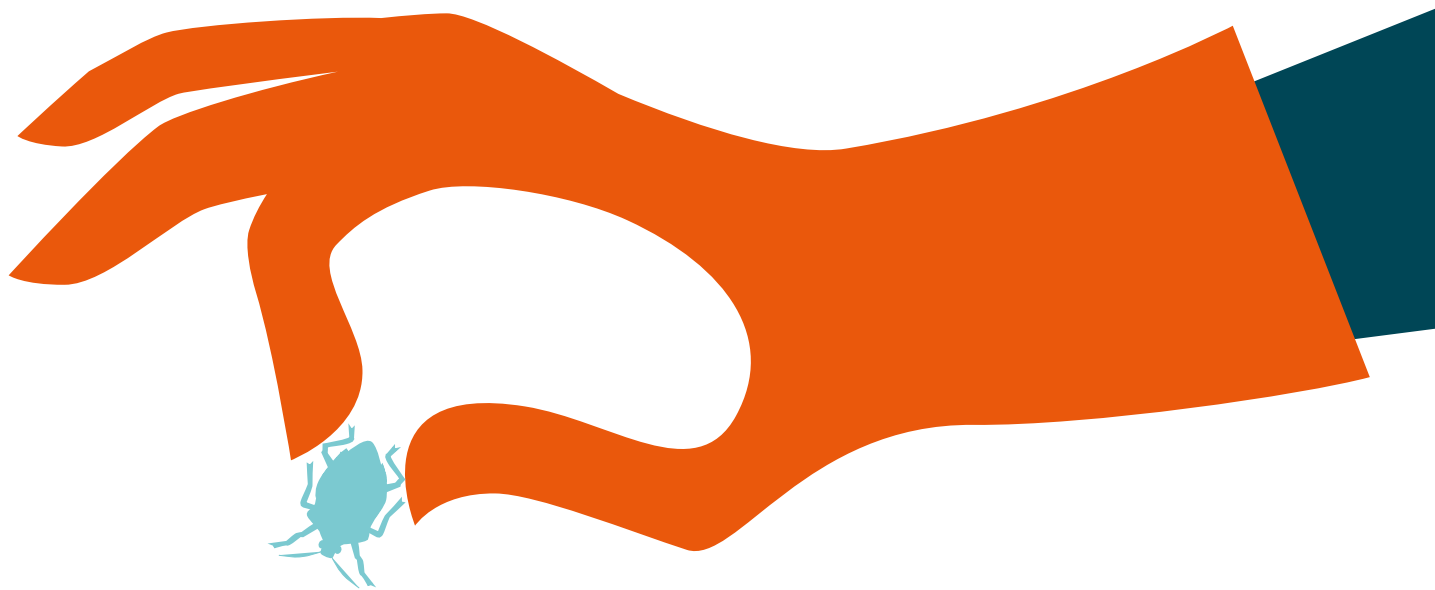


Biosecurity manual

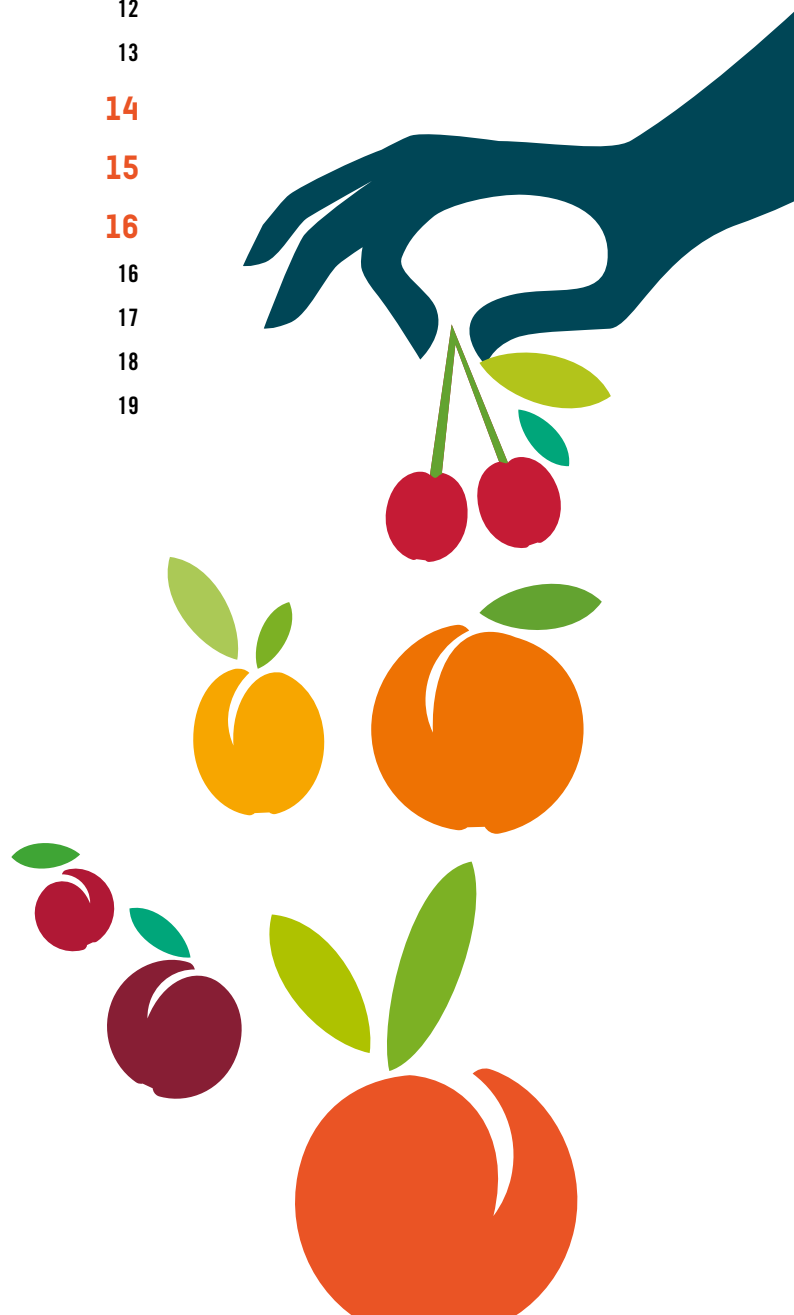
for New Zealand
summerfruit
orchards

2019



Contents

1. Introduction	1
2. Biosecurity overview	2
3. Orchard biosecurity measures	3
3.1. Risk assessment	3
3.2. Orchard hygiene and waste plant material	4
3.3. Planting and propagating material	7
3.4. Visitors and people movements	8
3.5. Vehicles and machinery	10
4. Pests and diseases	11
4.1. Pest and disease surveillance	11
4.2. Use of agrichemicals	12
4.3. Reporting suspect pests	12
4.4. Most unwanted – High priority threats for the summerfruit industry	13
