue), readily access nitrogen, phosphorous, and a range of micronutrients and via the life in the soil make them available in a plant available form.

Figure 2: Johnno's Vineyard mature Nemcon Brassica cover crop [Photo: Louise Eather].

Figure 3: Johnno's Vineyard brassica crop incorporated [Photo: Louise Eather].

Insectary hedge establishment

In 2024, we also established an insectary 'bio-hedge' of *Goodenia ovata,* hop goodenia (Figure 4) along the boundary of the Old Hut Vineyard.

This served a dual purpose:

- To provide a physical and visual barrier, discouraging tourists from walking through the vineyard near the cellar door (bio-security).
- To attract and support beneficial insects as part of a broader ecological management strategy (bio-diversity).

The process involved spraying the planting area with herbicide (Figure 5), then ripping and discing the soil. With guidance from Hunter Indigenous Plants, we imported organic soil and formed a 'Toblerone' shaped raised bed (Figure 6). The hedge was then planted with *Goodenia ovata*, hop goodenia mulched, irrigated (Figure 7), and seeded with *Dichondra repens*, tom thumb. We also plan to interplant *Alyssum* 'Carpet of Snow' among the tom thumb to further enhance insectary value.

Hop goodenia has proven to be a hardy and fast-growing species (Figures 8 and 9), and based on our experience, we recommend its use for similar projects in the Hunter Valley.

Figure 4: *Goodenia ovata,* hop goodenia planted in the Old Hut insectary hedge [Photo: Joseph Sims]

Figure 5: Establishment of the insectary hedge in front of Old Hut Vineyard [Photo: Louise Eather]

Figure 6: Toblerone mounding, organic soil and planted Hop goodenia [Photo: Louise Eather].

Figure 7: Mulched mound and irrigation being installed. [Photo: Louise Eather].

Figure 8: Hop goodenia bio-hedge 4 months after planting [Photo: Joseph Sims].

Figure 9: Hop goodenia bio-hedge March 2025 [Photo: Mary Retallack].

Figure 10: Louise Eather and the hop goodenia bio-hedge March 2025 [Photo: Mary Retallack].

Figure 11: Kangaroos freqent the property which is surrounded by remnant vegetation [Photo: Mary Retallack].

If you changed your project, what was the reason for the change?

The original scope of our EcoVineyards project also included monitoring changes in soil organic matter resulting from the use of native crimped grasses, a perennial cover crop, and an incorporated cover crop. However, upon further consideration, this component was removed due to concerns around biosecurity risks and the extended timeframe required to yield meaningful results.

Instead, we focused efforts on establishing two additional insectary plantings: one at the old Semillon end of Johnno's Vineyard, and the other centrally located within the Short Flat Vineyard (home to the Vat 1 and Vat 47 blocks).

What worked well?

Microbat monitoring

Our bat box delivered unexpectedly positive results. When a microbat Chorus sound recorder was placed beneath the box, 12 different bat species were identified including:

- *Austronomus australis*, white-striped freetail bat
- *Chalinolobus morio*, chocolate wattled bat
- *Chalinolobus gouldii*, Gould's wattled bat
- *Chalinolobus dwyeri*, large-eared pied bat
- *Miniopterus australis*, little bent wing bat
- *Miniopterus orianae oceanensis*, eastern bent wing bat
- *Nyctophilus* sp., long-eared bat complex
- *Ozimops planiceps*, south-eastern freetail bat
- *Ozimops ridei*, eastern freetail bat
- *Rhinolophus megaphyllus*, eastern horseshoe bat
- *Scotorepens balstoni*, inland broad-nosed bat
- *Vespadelus pumilus*, eastern forest bat

Figure 12: Ocloc predator perch provides a vantage point for raptor birds of prey and this discourages fruit eating birds from entering the vineyard [Photo: Mary Retallack].

Notably, the large-eared pied bat is listed under the Nationally Threatened BC Act, and three others are listed under the NSW Threatened BC Act. The large-eared pied bat, little bent wing bat and eastern bent wing bat are cave dwellers. It is likely that the nearby Brokenback Range, which boarders the vineyard and contains a significant number of caves, provides important habitat required for these bats.

