Vineyard Biosecurity Manual

A guide to biosecurity and practical measures you can implement to reduce the risks of pests and diseases impacting your vineyard

Version 2.1



Plant Health AUSTRALIA

Wine Australia

Hort Innovation

Plant Health Australia (PHA) is the national coordinator of the government–industry partnership for plant biosecurity in Australia. As a not-for-profit company, PHA services the needs of members and independently advocates on behalf of the national plant biosecurity system.

PHA's efforts help minimise plant pest impacts, enhance Australia's plant health status, assist trade, safeguard the livelihoods of producers, support the sustainability and profitability of plant industries and the communities that rely upon them, and preserve environmental health and amenity. **planthealthaustralia.com.au**

Australian Grape and Wine Incorporated is the peak national grape and wine body. It supports and represents the industry through building capability, developing strategy and advocating policy. **wfa.org.au**

The Australian Table Grape Association is the peak industry body representing commercial table grape growers from across the country. The table grape Industry Advisory Committee plays an important role in capturing the expertise of the industry and shaping industry investment. **australiangrapes.com.au/industry**

Dried Fruits Australia is the peak body representing the growers, processors and marketers of dried grapes.

Dried Fruits Australia provide services and initiatives of commercial benefit to grower members with the objective of maximising profitability to all industry stakeholders. **driedfruitsaustralia.org.au**

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Wine Australia supports a prosperous Australian grape industry by investing in research and development (R&D), building the international and domestic markets and disseminating knowledge. **wineaustralia.com**

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Image courtesy of Dried Fruits Australia

Introduction

This manual is designed for everyone involved in the viticultural production chain, including vineyard owners, managers, staff, contractors, researchers and consultants. It outlines simple principles and procedures that can be used to minimise the risk of introducing and spreading exotic and established pests and diseases throughout your vineyard.



Image courtesy of Dried Fruits Australia

Biosecurity overview

Biosecurity is the management of risks to your business, the industry, the community and environment from exotic pests, notifiable established pests and other established pests and diseases of biosecurity significance entering, establishing and spreading.

The risk is real

The current and future productivity and profitability of viticulture industries is threatened by pests and diseases which are either yet to establish in Australia, or yet to establish in your region or in your vineyard.

These include:

- **Exotic pests and diseases** – pests and diseases that are not present in Australia (page 30).
- **Established pests and diseases** of national significance – that are already in Australia but are restricted to particular regions. Several of these regionalised pests (e.g., Phylloxera, Queensland fruit fly, Mediterranean fruit fly) are **notifiable established pests**, as there are strict regulatory requirements to prevent their movement outside the regions where they are currently present.

The introduction of any of these biosecurity threats into your vineyard can have serious impacts to your business and livelihood, including:

- **Reduced quality and yield** – Pests and diseases can reduce yield in any number of ways including causing premature fruit drop, reducing water and nutrient uptake through root damage, reducing fruit set, reducing photosynthetic ability through leaf feeding. Pests and diseases can reduce quality by causing scarring, feeding on fruit, and increasing general intra- and inter-vine variability. **Some diseases can lead to vine death.**
- **Increased cost of production** – Costs associated with additional pest monitoring, chemical applications and labour costs, cultural management practices and biosecurity compliance costs associated with disinfestation treatments, biosecurity accreditations and documentation.
- **Impact on movement of fruit and goods** – The presence of a pest in your area can result in movement restrictions on product, equipment and machinery to prevent spread to other regions. It may also mean that fruit may only be moved after being processed or treated.
- **Reduced access to markets** – The presence of pests and diseases can mean that certain markets will not be willing or legally able to receive products grown in those regions. This can also apply to interstate and intrastate buyers in regions that are free from the threats.

You have an important role to play in protecting your vineyard, your region and the viticulture industries from biosecurity threats.



The cost of overlooking biosecurity: A case study from the US

Pierce's disease is an extremely damaging disease which affects grapevines and many other plant species and is present in many countries around the world. Pierce's disease, caused by the bacterium, *Xylella fastidiosa*, has been identified as Australia's number one exotic plant biosecurity threat.

In the United States the grape industries incur substantial costs from vine losses and steps implemented to mitigate against Pierce's disease. Pierce's disease prevents the movement of water within infected plants and causes the death of infected vines within 1 to 5 years. The disease is spread through sap feeding insects, the most efficient of which is the glassy-winged sharpshooter (another pest which we currently do not have in Australia).

The cost of Pierce's disease on the grape industries within California alone is an estimated **$104 million each year**. Of this, **$56 million is the direct cost to grape growers** from lost production and replacement of vines. The remaining $48 million is the cost of activities to limit the damage of the disease in the region (Kabir, Tumber and Alston 2014).

Additionally, modelling has shown that if the glassy-winged sharpshooter was more widely distributed throughout growing areas of California then the cost of the combined Pierce's disease, glassy-winged sharpshooter burden on the wine grape industry alone would likely increase by $185 million each year (Kabir, Tumber and Alston 2014).

For more information on Pierce's disease see page 48.



Chardonnay cultivar showing symptoms of Pierce's disease under moisture stress (Image courtesy of Alex Purcell, University of California, Bugwood.org).



Glassy-winged sharpshooter, vector for Pierce's disease (Image courtesy of Reyes Garcia III, California Department of Agriculture, Bugwood.org).



Image courtesy of Taste Australia

What can you do?

1. Become familiar with your industry's exotic pests and notifiable pests (on page 30). You may need to refer to these if you find a pest or disease you don't recognise.
2. Report any suspected exotic or notifiable established pests and diseases without delay by calling the Exotic Plant Pest Hotline on **1800 084 881**.
3. Develop and implement a biosecurity plan to address the risks posed to your specific operations, including risk from the movement of people, vehicles, equipment, soil and plant material onto and off your vineyard. The Farm Biosecurity website has a toolkit to assist you develop your Biosecurity plan **www.farmbiosecurity.com.au/toolkit**

Ensure all visitors to your property are aware of your biosecurity requirements and adhere to your requirements for managing the biosecurity risks that they present. Use a Visitor Register to record who enters your vineyard. To view an example of a visitor register, download this link from the Vinehealth Australia website **here**.

Why vineyard biosecurity matters

Australia's freedom from exotic plant pests and limited spread of notifiable pests is key to the future profitability and sustainability of Australia's plant industries.

Adopting sound vineyard biosecurity practices helps to protect your business, your livelihood, and the livelihoods of your staff and the businesses which provide you and the industry with services (e.g., rural merchandisers, transport, viticulturists).

By using the measures recommended in this manual in day-to-day activities you will improve your vineyard's biosecurity and that of your region, minimising crop losses and avoiding additional costs. Once a new pest or disease becomes established in Australia, the ongoing costs of managing it are often far greater than the costs associated with preventing its establishment in the first place. In addition, the earlier an exotic or notifiable pest incursion is detected, the more likely it can be successfully eradicated or contained.

In addition to the exotic pests which are not in Australia, we also need to be aware of the notifiable pests that may be established in some regions but not others. For these pests, it is a legal requirement to report them if you find them on your property. Regulated pests for viticulture are Phylloxera, which is restricted to some areas of Victoria and NSW, Queensland fruit fly (present in the Northern Territory, Queensland, New South Wales and parts of Victoria) and Mediterranean fruit fly (present in southern Western Australia).

Understanding and adhering to your legal obligations in conjunction with adopting sound biosecurity practices such as those suggested in this manual will minimise the risk of pest and disease accumulation and spread, as well as helping to protect others in your region. Adopting on-farm biosecurity practices will also help with management of damaging pests and diseases which are already established in our vineyards.

Working together to protect your vineyard

There are multiple layers to the biosecurity system and every Australian has a role to play. The diagram below shows the three components of the biosecurity system and the activities carried out by many people and groups, including vineyard managers and staff. Protection from pests and diseases is only possible if everyone works together.

The Australian Government plays a key role pre-border, working with exporting nations to minimise risks before product leaves a country as well as at the national border, where international movements of people and goods are regulated.

Within Australia, post-border biosecurity measures aim to prevent the spread of weeds, pests and diseases that are already present, and to contain and eradicate any new pest that may enter Australia. Post-border biosecurity relies on the activities of state governments, local governments, property owners and everyday Australians.

The roles of every Australian, including vineyard managers and staff, are to:

- protect areas within their control from pests and diseases
- obey the law, particularly those about movement restrictions
- report any sightings of possible exotic or notifiable pests or diseases

In Australia, biosecurity involves four layers of protection

PRE-BORDER



Federal Government (Department of Agriculture, Water and Environment)

- Analysing pest risks associated with proposed imports
- Inspecting, verifying and auditing overseas exporters
- Undertaking pest surveillance overseas
- Developing international standards
- Building capacity overseas
- Anticipating pest threats by gathering global pest intelligence
- Negotiating export market access
- Maintaining the Manual of Importing Country Requirements (MICoR) and Export Documentation System (EXDOC) to facilitate exports

AT THE BORDER



Federal Government and State & Territory Government (State Departments of Agriculture)

- Inspecting and monitoring arrivals of people, cargo, mail and plant products
- Raising awareness of plant pests and movement restrictions
- Imposing biosecurity measures at ports
- Encouraging the reporting of suspected new pests by port workers and importers
- Protecting Australia's north from exotic pests with the Northern Australia Quarantine Strategy (NAQS)
- Enforcing border restrictions
- Isolating newly arrived plant material in post-entry quarantine and testing its health before it is released post-border
- Prioritising exotic pests to target with preparedness and prevention activities

POST-BORDER



State and Territory Governments

- Preventing the further spread of existing pests (e.g., fruit flies and weeds)
- Providing early warning of incursions of exotic and reportable established pests via surveillance
- Eradicating exotic pests under the Emergency Plant Pest Response Deed
- Eradicating or containing (where eradication is not possible) notifiable established pests
- Managing risks under the control of everyday Australians
- Encouraging the reporting of anything unusual
- Managing established pests
- Maintaining the ability to diagnose plant pests
- Maintaining emergency response capacity
- Responding to environmental threats with the National Environmental Biosecurity Response Agreement

REGION/VINEYARD



Industry and you

- Ensure you comply with all Australian, State and Territory government laws relating to importing material and moving material across (and within where applicable) state and territory borders
- Preventing the further spread of existing pests
- Monitoring for exotic and notifiable established pests
- Contribute to eradicating exotic pests under the Emergency Plant Pest Response Deed
- Reporting of anything unusual
- Managing established pests
- Protecting vineyards with on-farm biosecurity measures

Biosecurity laws

Everyone has a role to play in safeguarding Australia from pests, diseases and weeds. In addition to quarantine zones, all states have legislation for biosecurity management which includes requirements for pest and disease reporting.

The Biosecurity Act 2015

The *Biosecurity Act 2015* is national legislation that lays out the requirement of each stakeholder in the management of biosecurity risk and the response to biosecurity events at the national border.

This law outlines that mitigating biosecurity risk is a shared responsibility among all members of the community.

Abiding by international and domestic border restrictions is one role that all Australians must play in maintaining Australia's biosecurity status. In addition, everyone has an obligation to do what they can to avoid spreading plant pests, diseases and weeds, to keep a lookout for anything unusual and report unfamiliar pests, disease symptoms and weeds.



Image courtesy of Dried Fruits Australia

State & Territory legislation

Recently, some States have introduced a "Duty of Care" framework into their biosecurity laws. This provides a "General Biosecurity Duty" (sometimes called a "General Biosecurity Obligation") for every person to take reasonable and practicable steps to prevent biosecurity risks, such as the spread of pests and diseases, from occurring as a result of their activities or business. In these States, currently Queensland, New South Wales and Tasmania, the duty of care applies to everyone in the community and not just primary producers. Often, the legislation is supported by guidelines, Codes of Practice or other advice to help people understand their Duty of Care and how to comply.

In other States and Territories, the biosecurity laws may be more prescriptive in describing the actions that individuals need to undertake.

It is important to check the laws that apply to where your business operates and what you need to do to comply. Be aware that legislation changes occasionally, and you need to keep abreast of changing legislation. Table 1 includes the various biosecurity legislation Acts and Regulations and website links where further information can be sought.