5. Best practice checklist	14
6. Summerfruit most unwanted–fact sheets	15
Appendices	16
1. Biosecurity best practice checklist	16
2. Pest monitoring data sheet	17
3. Visitor register	18
4. Most unwanted poster	19



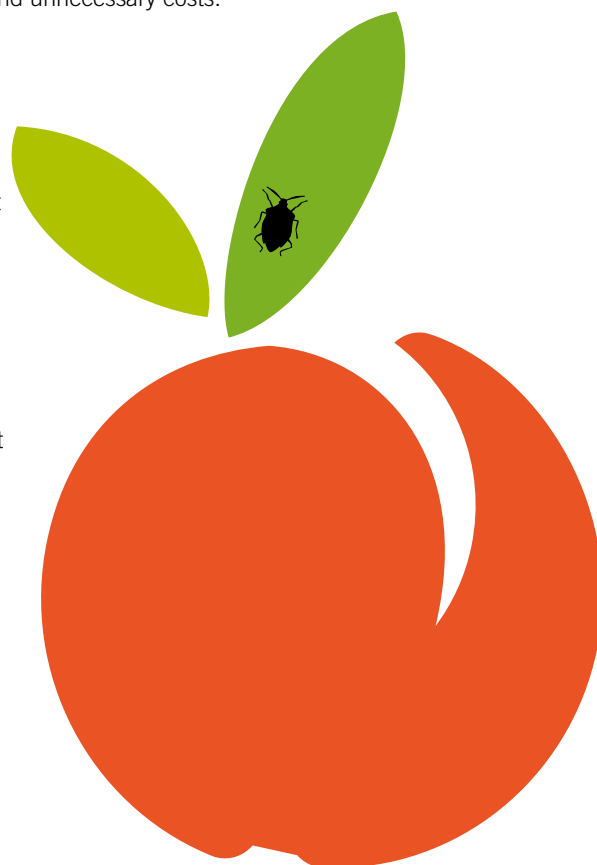
1 Introduction

This manual is a reference document for the implementation of biosecurity measures specific to the New Zealand summerfruit industry. It describes the relevant biosecurity guidelines and principles to assist you in protecting your orchard from the introduction and spread of exotic organisms.

