EcoVineyards: demonstrating the benefits of under-vine ground cover

Dr Mary Retallack, Retallack Viticulture Pty Ltd

EcoGrowers (those using ecological practices) are planting a diverse mix of low-growing ground cover to improve the functional capacity, resilience and profitability of their vineyards.

Wine grape growers throughout Australia are being supported in their actions to enhance soil health, establish ground cover and increase biodiversity in vineyards through the National EcoVineyards program.

The program aims to accelerate the adoption and practice change outcomes specified in Wine Australia's Strategic Plan 2020–2025, specifically to increase the:

- land area dedicated to enhancing functional biodiversity by 10%
- use of vineyard cover crops and soil remediation practices by 10%.

In addition to our annual events and activities, the EcoVineyards team is working closely with wine grape growers to establish demonstration sites in 8 participating wine regions throughout Australia, including the Hunter Valley, Orange, Margaret River, Yarra Valley, Mornington Peninsula, Clare, Adelaide Hills, and Langhorne Creek.

We encourage wine grape growers to achieve 100% functional plant cover (and active root growth) 100% of the time (where possible).

Why is this important?

With bare soil, nature will fill the void with weed species (also known as pioneer plants or early colonisers), which are often indicators of soil health. Early coloniser species include moss and lichen (also called cryptogams, or plants that reproduce by spores without flowers or seeds). They help to protect the soil surface when it is sterile due to prolonged herbicide application. Using herbicides in a vineyard is often problematic, with many weed species quickly becoming resistant to the herbicides.

What might be considered competition from weeds could be due to other factors including allelopathy, which is the adverse effect one plant has on another, caused by the exudation of chemicals into the soil that suppress the growth of nearby plants. For example, wireweed (*Polygonum aviculare*) and ryegrass (*Lolium* spp.), which produce suppressive chemicals, and weed species are commonly found in association with compacted and bacteria-dominant soil.

The aim is to replace these voids and weeds with diverse ground cover plants, which might include grasses, forbs (flowering plants) and low growing, prostrate woody plants. This should convert compacted and bacteria-dominant (Figure 31) soil to:

- be more friable with greater water-holding capacity
- have more soil carbon and microbial activity with fungi-dominated soil, which is preferred by perennial species such as grapevines
- transform nutrients into plant-available forms
- create pathogen-suppressive soil
- have greater resilience in the system.

Liquid carbon pathway

It is important to maximise the benefits gained from using nature's solar panels (i.e. the leaves of optimally photosynthesising plants) and the many benefits from the liquid carbon pathway (Figure 32) when it is working well in healthy systems.

The liquid carbon pathway is a symbiotic relationship between mycorrhizal fungi and 90% of all plants, including grapevines. Plants produce extra carbohydrates (simple plant sugars) and then exude that surplus into the soil to feed fungi. Arbuscular mycorrhizal fungi (AMF), in turn, use the exudates to create a sticky carbon exudate called glomalin.

Glomalin is critical when soil aggregates are forming to create soil structures with adequate pores for air and water storage. With the increased water-holding capacity that comes with increased soil carbon, a plant's photosynthetic capacity increases. This leads to more carbon being pumped into the soil, which is an important feedback loop, all fuelled by the sun. Photosynthesis and the liquid carbon pathway are essential for building soil.

In return for these exudates, soil microbes, particularly fungi, provide moisture and nutrients to plants. When the cycle is functioning well, soil biology will source, cycle and transport many nutrients that plants require for growth. Without this interaction, many minerals and trace elements are not plant-available, and the system does not work optimally.

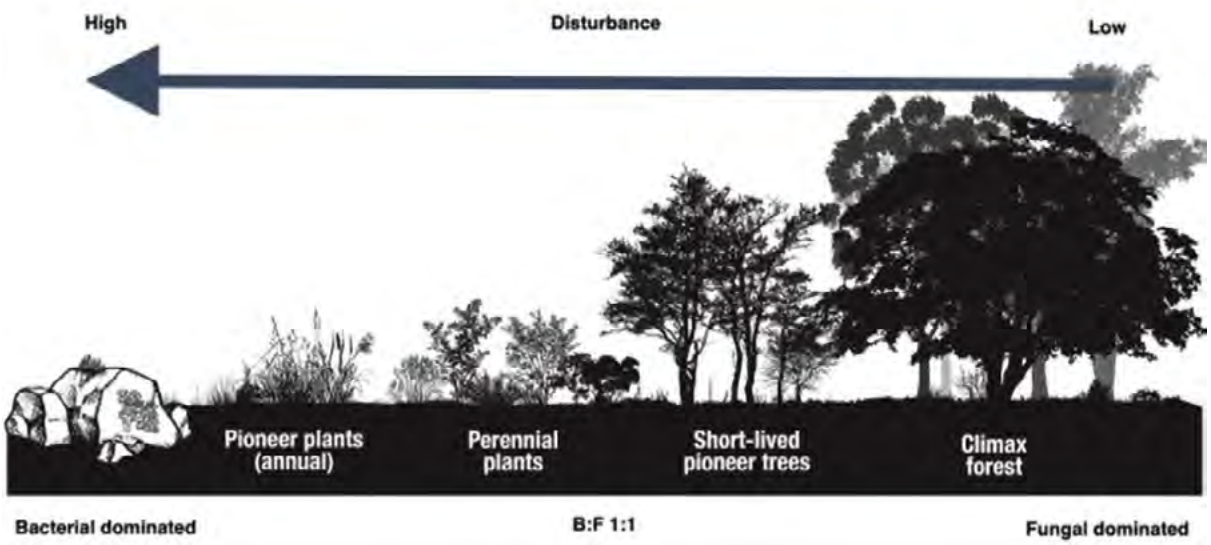

Figure 31. An example of the types of Australian plants involved in ecological succession.