Table 1. State and Territory legislation

Jurisdiction	Legislation (2021)	For more information – follow these links
ACT	▪ *Plant Disease Act 2002* ▪ *Pest Plants and Animals Act 2005*	**environment.act.gov.au/parks-conservation/plants-and-animals/Biosecurity/biosecurity-legislation**
NSW	▪ *Biosecurity Act 2015* ▪ *Biosecurity Regulation 2017* ▪ *Biosecurity Order* (Permitted Activities) *2017*	**dpi.nsw.gov.au/about-us/legislation/list/biosecurity-act-2015**
NT	▪ *Plant Health Act 2008* ▪ *Plant Health Regulations 2011*	**legislation.nt.gov.au**
QLD	▪ *Biosecurity Act 2014* ▪ *Biosecurity Regulation 2016*	**daf.qld.gov.au/business-priorities/biosecurity/**
SA	▪ *Plant Health Act 2009* ▪ *Plant Health Regulations 2009* ▪ *Phylloxera and Grape Industry Act 1995*	**pir.sa.gov.au/biosecurity/plant_health**
TAS	▪ *Biosecurity Act 2019* ▪ *Weed Management Act 1999*	**dpipwe.tas.gov.au/biosecurity-tasmania/about-biosecurity-tasmania/biosecurity-act-2019**
VIC	▪ *Plant Biosecurity Act 2010* ▪ *Plant Biosecurity Regulations 2016*	**agriculture.vic.gov.au/biosecurity/protecting-victoria/legislation-policy-and-permits**
WA	▪ *Biosecurity and Agricultural Management Act 2007* ▪ *Biosecurity and Agriculture Management Regulations 2013*	**agric.wa.gov.au/bam/biosecurity-and-agriculture-management-act-2007**

Each State and Territory has certain requirements which restrict the movement of fruit and plant material both into the State or Territory and, in many cases, within the State or Territory. This includes fruit fly exclusion zones and phylloxera management zones (**page 25**).

In South Australia it is a requirement under the *Phylloxera and Grape Industry Act 1995* for owners of vineyards (wine grapes, dried fruit, table grapes) of an area 0.5 hectares or greater to be registered with Vinehealth Australia.

If you plan to move grapes, grape products or other material from your vineyard to another area, familiarise yourself with these quarantine zones first to make sure you are not accidentally breaking the law and introducing biosecurity risks to other vineyards.

Information regarding the various quarantine zones is available at **interstatequarantine.org.au/travellers/quarantine-zones** or State/Territory government biosecurity manual (see table 3 on **page 33**)

Regional cooperation on biosecurity

Biosecurity at the regional level is strengthened when everyone works together. When everyone manages their property to reduce biosecurity risks, the entire region benefits.

Pests and diseases can spread to your vineyard from neighbouring areas, so it makes sense to work with others on regional approaches to pest management wherever possible. Biosecurity risks are easier to manage when expectations of visitors, workers and contractors are consistently applied across the region.

To help strengthen district or regional biosecurity you can:

- work with your local industry organisation to brainstorm ideas for better practice
- work with other horticulture/viticulture organisations and Government (State/Territory and local) to brainstorm ideas
- talk to your neighbours about ways that you could work together
- put biosecurity as a standing agenda item in community meetings.



Image courtesy of Wine Australia



Making a Biosecurity Plan for your vineyard

The following pages suggest ways to reduce the vulnerability of your vineyard to biosecurity threats. Every vineyard is different, so the general principles described here will need to be tailored to your needs.

Each year, or whenever there are changes to key business activities relevant to biosecurity, you should revisit your vineyard biosecurity plan. In addition to the relevant state and territory legislation, your plan should consider each of the six biosecurity essentials to enable you to make decisions about how and to what extent you will manage risks under each of these categories.

The six biosecurity essentials are:

1. **Vineyard inputs**
2. **Production practices**
3. **Vineyard outputs**
4. **People, vehicles and equipment**
5. **Animals and weeds**
6. **Train, plan and record**

The following sections outline a range of biosecurity practices for all viticulturists, vineyard owners, managers and staff.

Assess the strengths and weaknesses of your current biosecurity arrangements and then use the guidelines in the following section to improve your biosecurity planning.



Image courtesy of Wine Australia

1 Vineyard inputs

Anything moved onto your vineyard can be a potential source of pests and diseases.

Planting and grafting material

Diseases can be transmitted to your vineyard through infected planting material. Make sure that you limit your risk of introducing diseases into your vineyard by purchasing planting and grafting material from accredited nurseries or vine improvement associations that meet biosecurity and legislative requirements.

You cannot rely on visual assessments for determining the health status of planting material, especially when the material is dormant. Virus and trunk disease are examples that may only exhibit symptoms once vines are a few years old. Therefore, it is important that you obtain records of the material's source, treatment and virus testing history from nurseries or vine improvement associations before you purchase it. This includes records for both the scion and rootstock if the material is grafted.

To ensure that you can be provided with healthy material of your preferred clone/rootstock combination, make sure that you communicate with a certified nursery or vine improvement association and try to notify them of your planting or grafting plans about two years in advance. This should allow them enough time to prepare for your upcoming needs.

What should you look for?

- Look for nurseries or vine improvement associations that are independently accredited and adhere to other quality assurance accreditations.
- Request virus testing history for your source rootstock and scion material.
- Maintain records of treatments (e.g. hot water treatments, fungicidal dipping) if treatments are required as part of importation or propagation.
- Request the original source location for your scion and rootstock and maintain these records as part of your planting history and in case of requiring traceability.
- Inspect your planting material thoroughly upon receival.

Ensure that new planting material:

- is free from visible pests and diseases and damage
- is bright in colour and not wet, blackened, mouldy or dried out
- has a fully healed graft union (for grafted vines) that is not contaminated or excessively calloused
- is preferably pencil thickness
- is free from soil.

Receive all new planting material in a shed or other controlled environment and inspect thoroughly before you move it to a vineyard. Do not plant anything that looks unhealthy and has the potential to introduce a disease into your vineyard. Seek advice immediately from your local biosecurity officers if you suspect the material is infected or infested with a disease or pest.

Never use poor quality or diseased planting material as it has the potential to infect your entire vineyard. In the event that you cannot source certified planting material, it is worth postponing planting. The long-term economic cost of introducing a disease into your vineyard far outweighs the cost of delaying planting.

Any material that is undocumented or of unknown origin should not be accepted onto your vineyard.

It is important to maintain a register of your vineyard's planting material, including its source (with contact details), cultivar–rootstock combinations and batch numbers, virus testing history and results, specific planting locations, numbers of plants and the date received and planted. This allows for any issues to be traced back to the source and to prevent further spread of disease through the use of infected material.

Choosing the right rootstock for your region and climate may also help reduce your susceptibility to pests and diseases. Tools such as the **grapevine rootstock selector tool** from Wine Australia can assist.

If you are using heritage material from your own vineyard for grafting or planting, always ensure you virus test your source vines first before taking cuttings. This also includes rootstock material if you are planning to graft.

You can send samples for virus testing to the diagnostic laboratories at either AgriBio or The Australian Wine Research Institute. Contact the laboratory before sending the material to ensure you meet their packing and submission requirements and any biosecurity laws.

AgriBio (Agriculture Victoria) – Crop Health Services
Phone: (03) 9032 7515
www.agriculture.vic.gov.au/support-and-resources/services/diagnostic-services#h2-1

The Australian Wine Research Institute –
Virus testing team
Phone: (08) 8313 7426
commercialservices@awri.com.au
www.awri.com.au/commercial_services/virus-testing

Use certified inputs

Reduce the risk of purchasing contaminated inputs by ensuring you only purchase pest- and disease-free inputs such as organic fertilisers, compost and mulch from suppliers that can demonstrate compliance with Australian standards.

Look for compliance with the Australian Standard AS4454-2012 that applies to compost, soil conditioners and mulches.

For fertilisers, ensure your supplier is following the Fertilizer Industry Federation of Australia (FIFA) code of practice or has equivalent quality controls in place. See **fertilizer.org.au** for more information.

If you make your own compost and are considering grape marc as an input, ensure you familiarise yourself with your state's plant quarantine manual or equivalent as grape marc is a regulated item. This means that there are legal requirements governing the movement of grape marc between zones which you must adhere to. Application of grape marc produced from grapes grown in a Phylloxera Infested Zone to vineyards in this Zone is strongly discouraged. For more information go to **vinehealth.com.au/rules/state-movement-regulations**


Image courtesy of Wine Australia

Keep records of where inputs are applied across the vineyard as well as batch number and source information.

Purchasing second-hand materials and machinery

Best practice is to **not** move materials from vineyard-to-vineyard or region-to-region. As always, make sure that you comply with state and territory regulations regarding the movement of equipment and machinery between regions and states and note that these can differ between states. It is best to contact your state/territory department of agriculture to discuss specific requirements (see page 33 for contact details).

If you are buying materials such as trellis posts or machinery on the second-hand market, there are some things that you can and must do to lessen the risk:

- understand what regulatory requirements are involved in the movement by contacting your state/territory biosecurity department
- adhere to these regulatory requirements, including determining the history of use of the machinery or equipment from the purchaser, having it thoroughly cleaned of all soil and plant material, undertaking disinfestation if required and obtaining inspections and biosecurity documentation before you proceed with the purchase and movement. Inspect machinery when it first arrives on your property to ensure the machinery is clean and any disinfestation processes have been completed.
- preference purchasing second-hand materials from within a Phylloxera Exclusion Zone. Consider the risk of purchasing second-hand machinery or equipment from a Phylloxera Infested Zone for use in a Phylloxera Exclusion or Phylloxera Risk Zone
- inspect the machinery/equipment in person before purchasing it where at all possible
- ensure appropriate inspections occur at the border if your import has come from interstate or another phylloxera management zone
- if your purchase has come from within your region, quarantine it on arrival to monitor for any signs of pests. Ensure your purchase is thoroughly cleaned prior to use in the vineyard in your vineyard.

Recycled posts and trellis material from other vineyards pose a biosecurity risk to your business. Consider whether purchasing second-hand materials is worth the risk. When purchasing second-hand machinery ensure you understand and adhere to all regulatory requirements relevant to the purchase location and the location of your vineyard.



Image courtesy of Wine Australia



Image courtesy of Wine Australia

2 Production practices

You can reduce the risk of spreading pests and diseases by including simple biosecurity measures as part of your everyday vineyard management practices.

Sterilise tools and equipment regularly when moving through the vineyard to prevent the spread of disease. Have the conversation with your contractors and staff to ensure they are aware of your expectations.

Monitor vines for pests and diseases

Monitoring the health of your vines is a fundamental part of vineyard management and gives the best chance of spotting a new pest soon after it arrives. You, your staff, contractors or consultants should be looking for notifiable established and exotic pests and diseases on your vineyard on a regular basis. You can do this at the same time as your other routine vineyard, pest and disease monitoring activities.

Pay particular attention to high-risk areas where pests are most likely to enter and establish, for example, loading areas (sidings or pads), near wash down or parking areas and vine rows or end of rows adjacent to roads.

The importance of detection and surveillance

Vineyard monitoring and surveillance involves looking for pests and diseases, any symptoms, or plant health issues on your vineyard and recording their absence or presence plus population levels.

Pest and disease monitoring is necessary for the following reasons:

- **Pest and disease status information**: Surveillance at the vineyard level contributes essential information to regional biosecurity efforts and ultimately to the national status (presence or absence) of a pest or disease, assisting in the effective allocation of effort and resources.

- **Market access**: Export destinations for table grapes may require 'evidence of absence' data for exotic and some established pests and diseases that are of concern. For example, the Australian table grape industry, in collaboration with governments, must prove, through surveillance, that exotic pests and diseases have been looked for and shown to be absent or under appropriate management to minimise risks to the importing country.
- **Eradication/containment**: Early detection of exotic or notifiable established pests and diseases improves the chance of eradication or containment within a region. Even if eradication or containment is not feasible, early detection, in conjunction with contingency planning and preparedness by government and industry bodies (e.g. preparing emergency chemical registrations, permits for import of biocontrol agents, awareness material and training in diagnosing pests and diseases) help to achieve the best possible outcome for management.

Vineyard managers and staff are the eyes and ears on the ground. Keep an eye on what is happening in your surrounding area.

Learn about exotic pests and diseases

While Australia has one of the strictest border control systems in the world, there is always the chance that an exotic pest or disease could make it into the country. The number of passenger arrivals and imported goods continues to increase, increasing risk. A serious exotic grapevine pest might only be a day's flight away.

A new pest on your vineyard might also be new to the region or even the country.

At the back of this manual there is a series of **fact sheets** on exotic pests and diseases, showing what they look like and the symptoms they cause on plants.

Vineyard managers, staff, contractors and consultants have a duty of care and a legal responsibility to immediately report suspicious pests to minimise potential damage. All reports to your state department of agriculture or the exotic plant pest hotline will be investigated and treated confidentially.







Image courtesy of
Dried Fruits Australia

Ensure machinery and equipment
is clean when leaving the vineyard

3 Vineyard outputs

The measures in place on your vineyard support biosecurity in your region.

Storage and waste disposal

Hygiene is important in all areas of the property, not only the vineyard .

Dispose of pruning waste, dropped fruit, grape marc or waste from packing sheds needs to be disposed of safely and in a manner which does not increase biosecurity risk, either to your own business or others, especially where there is a suspected or known incidence of a pest or disease problem. This means having disposal sites located away from the vineyard or, if you have infected or infested material, using a commercial biosecure disposal service or seeking advice on deep burial or other options to mitigate the risk of the pest or disease spreading.