Predator perch

In 2023, a predator perch was installed at the end of the NVC Vineyard 1921 Shiraz block, adjacent to a dry sclerophyll forest. In January 2025, while undertaking maturity sampling, a young peregrine falcon was spotted using the perch. Unfortunately, as I attempted to photograph it, the falcon took flight toward the top of the vineyard prompting a swift retreat by the lorikeets feeding on grapes in its path.

During the 2024 and 2025 vintages, we observed a noticeable reduction in rainbow lorikeet damage in this block. The lorikeets appeared to limit their movement toward the perch and surrounding stand with each passing season.

Brassca cover crop and insectary plantings

The brassica cover crop proved highly effective in reducing parasitic nematode numbers in the treated blocks.

The insectary hedge successfully deterred cellar door visitors from entering the vineyard. The time invested in properly preparing the soil played a key role in ensuring the establishment and vigorous growth of the hedge.

Additional insectary plantings

Two additional insectary plantings were established in the Johnno's Vineyard (Figures 13 and 14) and the Short Flat Vineyard (Figure 15).

These sites were specifically chosen due to the significance of their fruit within Tyrrell's wine portfolio and the lack of existing vegetation that supports beneficial insect populations in these areas.

Figure 13: A section of the insectary planting at the end of Johnno's Vineyard [Photo: Louise Eather]

Figure 14: Johnno's Vineyard - Grouping of plants, especially grasses, to provide natural habitats to native fauna [Photo: Louise Eather].

Figure 15: Short Flat Vineyard insectary planting [Photo: Louise Eather].

Any pitfalls to avoid?

In hindsight, I would have made greater use of the resources available on the EcoVineyards website during the planning stages of our project.

The insectary hedge, in particular, may have benefited from a more diverse plant selection. I now realise the value of visiting a broader range of native plant nurseries and botanical gardens beyond just the local options to explore a wider variety of colours, forms, and species.

Because the hedge is positioned in front of the cellar door, I placed too much emphasis on aesthetics, rather than balancing visual appeal with ecological function.

Highlights

Having planted predominately shrubs and groundcovers, we observed the following to be exceptionally hardy in the Pokolbin area:

- *Daviesia ulicifolia*, gorse bitter pea (shrub)
- *Dichondra repens*, tom thumb (ground cover)
- *Eremophila debilis*, winter apple (shrub)
- *Goodenia ovata*, hop goodenia (shrub)
- *Grevillea montana*, grevillea (shrub)
- *Hardenbergie violacea*, native lilac or happy wanderer (climber)
- *Pultenaea spinosa*, grey bush pea or spiny bush pea (shrub)
- *Themeda triandra*, kangaroo grass (ground cover)

Despite their prevalence in their native bushland, I found only moderate survival rate was achieved with *Bursaria spinosa*, sweet bursaria; *Arthropodium cirratum*, New Zealand rock lilly; *Chrysocephalum apiculatum,* yellow buttons and *Pultenaea villosa*, hairy pea bush.

What are you more aware of now?

I learned that brassica cover crops can negatively affect non-parasitic nematodes due to their bio-fumigation effect. From Jade Killoran's EcoVineyards seminar, I also learned that rolling the soil after incorporating Nemcon boosts this effect, and that different cover crops target specific parasitic nematodes.

I was initially sceptical about the predator perch attracting anything other than magpies, but after observing the lorikeets avoid the area over two seasons, I now see its potential when correctly placed.

The concept of agroecology was new to me:

- While I knew about using parasitic wasps to manage pests like vine moth, I hadn't considered how flower colour particularly white, yellow, or blue can attract beneficial insects, or the importance of grasses to provide valuable habitat for lizards.
- I also now understand that different cover crop species influence specific microbial communities in the rhizosphere, improving soil health.
- Finally, I was surprised to learn microbats can eat three times their weight in insects in one night and that 12 bat species live in our vineyard.

Where to from here?

We have begun extending the biological hedge to act as a passive barier to cellar door visitors and deter them from entering the Old Hut Vineyard from another section of the car park.