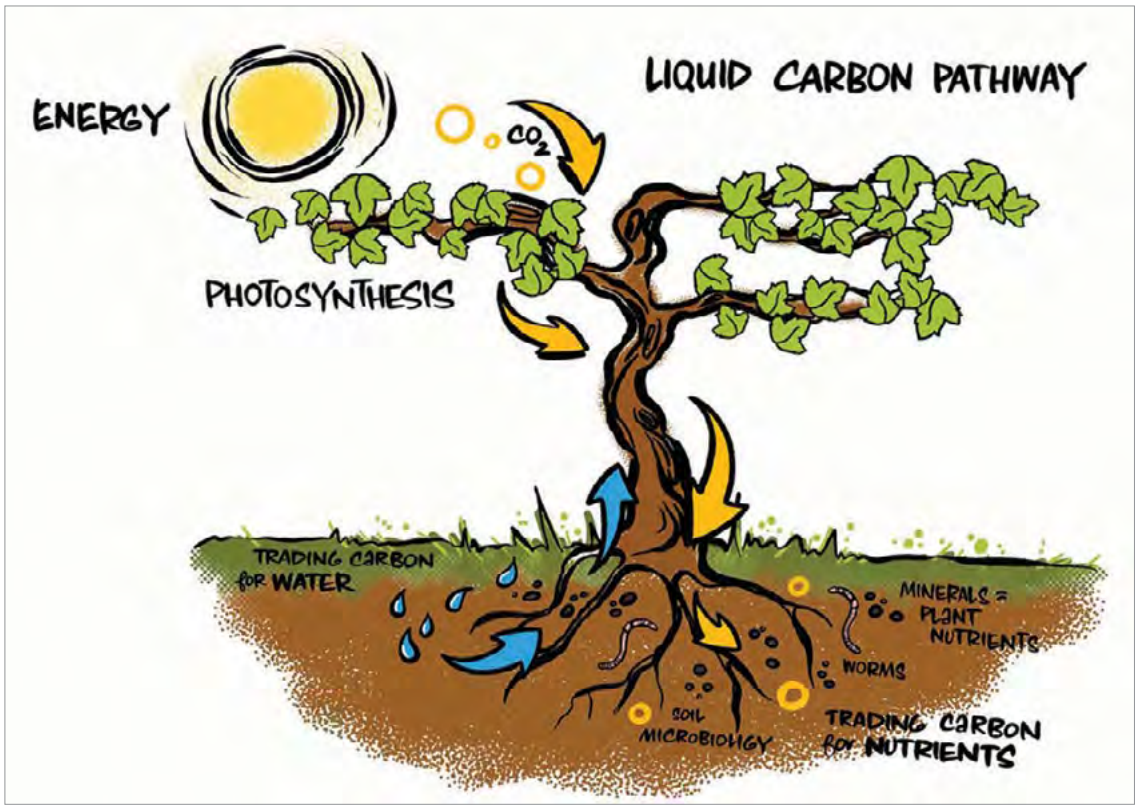

Figure 32. Soluble or liquid carbon pathway.

Low-growing ground cover

The EcoVineyards events held in May 2024 focused on a range of cover crops and perennial ground cover species (commercial and native) that can provide long-lasting benefits in vineyards.

PGG Wrightson's Seeds and Vortec Global demonstrated a purpose-built hydroviner for use in vineyards, and local contractors applied a slurry mix of wood fibre, water and seed.

We also explored a range of low-growing species (reported to grow <300 mm) that might be suitable in the under-vine area by hand-sowing individual species in each panel. Wood fibre was then hydroseeded over the top of half the row to assess germination rates with and without wood fibre, and the overall success and growth characteristics of each species. Commercially, a single blend of seed would normally be incorporated in the hydroseeding mix in a single pass.

NSW demonstration sites

The EcoVineyards team established demonstration sites at Keith Tulloch Wines (Figure 33 and Figure 34) in the Hunter Valley and See Saw Wine in Orange with the following 19 ground cover species in either location.