Waste management options for infected plant material include disposal in a waste pit away from vineyards, burning or deep burial. Consider the risk of leakage, overflow or spills that may carry pests and diseases towards your vineyard. Pest and disease problems can accumulate from season to season if infected plant material is left in the field with the vines. Piles of waste material can attract wild animals or harbour pests, weeds and vectors. Make sure that you manage your waste streams so that you don't create a safe haven for pests and diseases.

Managing waste from washdown and decontamination areas is also a key consideration. These areas may be more likely to harbor pests or diseases that have travelled from other properties on vehicles. Vehicle and equipment wash down areas should drain away from growing areas.



Risks during harvest

While there is a risk of spreading pests and diseases while undertaking normal production practices throughout the year, it is heightened during and after harvest or vintage in soil or plant material attached to machinery, trucks and vehicles. If your business relies on sharing machinery, reduce the risk of spreading pests and diseases between properties by removing plant material and cleaning and disinfecting machinery before it leaves the previous property. Ensure contractors and seasonal workers also adhere to these biosecurity measures.

Here's how you can reduce your risks during harvest:

- limit access to trucks coming onto your property (preferably to a single point of entry and exit)
- restrict unnecessary access to vineyards
- keep vehicles and machinery on formed tracks or hardstand areas unless required to enter vineyard blocks
- establish designated collection and drop off sites which are clearly signposted e.g., shed or loading dock
- ensure seasonal workers park in a designated area, preferably on a roadside reserve or in a designated area (rather than in the vineyard).

Boxes, trolleys or bins used to store grapes both in the field and for processing pose a significant risk and should be kept free of plant material and disinfected between seasons. Bins should be cleaned before they come onto your property. Some processors may offer to show cleaning certificates. If possible, bins, boxes and trolleys should not touch the soil. If you still use timber bins, phase them out over time.





4 People, vehicles and equipment

People, vehicles and equipment can carry diseases and pests onto, off and around your vineyard.

Use a visitor register

Visitor or contractor records are useful tools in the event of a new pest incursion because they can allow biosecurity officers to trace the origin and spread of a pest or disease, increasing the chances of complete eradication or at least containment to a smaller area.



Use signs to advise visitors not to enter, and direct visitors to designated parking or reception areas, wash-down stations and pick-up and drop-off points

Maintain a register of people who have been in your vineyard.

If you have a cellar door, you might like to keep a visitor register there as well as at another location suitable for contractors. An example of a **visitor register template** can be found on the Vinehealth Australia website.

Ensure visitors are aware of your biosecurity requirements prior to entry

Assess the risks that each visitor coming in close contact with the vineyard poses before they arrive by asking a set of questions such as:

1. Have they recently travelled in grape growing regions overseas or between grape growing regions interstate?
2. Have they recently been on a vineyard with a concerning or reportable pest or disease problem?
3. Have they cleaned their boots, vehicles and/or machinery before entering your vineyard?

Biosecurity inductions

A biosecurity induction is important for all people coming into your vineyard. For workers, contractors and service provider as a starting point it is a good idea to include your biosecurity expectations in contracts/service agreements.

Hold an induction for all new contractors, seasonal workers, other employees and visitors to let them know about your biosecurity requirements and expectations. Inform workers and visitors of the main threats you are concerned about so that they can act in ways that do not spread risk to your vineyard.

Visitors to cellar doors surrounded by vines should also receive information on biosecurity risks and measures given the high risk they present. Have information on what you are doing to protect your vineyard and what you require visitors to do, or not do, visible to raise awareness and ensure cellar door visitors don't introduce pests or diseases into your blocks.

Consumer-facing signs to help you can be obtained from Vinehealth Australia **here**.

It is your right to refuse anyone entry to your vineyard, if they don't understand and comply with your biosecurity requirements. If the risk that they pose is unacceptable to you, don't let them on your property (people with Statutory powers, for example Biosecurity Inspectors and Police Officers have the right to enter your property).

Place biosecurity signs at each entry point to your property/vineyard. Signs can be obtained from Vinehealth Australia **here** or from **farmbiosecurity.com.au/toolkit**

Control access

Controlling and limiting access of non-essential persons, such as tourists, to vineyards, is good management and is the best way to minimise biosecurity (and safety) risks from the movement of people.

Below are some strategies you might like to implement to reduce the biosecurity risk of people entering and moving around your vineyard:

- Require people to advise of their planned visit prior to arrival and ensure they are aware of the biosecurity protocol when arriving on the property
- Provide a designated, hard-surfaced parking area that is away from your vineyard and ask all visitors and staff to park their vehicles there. If visitors or staff need to move to other areas of the vineyard, they should use designated vineyard vehicles.
- Ask people to stay on paths and designated roadways as much as possible when moving around the vineyard.
- Boundary fencing and gates are recommended to help control access. Hedges, rope or prickly bushes can also be used to deter entry into vine rows.
- Limit the number of vineyard entry points and consider having a different entry point for visitors of different risk profiles (e.g., tourists vs. staff). This makes it easier for you to monitor and control the movement of people.

To ensure that your vineyard does not become the source of new pests for others, you have a responsibility to inform visitors of any declared or notifiable pests present on your vineyard so that they can take steps to avoid transferring them to the next vineyard.

Take particular care with high-risk visitors

This includes:

- anyone who has recently arrived from overseas (particularly if they have been in contact with vineyards),
- people who have travelled from another vineyard,
- any visitor who moves from vineyard-to-vineyard and region-to-region, and
- visitors who have recently visited phylloxera infested zone vineyards

If you cannot reduce the risk presented by a visitor by implementing some of the suggestions outlined in this manual, you should refuse them access to your vineyard.



Have a conversation with your contractors

Contractors regularly move between vineyards and are therefore a high biosecurity risk. To ensure that contractors do not threaten businesses they must:



- Wash down their vehicles, boots and equipment before entering your vineyard
- Let you know when they arrive and leave so that you can ensure they are signed in and can assess their risk
- Adhere to your biosecurity zoning requirements
- Park vehicles preferably on a hard pack surface well away from vines or as instructed by the owner/manager.
- If the contractor is bringing equipment onto your vineyard, ensure they can demonstrate that they have complied with equipment cleaning and disinfestation as per legislative requirements.
- You can stipulate as part of the contract that contractors and employees adhere to these risk mitigation requirements.

Clean boots and clothes

Since pests and diseases can enter on people's footwear and clothing, it helps to have a policy of clean clothes and boots for staff and visitors.

Provide a disinfectant footbath and scrubbing brushes for shoes or provide staff and visitors with boots or boot covers to wear while in your vineyard. People should use a footbath upon entry and exit of your vineyard.

Think about where people coming onto your property have been before. For example, if your crop consultant has visited 10 other properties before arriving on yours, what might their boots and clothes be bringing to your vineyard?

Where soil borne diseases are a significant threat to your business, you may wish to keep specific shoes/boots or overalls that you provide to visitors for use only within your vineyard.



Foot baths are a simple way to manage biosecurity risks associated with soil-borne pests being carried in dirt and mud, but they need to be maintained well to be effective.

Limit vehicle movements in vineyards

It is not possible to stop all movements of vehicles onto and around the vineyard, but there are steps you can take to minimise the risks that vehicles pose.

Having a designated parking area allows you to inspect a vehicle and decide what, if any, action you need to take depending on the risk posed.

Non-production vehicles should stay on designated roadways as much as possible when moving around the vineyard.

Wherever possible, use dedicated vehicles to move through vineyards. A dedicated vineyard vehicle should stay on the vineyard, to remove the risk of bringing a pest back with it if it leaves the vineyard. Otherwise, provide a washdown facility to clean vehicles before entering the vineyard.

If the visitor's vehicle must enter the vineyard for operational requirements, then it must be inspected prior to entry to ensure it is clean of soil and plant material. If not, it should be denied access. If in the past four weeks, the vehicle has visited a vineyard in a Phylloxera Infested Zone (PIZ) or a Phylloxera Risk Zone (PRZ) this is high-risk. Do not allow the vehicle access to your vineyard.

Entry and exit of vehicles, machinery and equipment

Vehicles, machinery and equipment that come onto the vineyard and will be working close to or in vine rows – e.g., harvesters and contract sprayers, should be cleaned and disinfected before they enter production areas on a property.

When using contractors, ensure they understand your expectation that their vehicles, machinery and equipment need to be clean on arrival, and that you will be inspecting them.

Where the risk of disease transfer on vehicles is high, a designated washdown facility should be considered. A sealed concrete or bitumen surface with a sump underneath to collect wastewater and debris is ideal. A pad of packed gravel or hard road also works well as long as mud, soil and plant material are kept away from vines, storage areas and waterways. If you can, contain run-off from the washdown pad and monitor for any problems.

Information on effective washdown facilities is included on this **factsheet**.

Automatic wash-down bay designs are also available at the following site. See **publications.qld.gov.au/dataset/panama-disease-tropical-race-4-grower-kit/resource/57f29400-c4cc-4732-9c73-da6936df8ac3**

Manage vineyard functions, field days and buyer visits

The risk of spreading pests and diseases increases with the number of people moving onto and through your vineyard.

Visitors entering vineyards for winery tours, buyer visits, farm demonstrations, field days and media access can pose a particularly high risk because they can visit multiple vineyards in one day and have the potential to move pests and diseases along with them.

Events such as weddings, festivals, conferences, bike tours and equipment demonstrations have the potential for biosecurity risk, so actions to minimise this risk need to be planned and implemented.

However, if your business relies on hosting visitors, there are a number of strategies you should use to reduce your risk.

- Ask tour operators or event organisers to communicate your entry requirements to guests before their arrival. This may include things like not bringing in any outside plant material or being aware that they may be required to use a footbath or change into dedicated footwear kept especially for visitors. Do not allow people who have previously visited other vineyards to enter your vineyard unless they have cleaned and disinfected their footwear.
- Have a segregated area, like a cellar door or open field away from your main vineyard that is used to host people.
- Use signs to point people in the right direction and prevent them from straying into your vineyard.
- Ask people not to park near or walk between the vine rows. Use signs and discourage entry with fencing, rope or hedging.
- Ask guests to park in the dedicated parking area at the front gate and then have a vineyard vehicle ferry them to the event location.
- Provide footbaths or boot covers at vineyard entry points if access is necessary.
- Monitor high traffic areas frequented by visitors (access zones) more frequently for the presence of new pests and diseases.

To discourage visitors accessing vine rows, consider creating a dedicated meeting space or design an optimal site where appealing photographs can be taken without moving through areas of the vineyard.



Visitors and contractors could be a significant risk to your business if they don't undertake appropriate clean down activities prior to coming onto your property.



You have the right to ask contractors to clean vehicles and machinery before entering your property (Image courtesy of Chris Anderson)



Image courtesy of Wine Australia

5 Animals and weeds

Animals can cause a direct impact on production but can also affect your business by spreading pathogens, pests and weed seeds onto and around your vineyard.

Monitor grazing stock and wild animals

Grazing livestock between vines and wild or feral animals brings biosecurity risk, especially if those animals have been in another vineyard, by potentially carrying soil, weed seeds, insect pests or even pathogens onto your property.

Have adequate fencing to exclude animals from your property as much as possible. If you are bringing sheep or other grazing stock into your vineyard, ensure that they are not coming from a vineyard or farm with any concerning pest or disease problems. If possible, ask that the sheep be shorn before they arrive and are put through a hoof wash before entering the property.

Be aware of which Phylloxera Management Zone you are located in and the regulations around movements of grazing stock and trucks between properties in different phylloxera zones. See **page 25** for more information.

Monitor mid-row plants and weeds

Groundcovers (cover crops) grown under-vine or between the rows of a vineyard can provide a range of benefits including increasing functional biodiversity, increasing numbers and diversity of beneficial insects and improving soil health. However, plants and weeds in the mid-rows of vineyards can harbour pests and diseases and enable them to survive between seasons.

For example, Phalaris is a tall grass that reaches into the vines and creates easy access for pests into grape bunches. Bermuda grass is a host for *Xylella* sp. and vectors and could help spread it if an incursion occurred.

Noxious or regulated weeds should be controlled within the vineyard and externally, such as along roadways and boundary fence lines. Keep an eye out for new weeds in areas where water may have run across your land from neighbouring properties. Try to treat weeds before they flower and produce seeds. Monitor the mid-row and vineyard surrounds for weeds which can harbour pests and diseases of concern.

Establish a weed management plan for your vineyard, including plans to eradicate, contain or manage current weeds on your vineyard, and to prevent the introduction of new ones.

You are likely to need a combination of practices to manage existing weeds, including herbicides and cultural practices like mowing and vineyard hygiene.