Summerfruit growers share a responsibility with the Ministry for Primary Industries (MPI) and other stakeholders in preventing and mitigating the potential impact of biosecurity threats on our industry. The goal of this manual is to minimise the effects of a possible biosecurity incursion in summerfruit orchards and to reduce the chances of the establishment and spread of a new pest or disease in New Zealand. By implementing the recommended measures in your day-to-day operations, you will improve your own biosecurity and that of your region while minimising losses and unnecessary costs.

In your orchard, you will already be taking actions to protect your summerfruit crops. Many of these actions will be part of health and safety, food safety, good agricultural practice or to meet export requirements. Use this manual along with other industry information to be more aware of how you already implement biosecurity and what else you could do to further protect your operation.

Please don't think these practices do not apply to you just because we don't have a biosecurity response happening in your area. The best way to reduce your risk is to have clear procedures to follow and that all staff are trained on these so they know how to take care of biosecurity. Encourage your staff to watch for and report anything that may put your orchard biosecurity at risk.



2 Biosecurity overview

Biosecurity is the exclusion, eradication or management of pests and diseases that pose a risk to the economy, environment, cultural and social values, including human health. The biosecurity system protects New Zealanders, our way of life, our natural and productive resources and our biodiversity from the harmful effects of pests and diseases. (Biosecurity 2025)

Specifically, orchard biosecurity is the protection of your property and the entire industry from the entry, establishment and impact of exotic organisms. Biosecurity management also assists in maintaining access to existing markets and the opening of new markets through country pest freedom status. **The presence of exotic pests and diseases can mean that certain markets will not be willing to receive products grown in New Zealand.** Biosecurity controls implemented at the orchard level play a fundamental role in protecting our summerfruit industry. The arrival and establishment of a new pest or disease would not only affect your orchard productivity, but also your production costs, due to an increase in labour and the additional pest controls necessary to manage the unexpected outbreak.

Growers are often the first to notice the presence of a new biosecurity threat. It is important to be familiar with the worst exotic pests and diseases affecting our summerfruit industry. Be on the lookout for signs or symptoms of any new pests and diseases and if you spot something unusual call MPI's Pest and Disease Hotline on 0800 80 99 66.

STOP

To report
any suspected
exotic organism,
call MPI on:

0800 80 99 66



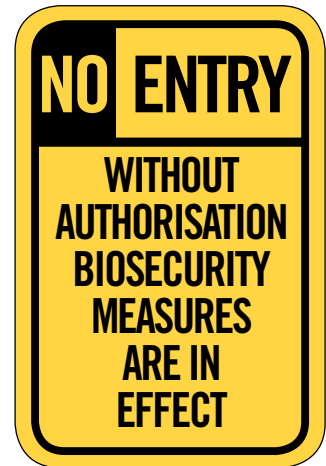
**Growers are often
the first to notice the
presence of a new
biosecurity threat.**



3 Orchard biosecurity measures

Orchard activities should be planned and managed with the aim to minimise biosecurity risks from plant propagation material, orchard practices, vehicles, equipment and people movements across production sites. A systematic approach to production, hygiene and biosecurity management needs to be implemented at the orchard level and appropriate measures taken to prevent the introduction and spread of pests or diseases during the production process. Implementation of orchard biosecurity supports regional biosecurity, which in turn underpins national biosecurity.

The biosecurity measures you introduce in your orchard will be specific to your operation according to the characteristics of your own property and production systems. The focus should be on making these measures practical, effective and easy to implement to facilitate their quick adoption by everyone in the orchard, including visitors and staff.



3.1. Risk assessment

Understanding the level of risk associated with a particular orchard activity will help you prioritise actions that are the most important to put in place on your property. When analysing risk, the two factors to consider are *likelihood of occurrence* and *overall impact* on your operation. Apply biosecurity measures consistent with the level of risk identified during your orchard's risk assessment.