Native species:

- creeping saltbush (*Atriplex semibaccata*)
- cut leaf goodenia (*Goodenia pinnatifida*)
- dichondra (*Dichondra repens*)
- fuzzy New Holland daisy (*Vittadinia cuneata*)
- inland pigface (*Carpobrotus modestus*)
- kneed wallaby grass (*Rytidosperma geniculatum*)
- lemon beauty heads (*Calocephalus citreus*)
- native flax (*Linum marginale*)
- pussy tails (*Ptilotus spathulatus*)
- round-leaved pigface (*Disphyma crassifolium*)
- running postman (*Kennedia prostrata*) Orange only
- scaly buttons (*Leptorhynchos squamatus)* Orange only
- Swan River daisy (*Brachyscome iberidifolia*) Orange only
- weeping grass (*Microlaena stipoides*)
- woolly New Holland daisy (*Vittadinia gracilis*)

Introduced species:

- creeping thyme (*Thymus serpyllum*)
- Persian clover (*Trifolium resupinatum)* can grow up to 500 mm tall
- subterranean clover (*Trifolium subterraneum*)
- sweet alyssum (*Lobularia maritima*)

These demonstration sites will help identify which species are likely to grow well so regionally specific mixes can be developed. The findings from each region will be presented in a series of case studies in 2025.

Wine grape growers are invited to access a range of regionally specific resources on soil health, ground cover (including cover crops) and functional biodiversity on the EcoVineyards website (https://ecovineyards.com.au/).

Figure 33. Lorrae St Vincent (Brokenwood), Dr Mary Retallack (EcoVineyards) and Brent Hutton (EcoVineyards) at Keith Tulloch Wines (left). Ground cover species were sown in each panel and the hydroseed slurry applied to half the row and sown with kneed wallaby grass (*Rytidosperma geniculatum*) (right).

Figure 34. The hydroviner unit was used to apply a slurry of wood fibre and water at Keith Tulloch Wines in the Hunter Valley (top left) and Orange EcoVineyards event participants (top right and below).

Funding

The National EcoVineyards Program is funded by Wine Australia with levies from Australia's grape growers and winemakers and matching funds from the Australian Government. The program is delivered by Retallack Viticulture Pty Ltd with significant support from regional communities.

For more information, please visit the National EcoVineyards Program website (www.ecovineyards.com.au).

Ground cover seminar and hydroseeding demonstration

Penny Flannery, Development Officer – Viticulture, NSW DPIRD

On 9 May 2024, I attended a ground cover seminar and hydroseeding demonstration by EcoVineyards and EcoScape Solutions of Orange at See Saw Wine in Orange.

Dr Mary Retallack (Figure 35) discussed work she is doing in South Australia and the Hunter Valley and Orange regions with multi-species ground cover blends. Some of the local vineyards involved include See Saw Wine, Renzaglia Wines and Tamburlaine Organic Wines.

Figure 35. Dr Mary Retallack of EcoVineyards presenting at a ground cover seminar at See Saw Wine.

Dr Retallack also indicated that EcoVineyards are conducting a 3-year development program starting with soil health (2023), cover crops (2024) and functional biodiversity (2025).

Jade Killoran of Healthy Farming Systems continued the discussion on multi-species cover crops, indicating there was a mix of annuals, perennials, insectary native grasses, native woody and native forbs or flowering species used. All species selected are low-growing.

Jade discussed a trial site on the NSW South Western Slopes with a mustard growing trial and a test site in Mudgee, where ryegrass and other native perennials were chosen to out-grow wireweed.

Tim Berryman of Cumberland Plain Seeds Pty Ltd spoke about restoring the land and assisting with regeneration by using species that suit the area. He also said that growers should understand the land they are working on to help with this.

Mark Stidwill of DuraVeg – PGG Wrightson Turf talked about his hydromulch and hydroseeding materials, which were originally used in the mining industry for erosion control. He discussed the creation of the slurry mixture based on the operation, which include factors such as slope, rain-resistant seed types, and fertiliser requirements. All affect the composition of the hydroseeding mixture. Mulch fibre is used and is usually from recycled wood.

The hydroseeding demonstration by EcoScape Solutions (Figure 36) from Orange NSW included several different species including:

- alyssum (*Lobularia maritima*)
- creeping saltbush (*Atriplex emibaccata*)
- cut leaf goodenia (*Goodenia pinnatifida*)
- dichondra (*Dichondra repens*)

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- inland pigface (*Carpobrotus modestus*)
- kneed wallaby grass (*Rytidosperma geniculatum*)
- lemon beauty heads (*Calocephalus citreus*)
- native flax (*Linum marginale*)
- pussy tails (*Ptilotus spathulatus*)
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- Swan River daisy (*Brachyscome Iberidifolia*)
- weeping grass (*Microlaena stipoides*).

Figure 36. The hydroseeder seeding under the vines.

Species selection is determined by the needs of individual vineyards, which can include:

- increasing biomass, nitrogen-fixing, insect populations, nutrient cycling nitrogen to carbon cycling, and forage crops if stock are grazing the vineyards
- reducing compaction, waterlogging, salinity, and weeds
- requiring drought hardy species or salinity tolerant species
- using them as a nematicide (e.g. brassicas or mustard species).

Highlights include:

- Using a hydroseeder made establishing an under-vine planting easy, especially compared to hand-seeding, which is labour-intensive and time-consuming.
- The cost of hydroseeding is around $1,500/ha (Michael Curran, EcoScape Solutions, personal communication), depending on the material added to the mix, seed type, and fertiliser, but once established, it is 'set and forget'.