Image courtesy of Wine Australia

Phylloxera Management Zones

Grape phylloxera *(Daktulosphaira vitifoliae)* are small (1mm), soft bodied insects that feed on the roots of grapevines causing significant damage and yield loss. Grape phylloxera live in the soil and can be easily transported to new locations by clinging to equipment and goods such as boots, clothing, machinery, soil, plant material and car tyres.

Phylloxera is currently present in parts of New South Wales and Victoria. Therefore, it is important to protect the rest of Australia from the spread of this damaging pest. Phylloxera can be managed with the use of resistant rootstocks, widely used in the table grape and dried grape industries. Therefore, in Australia, phylloxera is mainly a production concern for wine grapes on susceptible root stocks, but all growers are required to abide by biosecurity laws and movement restrictions relating to this notifiable pest. Any suspected detection on your vineyard must be reported to authorities on 1800 084 881 or to Vinehealth Australia in South Australia on (08) 8273 0550.

Each grape growing region of Australia is classified under a Phylloxera Management Zone based on proximity to known phylloxera infestations and the variation in risk posed by materials originating from within each area.

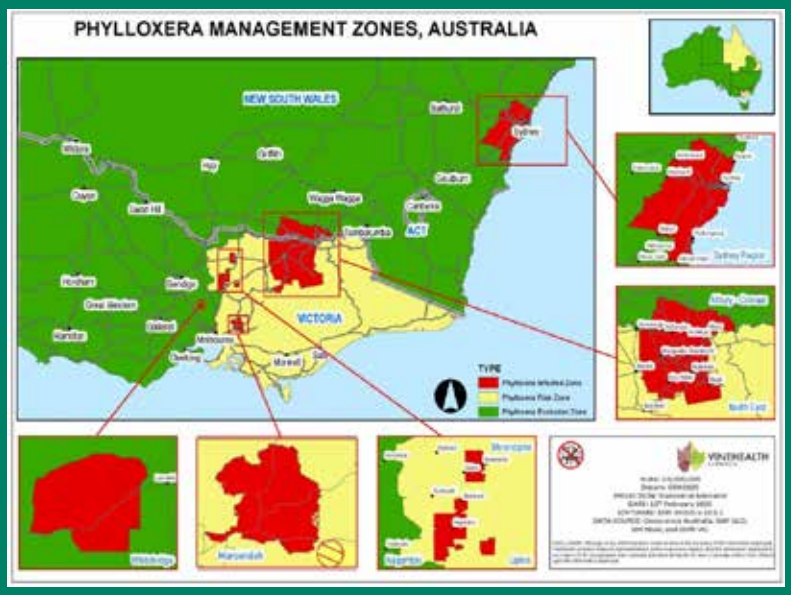
The three management zones are:

- **Phylloxera Exclusion Zone (PEZ)** – an area recognised as being free of phylloxera.
- **Phylloxera Infestation Zone (PIZ)** – an area known to be, or previously known to be infested with phylloxera.
- **Phylloxera Risk Zone (PRZ)** – an area where the phylloxera status is unknown.

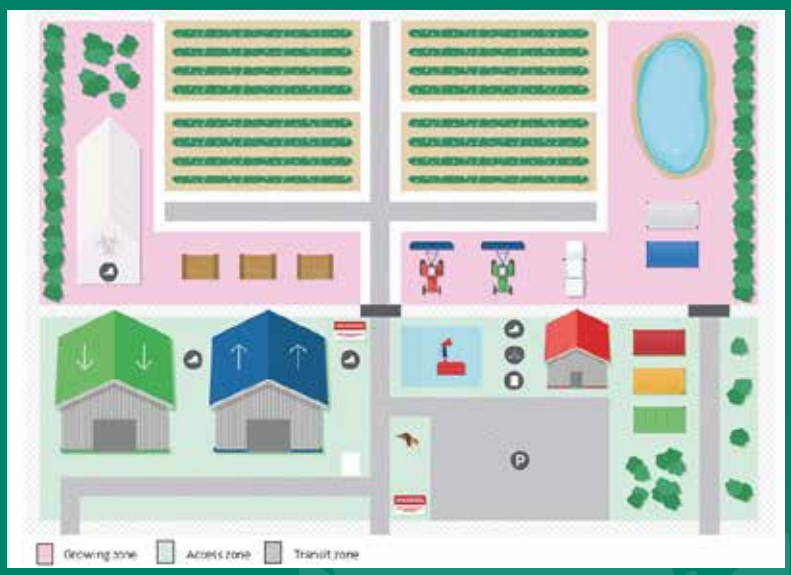
There are legislative requirements guiding the movement of product and material that may transfer phylloxera between different Phylloxera Management Zones. This includes the movement of grapevine plant material and product, vehicles, equipment and machinery used on or near vineyards, clothing and footwear worn on or near vineyards and vineyard soil.

Other restrictions apply to the movement of other risk items between zones.

You must comply with the relevant state legislation by familiarising yourself with quarantine and movement restrictions, **visit your state department of agriculture website for intrastate movements or the destination state's agriculture department's website for interstate movements.**



Please note that the boundaries of Phylloxera Management Zones can change as new reports of the disease are confirmed. Visit Vinehealth Australia for up to date information (Source: Vinehealth Australia).



This map shows an example of how vineyards may be zoned according to the different activities which take place in each area. Create your own zones as best as you can for your property, business and willingness to accept or not accept risk.



6 Train, plan and record

Make sure that biosecurity procedures and threats are included in staff training and that biosecurity is part of vineyard planning activities. Record keeping is a vital part of managing your business, providing the ability to trace where planting material and other inputs came from and where produce goes.

Train staff

Since many people are not aware of how easily pests and diseases can spread, anyone coming onto your vineyard needs to be informed.

As well as staff, family and friends can help keep an eye open for any problems. It is also particularly important that they are aware of what they can do to make sure they are not the ones bringing pests and diseases onto your vineyard.

Consider providing an induction or other formal training to inform staff, friends and family members of your biosecurity standards on an annual basis. Even if they had an induction years ago, it is easy to become complacent.

Hold specific training sessions for staff on the importance of biosecurity and the potential impact of exotic pests and diseases on your business and hence their source of employment. Training could also include pest identification and an overview of biosecurity and surveillance activities that are implemented in your vineyard.

Have information, such as biosecurity manuals, fact sheets and similar available in places staff frequent (e.g., lunchrooms, equipment sheds).

For itinerant workers and casual staff, (e.g., backpacker, seasonal workers) videos highlighting the importance of biosecurity are available at **youtu.be/6MU9TMbJttw**

Cellar door staff might like to consider undertaking the wine tourism biosecurity program available through Vinehealth Australia. For more information see **vinehealth.com.au/tourism/operators/wine-tourism-biosecurity-program**

Shed posters featuring notifiable established and exotic pests can build awareness and serve as a reminder.

If plant damage is suspected to be the result of an exotic pest, the Exotic Plant Pest Hotline should be called on 1800 084 881.

Make building your vineyard biosecurity measures a habit that are easily integrated into current business routines.

Establish vineyard zoning

For some existing businesses, or businesses establishing new vineyards, zoning may be a good method to minimise the risk of pest entry and spread.

Zoning is the separation of allowed activities between different areas of your vineyard in order to minimise the possibility of pests and diseases moving around your vineyard. Only particular activities should be permitted in particular zones and movement between zones should be minimised. This contains the risk posed by those activities to a discrete section and facilitates more effective risk-based management decisions.

For more information on zoning, refer to the Farm Biosecurity website: **www.farmbiosecurity.com.au/getting-biosecurity-zoning-right**



Developing your Vineyard Biosecurity Plan

As described above, there are six biosecurity essentials that should be addressed when developing or reviewing your vineyard biosecurity plan. Each year, or whenever there are changes to key business activities relevant to biosecurity, you should revisit your vineyard biosecurity plan.

Your biosecurity plan should consider each of the six biosecurity essentials in addition to the relevant state and territory legislation to enable you to make decisions about how and to what extent you will manage risks under each of these categories.

It is useful to start with a map of your vineyard to consider risk areas, and the best places to locate higher-risk biosecurity areas and checkpoints.

Higher risk areas could include the entrance to the vineyard, parking areas near the house or site office, the location of deliveries and pick-ups in relation to storage facilities, vehicle washdown areas, the cellar door and packing shed/cool rooms, and existing roads or tracks for movement within the vineyard. Think about what you can do to minimise the risk of introducing diseases and pests at each point.

The practices you choose may vary from vineyard to vineyard, or even block to block, depending on factors such as the size and location of your vineyard, the facilities and funds available, and the risks that need to be addressed. It may be more appropriate for you to focus your effort on blocks of highest risk.

Cost is a key factor in determining what measures you can put in place. It's best to assess all risks before acting to ensure that you invest in ways that achieve highest impact in decreasing biosecurity risk. A good starting point is to understand the biosecurity status of each area of your property and limit access to areas that you know are clean to minimise the risk of transferring pests and diseases to these areas.

Your biosecurity plan

A personalised biosecurity plan for your vineyard will help you prioritise the implementation of biosecurity practices relevant to your vineyard. If you manage multiple vineyards, you should consider making a biosecurity plan for each vineyard. Annually revise and update plans to capture any changes in workplace practices or scenarios.

Work out where your risks are, what your personal threshold for risk at each point is and ways you may be able to reduce those risks.

Remember planning is a process. Start where you are now. You can implement a few important actions first and then add more later. Identify actions you can take to increase your biosecurity preparedness.

An action planner to create your own tailor-made plan is available on the farm Biosecurity website: **farmbiosecurity.com.au/toolkit/planner** and you can also use the free Farm Biosecurity app. It is based on the six biosecurity essentials used in this manual. Making a biosecurity plan using the Farm Biosecurity app is easy. Simply select the actions that apply to you from the suggestions, or type in your own actions. Your selections become a to-do list that you can share with others. You can attach photos as reminders to let others know what needs to be done. The app allows you to add as many properties or sites as you like.

Making a biosecurity checklist

A biosecurity checklist can be used to identify the strengths and weaknesses of your vineyard biosecurity activities and provide ideas for your personal vineyard biosecurity plan.

The checklist can stipulate legal requirements and provide assessment of your business for biosecurity preparedness.

Self-assessment will allow you to quickly establish where current practices are working well and help you to prioritise areas for improvement over time as necessary, practical and affordable.

This checklist should be revisited and updated as part of your annual vineyard planning activities to ensure that your day-to-day activities reflect the highest practical level of biosecurity adherence.

You could include the checklist as part of your quality assurance reporting (where relevant) to demonstrate your compliance with good vineyard management principles.

Checklists and other record templates can be downloaded from the Farm Biosecurity website **farmbiosecurity.com.au**

Keep records

It is good practice to maintain records and keep them safe as a matter of course. This includes a visitor register to trace the movements of people, machinery and equipment and a record of the supplier, date and batch number of all vineyard inputs (planting material, compost, marc etc).

In the event of a new pest entry that prompts an emergency response, valuable time can be lost trying to determine how far the disease or pest may have spread. Sound record keeping can speed up this process and prevent further spread.

Additionally, if you have problems with a batch of inputs you will be able to use the records to demonstrate the effects on your vineyard to the supplier.

Templates can be downloaded from **farmbiosecurity.com.au/toolkit/records**

Resources available

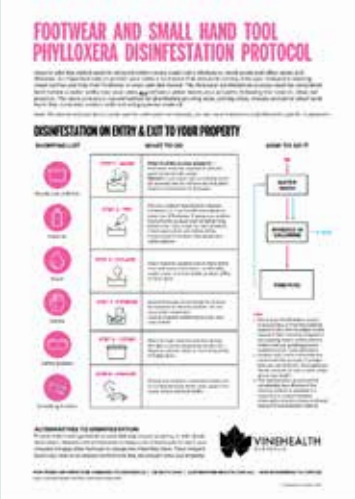
The Farm Biosecurity website has a series of short videos on the six biosecurity essentials that show how easy it can be to implement simple but effective biosecurity measures on your vineyard.
Go to **farmbiosecurity.com.au/videos**

Vinehealth Australia also have useful information and tools to support you to implement better biosecurity practices, including factsheets, signage and posters.
Go to **vinehealth.com.au/tools**

The Australian Table Grape Association has tools and resources providing practical support to table grape businesses.
Go to **australiangrapes.com.au**

A suite of resources for vineyard managers and staff

The Vinehealth Australia and Farm Biosecurity websites have a range of resources to provide more information on many of the topics discussed in this manual and tools to assist you to minimise the risk posed by pests and diseases to your vineyard by improving your biosecurity practices. A selection of Vinehealth Australia publications are shown below but for the full range visit **vinehealth.com.au/tools** and **farmbiosecurity.com.au/toolkit**.