The following risk assessment matrix will help you analyse the risks.

Risk (Associated with a particular orchard activity)		Likelihood of occurrence		
		Unlikely	Likely	Very likely
Overall impact	Major	Medium risk	High risk	High risk
	Medium	Low risk	Medium risk	High risk
	Minor	Low risk	Low risk	Medium risk

Example. Below is an example of a risk assessment completed for some of the activities carried out at a specific orchard. Risk assessment of the same activities in your operation could give you a different risk estimation depending on your orchard's situation.

Orchard activity	Biosecurity issue	Comments	Likelihood	Overall impact	Risk estimation
Visitors	Dirty vehicles or gear could carry pests and diseases into the orchard	In the past some visitors have come into our orchard with cleaner vehicles than others	Likely	Major	High risk
Pruning	Spread of pathogens through contaminated secateurs	Previous monitoring demonstrates a very low level of diseases present in our orchard	Unlikely	Medium	Low risk
Machinery	It could spread pests and diseases between blocks	We only have one block and our machinery works exclusively in our orchard	Unlikely	Minor	Low risk
Imported equipment	Pests hitchhiking on imported equipment	BMSB has proven to be a great hitchhiker pest. Check if imported equipment comes from a country where present	Very likely	Major	High risk

3.2. Orchard hygiene and waste plant material

Many tree diseases originate in the orchard and appear on fruit in cold storage after harvest. The impact of such diseases can be reduced by implementing the appropriate phytosanitary controls and monitoring programmes in the field, along with good orchard hygiene practices.

Pests and pathogens can overwinter on waste plant material such as mummified fruit, dried leaves, pruned limbs, and decaying fruit left on the orchard floor from the previous season. These organisms can then be further spread around the orchard by rain, irrigation water and wind infecting healthy trees and fruit later in the spring when temperatures become warmer.

Removal of waste plant material can help minimise growing conditions for pests and pathogens by reducing the level of inoculum pressure in the orchard, which in turn improves the efficiency of phytosanitary control measures. Keeping the orchard clean of waste plant material, and thus reducing the chances of spreading diseases, is a very important measure in maintaining healthy fruit trees.

Good orchard hygiene can be achieved through implementation of the following practices.

Disposal of waste plant material

Disposal of all waste plant material including prunings, remaining fruit and dead or sick branches, needs to be managed appropriately as they can attract and harbour pest and pathogens.

- **Dispose of waste in ways that limits any potential spread of infection.**
- Prunings can be placed in between tree rows and disposed of by using a mulching mower to help them breakdown more quickly. This removes growing conditions for pests and pathogens; reducing their chances of surviving through winter until the following season.
- Hot composting is also a safe way to dispose of unwanted plant material as is burning the waste plant material generated in your orchard.
- In the case of rotten or mummified fruit, it is best to collect them and bury deeply or dump them away from the orchard, thus reducing the level of inoculum by avoiding further pathogen sporulation in the field.
- Recent studies by Dr Phil Elmer at PFR have demonstrated that this fruit can also be swept into the grassed alleyways and then mulched with a mulching mower. This process completely inhibits the overwintering part of the disease cycle for diseases such as botrytis and might be applicable to other diseases.
- Always keep unhealthy and healthy plant material apart to minimise the risk of contamination.
- Packhouse reject fruit can be disposed of by deep burial or used as stock food at a location remote from orchards.
- These practices should be already in place for existing diseases such as brown rot. They will have the same impact in minimising the spread of unwanted diseases.



Tool disinfection

- In areas where the risk of transmitting diseases is high, **it is very important to be diligent about keeping secateurs and other pruning tools clean to avoid infection and further spread of diseases.**
- Cleaning removes any sap, mud or other material where pathogens such as virus, fungi or bacteria can survive.
- Before working on your crops make sure your tools and equipment are clean and if necessary disinfected.
- Consider cleaning equipment before starting a new task or working in a different block or crop.
- If you have identified pests or diseases, always clean and disinfect material between trees to prevent the spread or to contain and isolate the outbreak. Work with infested blocks last in the end of the day to reduce the risk of spreading pathogens into healthy blocks.
- You should have dedicated tools, equipment or clothing to use in separate orchards.
- In general terms, **all tools should be cleaned before and after use**, plant residues removed and where necessary, sanitised with an appropriate disinfectant such as methyl alcohol or chlorine bleach.
- The condition of tools and equipment storage area is important as pathogens can be present in dust and soil. Keep storage areas clean and use bait stations to control vermin.
- Give regular reminders to your staff about tools cleanliness at the start of activities such as pruning or harvest so everyone is confident in what they need to do.