Additionally, we plan to establish new insectaries using tube stock in vineyards near known hotspots for vine moth and light brown apple moth (LBAM).

Are there any outstanding knowledge gaps you would like filled?

I want to expand my knowledge on specific grass and forb species that release exudates, which serve as food for fungi that prey on parasitic nematodes.

What has been the most valuable aspect of the program for you personally?

It's the holistic and integral approach to integrating soil and plant health. You realise you can lower your inputs, improve fruit quality and make the vineyard sustainable by adhering to the principles presented through this program. Starting with soil health, as the food source of the vine and then measuring vine health with something as simple as a garlic press.

My understanding of agroecology has grown significantly. I now realise we often under utilise plants. For example, my view of marshmallow has shifted - from seeing it as a weed to appreciating its benefits in heavy clay soils, where its deep taproot creates water channels and adds organic matter.

I also gained valuable knowledge about targeted cover crop use, such as planting lucerne to boost protozoa populations, and using creeping saltbush to suppress couch grass under vine or to draw salinity from the topsoil.

The quantity, breadth and depth of information and resources compiled on the website is extremely valuable. It is the compendium of agroecology.

Plant lists

Johnno's and Short Flat Vineyard insectary plants			
#	**Scientific name**	**Common name**	**# planted**
1	*Arthropodium cirratum*	New Zealand rock lily	30
2	*Bursaria spinosa*	sweet bursaria	20
3	*Chrysocephalum apiculatum*	yellow buttons	40
4	*Daviesia ulicifolia*	gorse bitter pea	10
5	*Dianella caerulea*	blue flax lily	46
6	*Eremophila debilis*	winter apple	10
7	*Grevillea montana*	Hunter Vallety grevillea	20
8	*Hardenbergia violacea*	native lilac / happy wanderer	20
9	*Leptospermum polygalifolium*	common tea-tree	20
10	*Melaleuca thymifolia*	thyme honey myrtle	10
11	*Petrophile pulchella*	conesticks	20
12	*Pultenaea spinosa*	grey bush pea / spiny bush pea	10
13	*Pultenaea villosa*	hairy pea bush	20
14	*Scaevola albida*	purple fan flower	40
		Total	**356**

Old Hut Vineyard insectary hedge			
#	**Scientific name**	**Common name**	**# planted**
1	*Dichondra repens*	tom thumb	seed
2	*Goodenia ovata*	hop goodenia	301
3	*Lobularia maritima*	alyssum	seed
		Total	**301**

Expenses

Date	Item	Number of plants	EcoVineyards costs (ex GST)	Co-contribution (landholder contribution)	In-kind time (hours)
12/09/2024	Impact Ecology - microbat call analysis		$124		
26/11/2024	Soil for insectary		$82		5
27/11/2024	Soil for insectary		$82		5
27/11/2024	Soil for insectary		$300		8
4/12/2024	Soil for insectary		$218		6
28/02/2025	Plant ties for insectary		$11		1.5
11/03/2025	*Dichondra repens* seed		$327		2
12/03/2025	Hunter Indigenous Plants	86	$235		4
26/03/2025	Parasitic nematode count Metagen		$198		1.5
2/04/2025	Hunter Indigenous Plants - Local native tubestock	277	$831		27
14/04/2025	Hunter Indigenous Plants	294	$851		6
14/03/2025	Eden Seeds Alyssum - Carpet of Snow		$31		
2/05/2025	Cessnock Landscaping Supplies		$636		7
25/06/2025	Local native tubestock	45	$126		5
	EcoGrower contribution			$3,000	
	Total	**702**	**$4,052**	**$3,000**	**78 hours**

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ACKNOWLEDGEMENT OF COUNTRY

EcoVineyards proudly acknowledges the Aboriginal and Torres Strait Islander Peoples, and their ongoing cultural and spiritual connection to this ancient land on which we work and live.

As the Traditional Custodians of this land, we recognise their wealth of ecological knowledge and the importance of caring for Country.

We pay our respects to elders past and present and extend this respect to all Aboriginal and Torres Strait Islander Peoples.


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