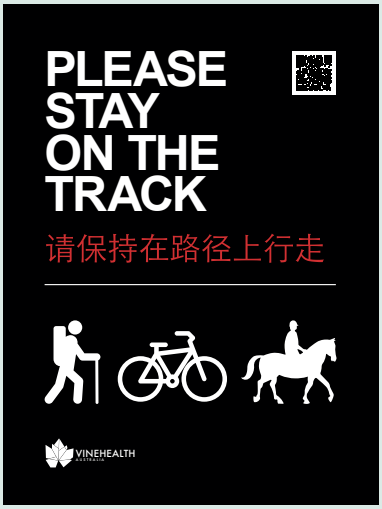




Fact sheets







Posters and signs

Exotic pest and disease threats

High Priority Pests (HPPs) are exotic pests assessed as high priority based on their potential to enter, establish and spread in Australia and the cost to industry of control measures.

The high priority exotic pest threat list provides an overview of the top ranked exotic invertebrate, pathogen, and nematode threats to the Australian viticulture industries. Assessments may change due to increased understanding of pest biology, changes to import arrangements or production methods.

Further information on these pests can be found on the Plant Health Australia website **planthealthaustralia.com.au/industries**

Table 2. Priority comparisons for the High Priority Pests of the three viticulture industries.

COMMON NAME	SCIENTIFIC NAME	DRIED GRAPE	TABLE GRAPE	WINE GRAPE
Pacific spider mite	*Tetranychus pacificus*	-	✔	✔
Oriental fruit fly complex	*Bactrocera dorsalis* (syn. *B. papayae, B. philippinensis* and *B. invadens*)	-	✔	-
Natal fruit fly	*Ceratitis rosa*	-	✔	-
Spotted wing drosophila	*Drosophila suzukii*	✔	✔	✔
Khapra beetle	*Trogoderma granarium*	✔	-	-
Grape phylloxera (exotic strains)	*Daktulosphaira vitifoliae*	-	-	✔
Brown marmorated stink bug	*Halyomorpha halys*	✔	✔	-
Spotted lanternfly	*Lycorma delicatula*	✔	✔	✔
Vine mealybug	*Planococcus ficus*	-	✔	✔
Comstock's mealybug	*Pseudococcus comstocki*	✔	✔	✔
Grape mealybug	*Pseudococcus maritimus*	-	✔	✔
Orange tortrix	*Argyrotaenia citrana* (syn. *A. franciscana*)	-	✔	✔
European grapevine moth	*Lobesia botrana*	-	✔	✔
American vine moth	*Polychrosis viteana* (syn. *Paralobesia viteana, Endopisa viteana*)	-	✔	✔
Bois noir (with vector)	*Candidatus phytoplasma solani*	✔	✔	✔
Pierce's disease (with vectors)	*Xylella fastidiosa*	✔	✔	✔
Black rot	*Guignardia bidwellii*	✔	✔	✔
Grapevine red blotch- virus (GRBV) (with vectors)	*Grapevine red blotch- virus (Geminivirus)*	✔	✔	✔

Vineyard managers and staff need to be familiar with the most serious exotic pests and diseases because there is always a chance that a pest or disease could make its way past border controls into Australia.

Fact sheets with High Priority Pests can be found from **page 34**. Note that this list may change over time, as the HPP list is reviewed annually by a viticulture industry biosecurity reference panel. For the most up-to-date information, visit the **Plant Health Australia website**.

Reporting pests and diseases

If you find an exotic or notifiable established pest or symptoms of a disease that you think might be exotic, take the following precautions to contain it and protect other parts of your vineyard:

- Mark the site where you saw the pest.
- Contain it where possible.
- Do not touch, move, or transport affected plant material.
- Take a photo of the pest or disease symptoms. Pests that move too quickly to be photographed can be captured in a sealed container and frozen before being photographed if safe to do so.
- Restrict the movement of people, animals and equipment near the affected area while waiting for identification.
- Without delay, call the Exotic Plant Pest Hotline on **1800 084 881** to report it to your state department of agriculture and follow their instructions.
- Wash your hands, clothes and footwear that have been in contact with affected plant material or soil.

Calls to the Hotline are forwarded to an experienced person in your state or territory government, who will ask some questions and arrange for an assessment of what you've found. If the Hotline in your state operates only during business hours, leave your full contact information and a brief description of the issue and your call will be followed up as soon as possible.

Established and reportable pests and diseases

Established pests of biosecurity significance are pests that are contained within one or more regions in Australia, have market access implications and/or a significant impact on production, but can be kept off a vineyard through on-farm biosecurity practices. As described earlier, some of these pests are notifiable pests with specific state/territory legislation controlling their movement (e.g Phylloxera, Qld fruit fly, Medfly) and if detected need to be reported to your State or Territory (as listed in Table 3).

Vineyard managers and staff are often the first to notice a new biosecurity problem, so it pays to be familiar with regionalised pest and disease threats to the viticulture industries.

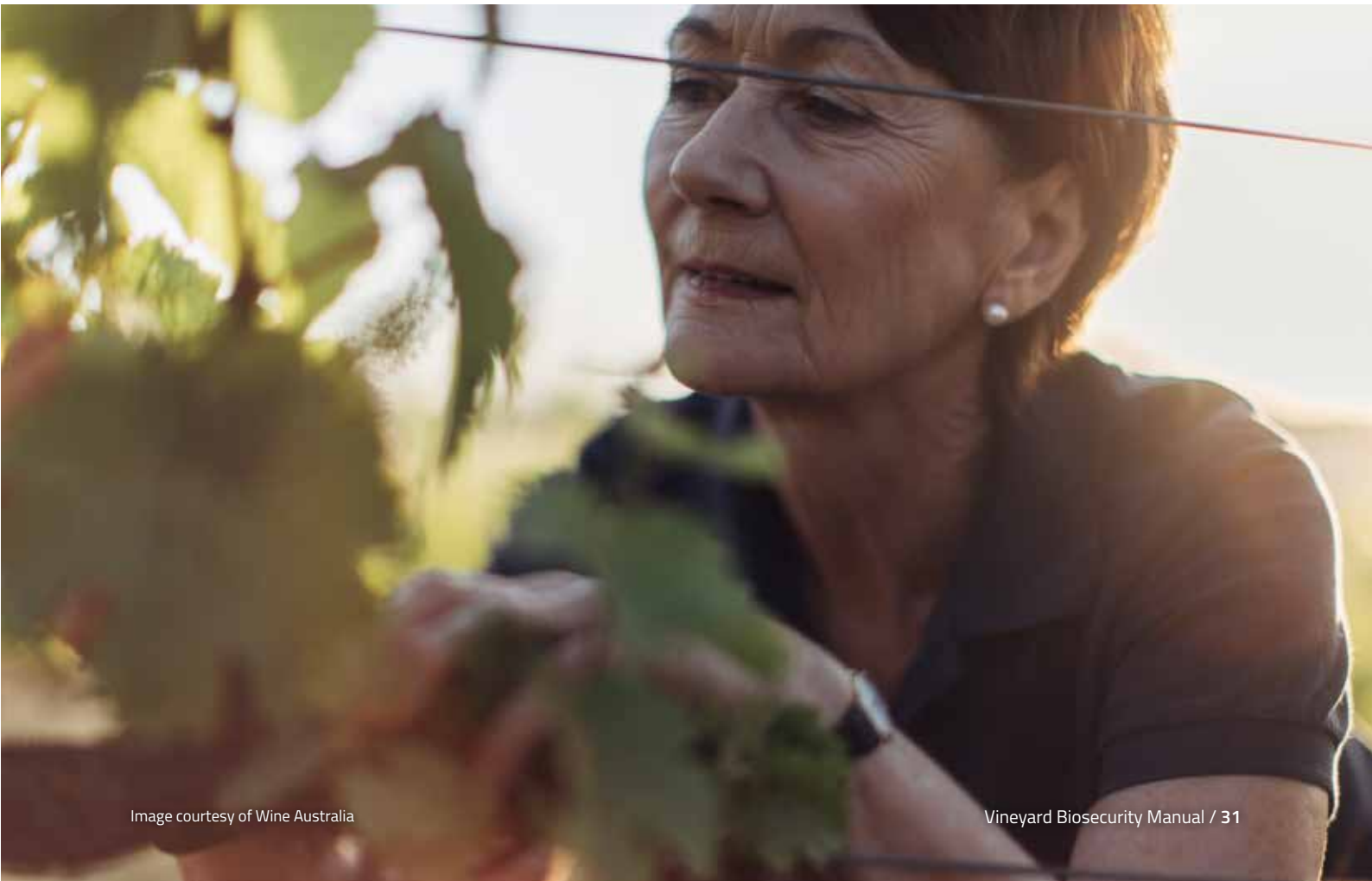


Image courtesy of Wine Australia

The Emergency Plant Pest Response Deed

The Emergency Plant Pest Response Deed (EPPRD) is a formal, legally binding agreement between Plant Health Australia (PHA), the Australian Government, all state and territory governments, and 38 national plant industry peak bodies. It supports the rapid and effective response to a significant pest detection through providing prior agreement on the governance (decision making) and funding of a national response. Australian Grape and Wine, Australian Table Grape Association and Dried Fruits Australia are signatories to the EPPRD, representing the wine grape, table grape and dried grape cropping sectors respectively.

As signatories to the EPPRD, Australian Grape and Wine, Australian Table Grape Association and Dried Fruits Australia will be involved in the decision-making for responses to emergency plant pests that they are affected by. Under the EPPRD this will occur in collaboration with other industry and government beneficiaries of eradication. If a response plan is agreed, industry and government will share the investment in that response plan, based on the relative public and private benefits of eradication of the emergency plant pest.

Early reporting of a newly detected pest or disease is key to successful eradication. Under the EPPRD, all signatories have a responsibility to take steps to ensure reporting occurs. Most states and territories require all members of the public to report potential new plant pests or diseases.

More information on the EPPRD is at: **planthealthaustralia.com.au/epprd**



Owner Reimbursement Costs

An underlying principle of the EPPRD is that growers are not better or worse off as a result of reporting an emergency plant pest.

The agreement allows for payments to growers, known as Owner Reimbursement Costs (ORCs), for direct costs incurred only as a result of the implementation of an approved response plan.

ORCs may cover direct grower costs or losses as a result of the destruction of crops, enforced fallow periods, replacement of crops and additional chemical treatments.

Calculation of ORCs is prescribed in the EPPRD, with different formulae being used depending on the type of crop grown. For more information, see **planthealthaustralia.com.au/orcs**

It is important to remember that ORCs only apply to approved response plans aimed at eradication, which is more likely to occur if a pest is found and reported early.

Table 3. Contact details – State and Territory Departments

AGENCY	WEBSITE/EMAIL	PHONE	ADDRESS
National			
Department of Agriculture, Water and the Environment	agriculture.gov.au	(02) 6272 3933 1800 020 504	GPO Box 858 Canberra, ACT 2601
Plant Health Australia	planthealthaustralia.com.au	(02) 6215 7700	Level 1, 1 Phipps Cl Deakin, ACT 2600
New South Wales			
Department of Primary Industries	dpi.nsw.gov.au/biosecurity/plant	(02) 6391 3535	Locked Bag 21 Orange, NSW 2800
Queensland			
Biosecurity Queensland, a part of the Department of Agriculture and Fisheries, Queensland	daf.qld.gov.au	13 25 23 (07) 3404 6999	41 George St, Brisbane, QLD 4000
Northern Territory			
Department of Industry, Tourism and Trade	industry.nt.gov.au	(08) 8999 5511	Berrimah Farm, Science Precinct 29, Makagon Road Berrimah, NT 0828
South Australia			
Primary Industries and Regions SA	pir.sa.gov.au	(08) 8207 7820	GPO Box 1671 Adelaide, SA 5001
PIRSA Biosecurity	pir.sa.gov.au/biosecurity Email: PIRSA.planthealth@sa.gov.au	(08) 8207 7820	33 Flemington Street Glenside, SA 5065
South Australian Research and Development Institute	Email: sardi@sa.gov.au	(08) 8303 9400	2b Hartley Grove Urrbrae, SA 5064
Tasmania			
Department of Primary Industries, Parks, Water and Environment	dpipwe.tas.gov.au Email: BPI.Enquiries@dpipwe.tas.gov.au	1300 368 550	GPO Box 44 Hobart, TAS 7001
Victoria			
Department of Jobs, Precincts and Regions	economicdevelopment.vic.gov.au	136 186	CPHO Group, Division of Market Access and Regulation, Biosecurity Branch Department of Jobs, Precincts and Regions 475 Mickleham Road, Attwood, Victoria 3047
Western Australia			
Department of Primary Industries and Regional Development	agric.wa.gov.au	(08) 9368 3333	DPIRD, 1 Nash Street, Perth, Western Australia 6000 DPIRD, Locked Bag 4, Bentley Delivery Centre, WA 6983

FACTSHEETS

Brown marmorated stink bug

What is brown marmorated stink bug?

Brown marmorated stink bug (BMSB) *(Halyomorpha halys)* is a brown coloured, shield-shaped stink bug known to affect around 300 plants including grapevine, peach, cherry, pear, soybean, vegetables and ornamentals. BMSB pierces the skin of the fruit to feed on the juices inside causing fruit dimpling, rotting and reduced fruit quality.

This pest is native to Asia but has spread to the US and Europe where is has become a highly damaging pest. Although it is not harmful to humans, BMSB is considered a nuisance pest due to its habit of overwintering in large numbers inside buildings and producing a foul odour when disturbed.

What does it look like?

Adults are between 12 and 17 mm long with a mottled brown, shield-shaped body with a slight reddish tinge.

Black and white banding around the abdomen periphery is characteristic for BMSB. The underside of the body is pale yellow and can have grey or black markings. The head is rectangular and the pronota (shoulders) are rounded.

Antennae in both nymphs and adults have distinctive alternating light and dark bands across the last two segments that look like a single white band.

BMSB has five nymph (juvenile) stages that range in size from 2.4 to 12 mm in length with underdeveloped wings.

The abdomen is bright orange or red when they hatch but as they mature, they develop a brown colouration similar to the adults.

Eggs are cream or white in colour, 1.6 mm long and shaped like barrels. They are found on the underside of leaves in clusters of 25 to 30.



Adult BMSB with the mottled brown, shield-shaped body and characteristic white and black banding around the periphery of the abdomen
(Image courtesy of David R. Lance, USDA APHIS PPQ, Bugwood.org)

What can it be confused with?

Adults and nymphs look very similar to other brown coloured stink bugs that are present in Australia.

The Department of Agriculture, Water and the Environment has produced a field guide to assist in the identification of this pest.
See biosecurityportal.org.au/bmsb/Documents/AU%20DAWR%20guide%20identification%20BMSB.pdf for further information.

What should I look for?

BMSB feeding causes bruising on grapes making the fruit susceptible to secondary infections such as sour rots and botrytis. Direct damage of this pest results in fruit discolouration, necrosis and fruit drop. Look for any kind of damage on the crop and report any sightings of unusual stink bugs on your plants or unusual aggregations of stink bugs in or on buildings.

Unusual sightings should be reported to the Exotic Plant Pest Hotline on 1800 084 881.

How does it spread?

Adults are strong fliers, a characteristic which allows them to easily spread and establish once within a country. BMSB are hitchhiking pests meaning that they can stowaway on a range of goods and are frequently detected by border staff on imported goods and cargo including machinery, furniture, electrical goods, bricks and cars.

Where is it now?

This pest is native to China, Japan, Korea and Taiwan and was introduced to the US in the mid-1990s and Europe in 2007.

How can I protect my vineyard from brown marmorated stink bug?

You can protect your vineyard from BMSB by checking your property frequently for the presence of any new pests. Ensure that you are familiar with the symptoms of common grapevine pests to so you can tell if you see something different and can report it in a timely manner. Be careful when opening packages or goods from overseas as they could contain the pest.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881.

Exotic fruit flies

What are exotic fruit flies?

There are many fruit flies (FF) not currently present in Australia that would present a major risk to the viticulture industries if they entered and became established. Some of these species include the Natal fruit fly (Ceratitis rosa), and the oriental fruit fly (Bactrocera dorsalis). Fruit flies are major agricultural pests, recorded on over 200 types of fruit and vegetables with the potential to cause losses of up to 100% in unprotected fruit. Major economic impacts are also experienced through restrictions on local trade and international market access.

What should I look for?

- Generally, fruit flies are about the same length as a common housefly but more slender. They have clear wings, and generally have black chests and paler abdomens. Adult female flies have exceptionally long ovipositors, allowing them to lay their eggs just under the skin of fruit, depositing fruit decaying bacteria at the same time.
- Pupae are white to yellow-brown in colour and barrel shaped, whilst larvae are about 10 mm long and creamy white. Eggs are white, elongate and elliptical measuring about 0.9 x 0.2 mm.
- Within one to two days, the eggs hatch into maggots (larvae) which feed on the decaying fruit, causing premature fruit drop. Considerable damage can occur inside the flesh before obvious signs of infestation can be seen on the fruit. The most obvious signs of infestation are small discoloured patches on the skin, which develop from punctures or stings made by the female as she lays her eggs.
- Infested young fruit becomes distorted, callused and usually drop, while mature fruit develop a water-soaked appearance.

For help with identifying fruit flies, go to **fruitflyidentification.org.au**

How do they spread?

Adult flies can disperse over long distances through flight and wind currents, while the transport of larvae in infested fruit can result in global movement.



Female fruit flies have a long ovipositor for penetrating the skin of fruit (Image courtesy of Scott Bauer, USDA Agricultural Research Service, Bugwood.org)





Adult Oriental fruit fly showing reddish-brown scutum (back surface of fly behind head and between the wings) and yellow scutellum (the triangle on the bottom edge of the scutum) (Image courtesy of Florida Department of Agriculture and Consumer Services, Bugwood.org).

Be aware there are several species of fruit fly already present in Australia. These include Mediterranean FF, present in parts of Western Australia and Queensland FF which is widespread throughout Queensland and has a limited distribution in the Northern Territory and south-eastern Australia. Any FF that looks different to those regularly encountered should be reported and further examined by an entomologist.

Exotic mealybugs

What are exotic mealybugs?

Although there are many mealybugs established and endemic to Australia, there are a number of mealybugs that affect grapevine which are not present in Australia. A number of these mealybugs would cause considerable damage and economic loss if they became established here. The vine mealybug *(Planococcus ficus)*, grape mealybug *(Pseudococcus maritimus)* and comstock's mealybug *(Pseudococcus comstocki)* are exotic mealybugs considered to be high priority pests for the Australian viticulture industries. Mealybugs are small, soft-bodied insects that feed on plant sap, reducing vigour and damaging fruit and foliage, as well as transmitting viruses.

What should I look for?

- The vine, grape and comstock's mealybugs are small (about 3-5 mm in length), segmented insects covered in a white powdery wax.
- Mealybugs secrete honeydew as a by-product of their feeding activities on trunks, cordons, leaves and fruit. This can encourage growth of mould and fungal diseases.
- The grape mealybug has long filaments making the mealybug appear to have a tail.
- The vine mealybug is oblong in shape and has shorter filaments around the body, with no tail filament.
- Comstock's mealybug has a pink to reddish-brown colour visible between body segments.
- Look for reduced vigour in vines, damaged fruit and/or plants covered with honeydew and black sooty mould.

How do they spread?

Long range dispersal of adults or nymphs may occur through wind-assistance, propagation material or on fruit. Mealybug dispersal as crawlers is limited.



Mealybug infested grape bunch; note the white powdery wax and honeydew on grapes, which are typical symptoms of infestation (Image courtesy of Kent M. Deane, University of California).



Mealybugs often hide in the junction point between canes and branches; note the white, waxy covering and the honeydew on the canes (Image courtesy of Kent M. Deane, University of California).



Mealybug infested grape bunch; note the white powdery wax and honeydew on grapes, which are typical symptoms of infestation (Image courtesy of Kent M. Deane, University of California).

Grape berry moth

What are grape berry moths?

The European grapevine moth *(Lobesia botrana)* and the American berry moth *(Polychrosis viteana)* are both grape berry moths. Adult females lay eggs on individual grapes, blossoms and stems. The moths' larvae feed on grape flowers and fruits, causing direct damage as the larvae penetrate the berry and hollow out the grapes, leaving only the skin and seeds.

What should I look for?

European grapevine moth: about 5 mm long, light brown body, with grey to brown irregular patches on the wings. Young larvae are yellowish green with a dark brown head and are about 1 mm in length. When mature, larvae are about 10–15 mm long and vary from light yellowish green to pale brown.

American berry moth: about 6 mm long, brown body, with grey-purple bands across the wings and cream with brown spots near the wing tips. Young larvae have a cream body and dark brown head. When mature, the larvae are 10 mm long and become green, then purple with a light brown head.

Both species of grape berry moth cause nearly identical symptoms and are difficult to distinguish.

- Young larvae feed on blossoms or berries, often webbing together entire clusters.
- Mature larvae then tunnel into berries and feed inside, leaving a hollowed-out berry with only the skin and seeds remaining.
- At harvest, severely infected bunches may contain several larvae, and many of the berries may be completely hollowed-out and have an unhealthy appearance. Damage is compounded by secondary infection of rot pathogens, such as grey mould *(Botrytis cinerea)*.

How do they spread?

Adults are highly mobile and can move rapidly between host plants. Larvae can be transported through infested fruit and grapevine material.



European grapevine moth adult on a grape leaf
(Image courtesy of Monica Cooper, University of California).



Both grape berry moths are internal feeders of grape berries
(Image courtesy of Edward Hellman, Texas A&M University).



Necrotic canker developing on grapevine shoot
(Image courtesy of ARC Infruitec-Nietvoorbij, South Africa).

Grapevine phylloxera *(Daktulosphaira vitifoliae)*

What is the grapevine phylloxera?

Grapevine phylloxera is an aphid-like, sap-sucking insect that feeds on leaves and roots of grapevine causing huge economic losses to vine growers. Native to North America, this insect is present in the Americas, Europe, the Middle East region, Asia, some parts of Africa, New Zealand and Australia. There are a few hundred strains of phylloxera and 115 of these are established in Australia. Phylloxera is present in discrete parts of New South Wales and Victoria.

Grapevine phylloxera feed on roots and between spring and summer crawl up the trunk into the canopy. They generally do not damage leaves or bunches, although leaf feeding populations arise occasionally in Australia. This pest causes death of the susceptible own rooted European grapevine *(Vitis vinifera)* that is not grafted to tolerant rootstocks. In Australia, this means phylloxera is predominately a pest of wine grapes. There are currently no effective chemical or biological control measures for grapevine phylloxera.

What should I look for?

- Damage in vineyards begins in a small area where the insect first invades, and continues to spread outwards, widening the zone of infected vines.
- Feeding damage causes brown swellings on older lignified storage roots called tuberosities. Infested young feeder roots develop yellow, fleshy galls.
- Root hair feeding causes hook shaped galls that prevent the development of feeder roots. Galls on young non-lignified feeder roots and root hairs are called nodosities.
- Vines on tolerant rootstocks may develop nodosities but do not have above ground symptoms. Infested susceptible vines gradually lose vigour, turn yellow and become stunted. New shoots fail to emerge and infestation results in gradual death of the vine.



Grapevine Phylloxera adults and juveniles (nymphs) are up to 1mm long, yellow to brown and have a tapered globular shape (Image courtesy of Agriculture Victoria).



Loss of vigour due to phylloxera infestation (Image courtesy of Paul Dennis, Agriculture Victoria).

How does it spread?

Grapevine phylloxera are dispersed by human movement of infested plant material and soil attached to boots, equipment or machinery. In addition to this, the juvenile or crawler stage is the most mobile and likely to be dispersed through all means, including on clothing, equipment and machinery. In some instances, grapevine phylloxera can be dispersed by wind and flood waters.

How can I protect my vineyard from grapevine phylloxera?

Adhere to state quarantine regulations regarding movement of materials. Use of tolerant rootstocks is the most effective strategy to protect your business from grapevine phylloxera. Exercise good biosecurity practice to keep phylloxera out of your vineyard, including ensuring that vehicles, equipment and footwear is washed and disinfected before it enters the vineyard.

Khapra beetle *(Trogoderma granarium)*

What is khapra beetle?

Khapra beetle is a serious pest of stored and dry foodstuffs that is widely distributed around the world throughout Asia, Africa, the Middle East and the Mediterranean. Khapra beetle can cause losses of up to 75% from direct feeding on stored product. Infested product also becomes contaminated with beetles, cast skins and hairs from larvae, which can be a health risk and are difficult to remove from storage structures and transport vessels. This beetle is not present in Australia and poses a major threat to Australia's dried fruit, grain and ginger industries.



Adult khapra beetles have dense hairs on wing covers (Image courtesy of Simon Hinkley and Ken Walker, Museum Victoria, Bugwood.org).

What should I look for?

- Khapra beetle adults are small (2-3 mm long and 1-2 mm wide), brownish in colour with a smooth oval shaped body. Eggs hatch into small hairy larvae that can grow up to 7 mm long, are reddish brown in colour and darken as they mature. Larvae have characteristic long hairs all over their body, especially at the rear end and can survive without food for over 12 months.
- Look for characteristic hairy larvae and cast skins which are the easiest to spot.
- Look in stored dried fruits, around storage and transport areas and in the cracks and wall linings of storage containers.



Khapra beetle adults, larvae and cast skins in stored grain (Image courtesy of Ministry of Agriculture and Regional Development Archive, Ministry of Agriculture and Regional Development, Bugwood.org).

How does it spread?

Khapra beetles are spread through the movement of stored food products or as contamination of seed, machinery and straw.

How can I protect my vineyard from khapra beetle?

Check your stored product and storage facilities frequently for the presence of new pests and unusual damage symptoms. Good hygiene measures around storage facilities, including cleaning up spillages, reduces the risk of storage pest infestations. Make sure you are familiar with common pests so you can tell if you see something different.

Be aware that the khapra beetle is almost identical to the warehouse beetle, which is established in Australia, and some closely related native beetle species. If you find any beetle or hairy larvae fitting the description of the khapra beetle, have it identified by an expert.

Orange tortrix

What is it?

The orange tortrix, *Argyrotaenia citrana*, is a moth which is a pest of grapes in coastal areas and valleys in the USA. It is also attacks a wide variety of other fruits including apples, raspberries, blackberries, apricots, avocados and citrus.

Overwintering larvae feed on any soft, exposed vine tissue, weeds, and in grape mummies on the vine. Spring feeding is on buds, canes, and webbed leaves. Larvae then enter fruit bunches and make a nest of webbing among the berries. Besides injury to leaves and berry stems, their feeding allows entry of other disease organisms.

What do I look for?

Adult moths are approximately 10 mm long with a wingspan of 16 mm. They are brownish or buff coloured with a saddle- or V-shaped darker brown area across the folded wings.

Males are smaller than females with narrow abdomens and have a pair of crescent-shaped dark markings on the wing margins.

The eggs of the orange tortrix are pale cream or green coloured when first laid, but darken as they mature. Larvae are pale cream to green in colour. When disturbed, the larvae wiggle backwards and either drop to the ground or hang on a silken thread.

How does it spread?

Young larvae can be transported short distances on silken strands by the wind. Adult moths are good fliers.

Where is it found?

USA (California, Oregon and Washington).

Control options

In the USA, Orange tortrix populations are often controlled by parasites, especially in warm years when high temperatures slow its development. In cool years, higher populations occur, and natural enemies may not be able to hold populations below economically damaging levels; more control measures may be needed.

Cultural practices to control the orange tortrix include cleaning up the vineyard during the dormant period. Removing dried grape clusters on vines and weeds, and clusters on the ground at least a month before shoots begin to develop in spring.

How can I protect my vineyard from Orange tortrix?

Check your vineyard frequently for the presence of new pests and unusual symptoms. Make sure you are familiar with common viticulture pests so you can tell if you see something different.



Orange tortrix adult moths and egg mass on a leaf (Image courtesy of UC statewide IPM Project © Regents, University of California).

Spotted lanternfly *(Lycorma delicatula)*

What is spotted lanternfly?

Spotted lanternflies are an invasive planthopper from Asia which feed on plant sap causes wilting, leaf curling and dieback. This pest affects at least 70 plant species including grapevine, a range of crops, trees and woody ornamentals.

What do they look like?

Adults: up to 27 mm long and approximately 12 mm wide. The forewings are predominantly grey with black spots which transition into black cells towards the wing tips. Contrasting patches of bright red and black with a white band are distinct features of the hind wings. The abdomen is yellow with horizontal black stripes.

Nymphs: range from 3-12 mm in length. Nymphs in their early stages of development appear black with white spots and turn red on the upper body before becoming adults.

Eggs: egg masses are yellowish-brown, approximately 25 mm long and often aligned in 4 to 7 vertical rows.

What should I look for?

- Egg masses overwinter on smooth surfaces including host plant surfaces, non-host materials and man-made structures (e.g. vehicles, shipping containers and garden furniture). Nymphs emerge in the spring or early summer. Adults appear in summer.
- Spotted lanternflies frequently gather in large numbers within in the canopy or at the base of the host. They are easiest to locate at dawn and dusk when they are migrating up or down the plant.
- Feeding causes wilting, leaf curling, dieback and reduced resilience to other stresses. Communal feeding results in wounds on the plant and the discharge of sugar-rich liquids along the stems, branches or trunk of the host. This attracts other insects (e.g. bees and wasps) and promotes fungal growth (e.g. sooty moulds). Large patches of fungal growth occurring on leaves or at the base of the tree may produce a fermented odour and cause the eventual death of the plant.

How do they spread?

Can be spread long distances through human-assisted transport, especially of egg masses. Once established, spotted lanternfly can disperse short distances by walking, jumping and flying.



Adult spotted lanternflies have large, visually striking wings (Image courtesy of Lawrence Barringer, Bugwood.org).



Adult spotted lanternfly with distinct wing and abdominal patterns and colouration (Image courtesy of Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org).



Spotted lanternfly nymphs causing leaf curling and dieback on a black walnut branch (Image courtesy of Eric R. Day, Virginia Polytechnic Institute State University, Bugwood.org).



Sugar-rich fluids from the communal feeding behaviour of spotted lanternfly promotes fungal growth on the host tree (Image courtesy of Richard Gardner, Bugwood.org).

Spotted-winged drosophila *(Drosophila suzukii)*

What is the spotted-winged drosophila?

Spotted-winged drosophila (SWD) is an emerging pest that originated in South-East Asia but has spread throughout North America and Europe. SWD is a small fly that attacks a range of soft skinned fruit and reduces crop yield and quality through direct feeding damage and secondary infection of the fruit. This pest has a significant impact on fruit production as the larvae feed on maturing fruit, not just over-ripe or decaying fruit. The preferred hosts for eggs laid in healthy fruit include grapes, berries, cherries, nectarines and plums.

What should I look for?

- Adult SWD are 2-3 mm long with a wingspan of around 6-8 mm. They are yellow-brown with dark bands on the abdomen and prominent red eyes.
- Larvae are cream or white and about 3 mm long. Pupae are red to brown, 2-3 mm in length by 1 mm wide and are cylindrical shaped. The pupae have distinctive pairs of horn-shaped protrusions, which further divide into 7-8 branches which are their respiratory organs.
- Infested fruit show small scars and indented soft spots on the surface, left by the 'stinging' (ovipositing) females. Larval feeding results in the fruit collapsing around the feeding site. If the attack rates are high by SWD, the entire fruit can collapse. The oviposition scar also exposes the fruit to secondary attack by pathogens and other insects.
- Although SWD preferentially attack fruit prior to harvest, they can also attack harvested fruits. Look for signs of SWD on fresh fruit in packing houses.
- Note: Adult SWD look almost identical to the regular vinegar fly (D. melanogaster). SWD are distinguished from other Drosophila species present in Australia by the black spot on the wing tips in males.

How does it spread?

Adult SWD can spread throughout a crop through flight, but longer distance dispersal occurs through movement of plant material (primarily fruit) infested with eggs or larvae.



SWD larvae feeding inside flesh of the fruit (Image courtesy of Larry Strand, UC (Davis) statewide IPM program).



Adult males are yellow-brown with dark abdominal bands, red eyes and distinct spots on the ends of their wings (Image courtesy of Martin Hauser, California Department of Food and Agriculture).



Adult females are yellow-brown with dark abdominal bands, red eyes and no spots on their wings (Image courtesy of Martin Hauser, California Department of Food and Agriculture).

Bacterial blight of grapevine *(Xylophilus ampelinus)*

What is bacterial blight of grapevine?

Bacterial blight of grapevine is a serious, chronic and systemic disease of grapevine which survives in the vascular tissues of infected plants and affects commercially important cultivars. Bacterial blight can affect the leaf, petiole, stem, root, shoot or flowers. Severe infection of susceptible cultivars can lead to a serious reduction in grapevine health and major harvest losses.

What should I look for?

- Linear reddish-brown streaks which appear and then expand upwards on the shoot, darken, crack and develop into cankers. Shoots subsequently wilt, droop and dry up. Young shoots may develop pale yellowish-green spots on the lowest internodes and eventually die back.
- Stem cross-section reveals tissue browning.
- Cankers can appear on the sides of petioles leading to one-sided (marginal) leaf necrosis as well as on flower and fruit stalks.
- Immature flowers turn black and die back and necrotic leaf spots also occur.
- Roots may also be affected resulting in retardation of shoot growth.
- Be aware, cankers on shoots and leaf spots are similar to those induced by grape anthracnose *(Sphaceloma ampelinum)*, without the brown discolouration of vascular tissue. Although symptom assessment and visual inspection can distinguish between these diseases, laboratory diagnostics should be conducted to confirm the absence or presence of bacterial blight.

How does it spread?

Bacterial blight is readily transmitted with pruning tools, especially in wet and windy weather. The disease is associated with warm moist conditions, and spread is favoured by overhead sprinkler irrigation. Bacterial blight is able to survive in the wood, and thus may be transmitted from nursery to nursery in infected cuttings. Local spread in vineyards tends to occur along the rows from the initial disease centre. It may also be carried in irrigation water. Natural dispersal is limited to the vineyard and the immediate surrounding area.



Cup shaped leaves are a symptom of Bacterial blight of grapevine
(Image courtesy of ARC Infruitec-Nietvoorbij, South Africa).



Cankers will darken, crack and spread throughout the grapevine stem
(Image courtesy of ARC Infruitec-Nietvoorbij, South Africa).



Necrotic canker developing on grapevine shoot
(Image courtesy of ARC Infruitec-Nietvoorbij, South Africa).

Black rot *(Guignardia bidwellii)*

What is Black rot?

Black rot *(Guignardia bidwellii)* is a fungal disease of grapevines that can infect all green tissues of the vine, including the fruit. Black rot is endemic to North America, but has spread to Asia, Africa, Central and South America and Europe via contaminated propagation material. This disease can result in complete crop losses in warm and humid grape growing regions.

What should I look for?

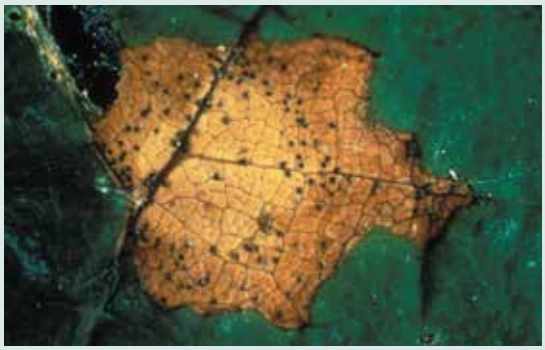
- On leaves, look for minute, round, reddish-brown spots. Spots develop black interveinal margins and greyish-tan to reddish-brown centres that are most apparent on the upper leaf surface.
- Pycnidia (spore bearing structures) develop in the centre of these necrotic spots and appear as small, blackish pimples.
- On shoots, stalks and tendrils, look for lesions that are purple to black, sunken, and typically oval or elongated. Pycnidia are commonly observed throughout these lesions with numerous cankers resulting in blighting of the growing tips of shoots.
- As the canes grow, the bark tends to split along the length of the lesion.
- On the fruit, look for brown spots that have a dark ring with a sunken centre which expands to involve the entire fruit. Individual fruit then rots and eventually shrivels into a black, wrinkled mummy.
- Symptoms are most evident on leaves during spring, on leaves, stems and fruit during summer and then on stems and fruit during autumn and winter months.

How does it spread?

Black rot can be spread through water and airborne spores, as well as through infected propagation material and fruit. Spore production, dispersal, infection and continued disease development is favoured by warm and humid conditions, summer rainfall and persistent dew. Black rot can overwinter in canes, tendrils, leaves and fruit on the grapevine and on the ground for up to two years, which provides a source of inoculum to infect vines in the following season.



Black rot necrotic lesions on leaves and stems (Image courtesy of Mark Sosnowski, South Australian Research and Development Institute).



Black rot lesions with pycnidia (Image courtesy of University of Georgia Plant Pathology Archive, Bugwood.org).



Black rot lesions on stems appear sunken and are elliptical to elongated in shape (Image courtesy of Clemson University – USDA Cooperative Extension Side Series, Bugwood.org).

Bois noir

What is bois noir?

Bois noir (black wood) is a yellows-type disease of grapevine caused by a phytoplasma *(Candidatus Phytoplasma solani).* This disease was first reported in France in 1961 and has been found to affect cultivated grapevines in several European countries and the eastern Mediterranean region. The pathogen affects the inner layer of the bark and other parts of the plant.

Bois noir accounts for serious crop losses in grapes, causing leaf and vein discoloration, stunted growth, shrivelled fruit and irregular ripening of wood. Bois noir has a broad host range and currently there are few effective management strategies for this disease.

What does it look like?

Bois noir causes infected plants to lose vigour and become stunted with short internodal spacing.

The leaves, including leaf veins become discoloured and blotched. In red grape varieties, leaves appear red while in white varieties, leaves and veins appear chlorotic (yellow) and necrotic (dead). Leaves also have a down curling appearance on the blade forming a triangular shape. The berries are shrunken, shrivelled and flowers appear dry in both red and white varieties.

What can it be confused with?

In Australia, the disease can be confused with Australian grapevine yellows *(Candidatus Phytoplasma australiense)*, and grapevine leafroll viruses.

Grapevine leafroll virus causes leaves to turn red to purple or yellow with veins remaining green, while bois noir causes red, yellow or brown discolouration to the entire leaf (including veins). Overseas, bois noir can be confused with flavescence dorée *(Grapevine flavescence dorée phytoplasma)* and black rot (*Guignardia bidwellii).* Bois noir and flavescence dorée cannot be visually distinguished and require specialist diagnosis.

Black rot blackens the berries while bois noir causes them to shrink and shrivel.

What should I look for?

Look for discoloured leaves (red or yellow), stunted fruit growth, short internodal spacing, browning, irregular ripening of stems with a woody appearance, and shrivelled or shrunken berries. Look also for the presence of planthopper insect infestation in your vines as planthoppers can spread disease.

How does it spread?

Bois noir is spread from plant to plant by insect vectors including planthoppers (such as the exotic species *Hyalesthes obsoletus, Anaceratagallia ribauti* and *Reptalus panzer*). It is not known if planthoppers in Australia can spread bois noir. Bois noir is also readily transmitted by grafting with infected plant material.

Where is it now?

The pathogen was first reported affecting grapevine in France. Since then it has been reported in several European and Asian countries. It has not been reported in Australia.

How can I protect my vineyard from bois noir?

You can protect your farm from bois noir by regularly checking your crop for the presence of new pests, and closely examining poorly performing plants for signs of leaf and vein discoloration, shrivelled berries, woody appearance on stems and planthoppers.

Only source planting material from reputable and accredited nurseries and check for signs of disease before transferring any new planting material to the field.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881.



Leaf symptoms of bois noir including down-curling of leaf blade in triangular or trapezoidal shape and leaf yellowing (Image courtesy of Wolfgang Schweigkofler, Dominican University of California)



Grapevine infected with bois noir showing uneven lignification of the stem (Image courtesy of Wolfgang Schweigkofler, Dominican University of California)

Exotic grapevine yellows phytoplasmas

What are the exotic grapevine yellows phytoplasmas?

Grapevine yellows phytoplasmas are diseases of grapevine caused by phytoplasmas which result in very similar symptoms. The disease Australian grapevine yellows *(Candidatus Phytoplasma australiense)* is present in Australia, however there are a number of exotic grapevine yellows diseases which are not present in Australia but would likely result in significant crop losses in grapes if they did arrive in grape growing regions. Two serious grapevine yellows diseases not currently present in Australia are bois noir (black wood) *(Candidatus Phytoplasma solani)* and flavescence dorée *(Grapevine flavescence doree phytoplasma)*. These pathogens affect the inner layer of bark and cause stunted growth, shrivelled fruit and irregular ripening of wood. Bois noir has a broad host range and currently there are few effective management strategies for this disease. Bois noir and flavescence dorée cannot be visually distinguished and require specialist diagnosis.



Grapevine flavescence dorée causing shrunken fruit (Image courtesy of Biologische Bundesanstalt für Land- und Forstwirtschaft, Bugwood.org).



Leaf symptoms include down-curling of leaf blade in triangular -trapezoidal shape and leaf yellowing (Image courtesy of Wolfgang Schweigkofler, Dominican University of California).



Grapevine infected with bois noir. Note the red discoloration and blotches on leaves (Image courtesy of Wolfgang Schweigkofler, Dominican University of California).

What do they look like?

- Reduced vigour in infected plants, stunting and short internodal spacing.
- Leaves, including leaf veins become discoloured and blotched. In red grape varieties, leaves appear red while in white varieties, leaves and veins appear chlorotic (yellow) and necrotic (dead).
- Leaves have a down curling appearance on the blade forming a triangular shape.
- Stems irregularly ripen and have a woody appearance.
- Berries are shrunken, shrivelled and flowers appear dry in both red and white varieties.

How do they spread?

Bois noir and flavescence dorée are spread between plants by insect vectors including planthoppers (such as the exotic species *Hyalesthes obsoletus, Anaceratagallia ribauti, Reptalus panzer* and *Scaphoideus titanus)*. It is not known if planthoppers in Australia can spread these diseases. Grafting healthy vines with infected buds also readily transmits these diseases.

Grapevine red blotch virus

What is Grapevine red blotch virus?

Grapevine red blotch virus (GRBV) is a recently identified and described virus which was first reported on Cabernet Sauvignon in the Napa Valley (California, USA) in 2008. The virus is associated with red blotch symptoms on leaves, as well as causing a significant reduction in sugar accumulation in grapes. Preliminary studies suggest that this virus is not of recent origin, but had instead escaped attention from grape growers in America because of the very similar symptoms to those of Leafroll virus.

What should I look for?

The symptoms of GRBV generally start appearing in autumn as irregular blotches on leaf blades and the basal portions of shoots. Look for primary and secondary veins on leaves turning red, as well as red blotches between the interveinal margins.

GRBV can also cause a significant reduction in sugar accumulation of up to 5° Brix as well as increased acidity. It is likely that GRBV would be first detected in wine grapes, as these grapes are carefully monitored for sugar content to determine harvest date. Look for lower than expected Brix values in both red and white wine grapes.

Unfortunately, much is still unknown about the effect of GRBV on yield and transmission, and how it may affect different cultivars and rootstocks.

What can it be confused with?

Grapevines with GRBV cause quite similar symptoms to those caused by Leafroll virus.

However, there are a few distinct differences between the two viruses that can easily be observed. Firstly, grapevines infected with Leafroll virus only turn red in and around the secondary veins of the grapevine leaf, with the primary veins and surrounding area remaining green.

With GRBV, the primary and secondary veins, as well as the interveinal zones turn red. Secondly, infection with Leafroll virus typically causes the margins of the leaf to roll onto itself, which gives the virus its symptomatic name. However, in GRBV the leaves do not roll at the margins.

How does it spread?

It is believed that the main modes of spread and transmission are through grafting and propagation material. The ability of GRBV to affect both mature and young grapevines has led researchers to suggest the possibility of a vector for the virus.



Symptoms of Grapevine red blotch virus include red blotches around the leaf and through the primary and secondary veins (Image courtesy of Marc Fuchs, Cornell University)

Where is it now?

GRBV is a recently described virus. However, preliminary studies have determined the virus is already widespread in both old and mature red and white *V. vinifera* cultivars throughout grape growing regions of America. The sequence of a virus nearly identical to GRBV has also been detected in Canada.

How can I protect my vineyard from Grapevine red blotch virus?

Only source high health status (preferably certified) plant material from reliable and accredited suppliers. Check your vineyard frequently for the presence of new pests and investigate any sick grapevines for unusual symptoms. Make sure you are familiar with common grapevine pests so you can tell if you see something different.

Keep records of anything unusual and ensure all staff and visitors adhere to on farm biosecurity and hygiene practices.

Pierce's disease *(Xylella fastidiosa)*

What is Pierce's disease?

Pierce's disease is a deadly disease caused by the bacteria *Xylella fastidioda*, which affects an extremely wide range of host plant species including grapevine, cherry, pear, almond, oak, blueberry, citrus and lucerne. The bacteria infect the water conducting system (xylem) of the grapevine, blocking the movement of water around the plant.

What should I look for?

- Plants infected by Pierce's disease show signs of water stress including browning and loss of leaves, lignification of canes and fruit raisining.
- The characteristic symptom is leaf scorch and includes marginal leaf scorch (browning) that is frequently bordered by a red or yellow halo. The outer leaf area may dry suddenly while the rest of the leaf remains green.
- Entire leaves may turn brown and drop, leaving the petioles attached to the plant.
- Tips of canes and roots may also die back as symptoms become more pronounced.
- Flower clusters on infected grapevines may set berries but these usually dry up before reaching maturity.
- Diseased stems often mature irregularly with patches of green and brown tissue, which are known as 'green islands', becoming visible.

How does it spread?

Pierce's disease is transmitted by grafting infected propagation material onto healthy rootstocks and by xylem-feeding leafhoppers. Glassy-winged sharpshooter, another exotic plant pest, is a key vector though there are likely endemic Australian insects that may also be able to vector this disease. Pierce's disease is not transmitted through contaminated pruning equipment or by seed transmission. To protect your vineyard, only source high health status (preferably certified) plant material from reliable and accredited suppliers. Check your vineyard frequently for the presence of new pests and investigate any sick grapevines for unusual symptoms.



Grapevine leaves showing scorch-like symptoms from Pierce's disease (Image courtesy California Department of Food and Agriculture).

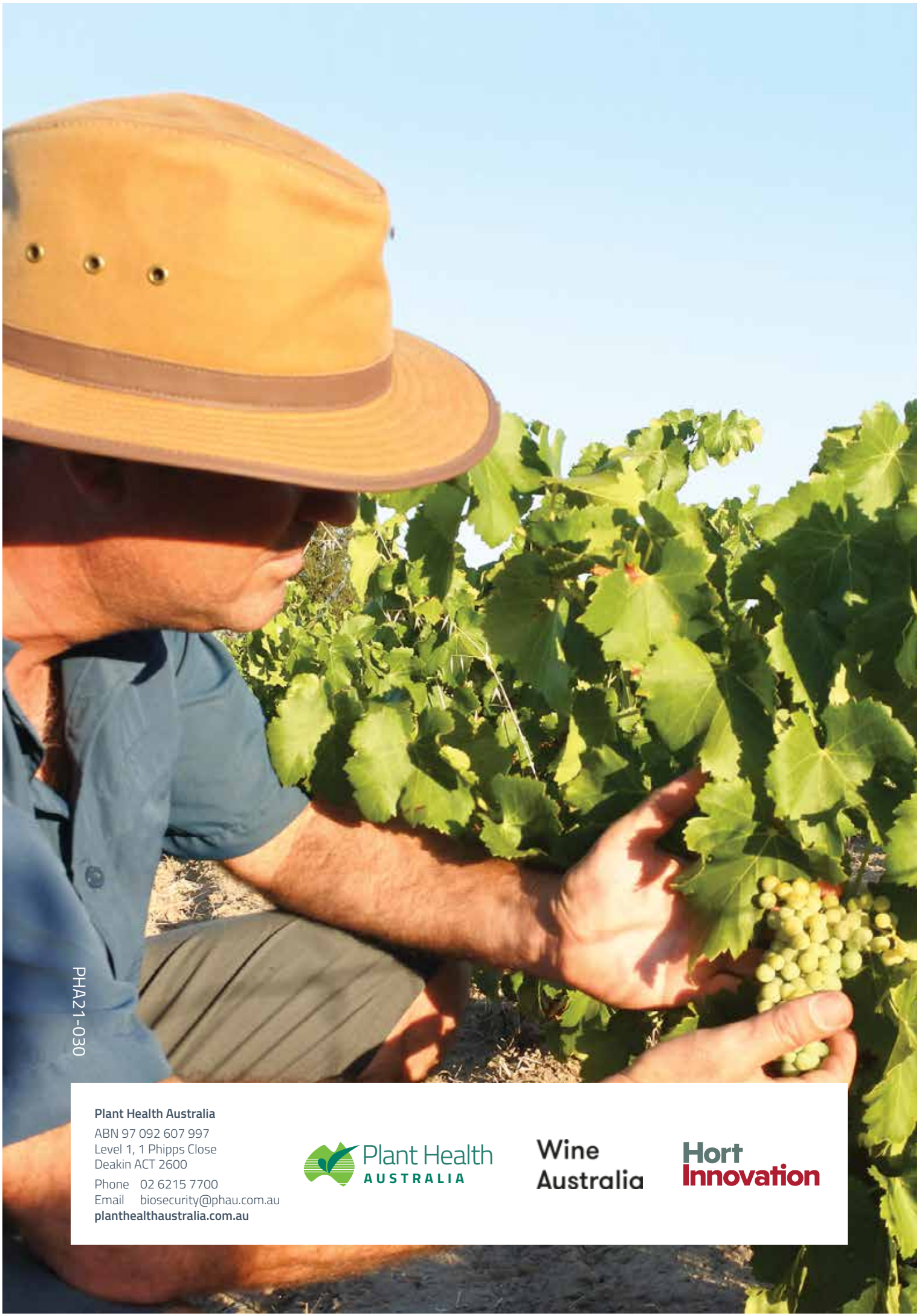


'Green islands' on a grapevine cane, surrounded by brown necrotic lesions (Image courtesy of John Hartman, University of Kentucky, Bugwood.org).



Berries usually dry out and shrivel up before reaching maturity (Image courtesy California Department of Food and Agriculture).





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