Pest and disease monitoring

- **Fruit trees need to be monitored for signs of pests and symptoms of disease throughout the year.** Your greatest defence is the early detection and control of pests and diseases.
- Symptoms of disease may include branches with wilted, discoloured, or dying/dead leaves, tree limbs with visible cankers, and rotting fruit on the tree or on the ground.
- **Ensure your staff know how to recognise the first signs or symptoms.** Involve them in frequent monitoring of your crops and perform regular crop scouting.
- Ensure diseased branches have been previously identified and are pruned out or treated later in the season. As mentioned before, the intention is to reduce pathogen inoculum levels in the field.
- Become familiar with the normal pests and diseases so people can identify what is not normal.
- Encourage staff to immediately report anything unusual.
- Provide information and training through posters, industry publications or field officer visits.
- Increase your monitoring frequency during high risk periods.

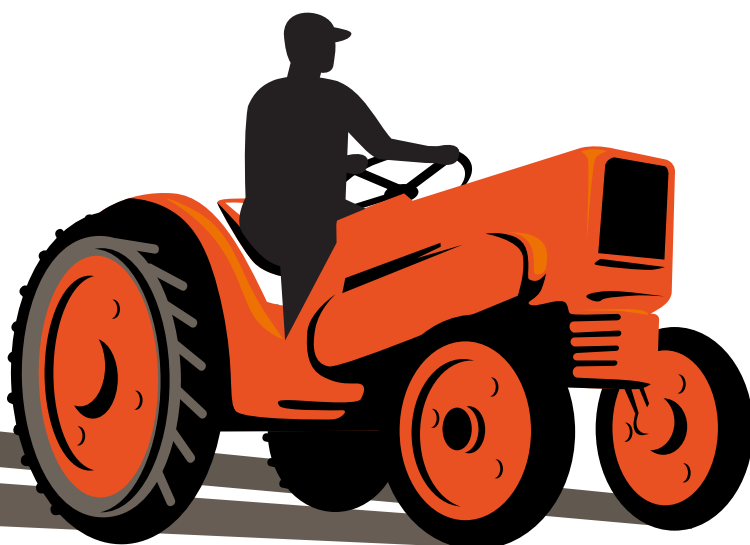


Harvest hygiene

- Ensure buckets, bins, pallets, trailers and other materials used during harvest are clean, clear of soil and free of any remnants of plant material or debris.
- Treat harvested fruit with care to prevent wounds that would allow bacteria access into the produce.
- Make sure harvest equipment is stored in a place protected from cross-contamination.

Receiving orchard supplies

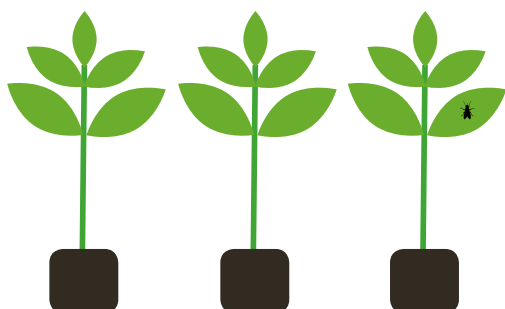
- Source incoming materials from a trusted or accredited supplier.
- When receiving orchard supplies, keep them isolated until you have inspected them for signs of pest and disease and are confident that they pose no risk.
- Check accompanying documentation to make sure everything is in order.



3.3. Planting and propagating material

The nursery stock distribution pathway has the potential for pests and diseases to be rapidly spread throughout summerfruit production sites across New Zealand. Plant producers (eg nurseries) have a critical role to play in our industry's biosecurity management. The following guidelines may help you minimise the potential risks to your orchard posed by the introduction of new propagation material.

- **Always obtain nursery stock from a trusted and reputable source.** Currently there is no national certification scheme for summerfruit nurseries, so in the absence of certified plant producers, growers should source plant material only from nurseries that are able to demonstrate they have measures in place to prevent the spread of pests and diseases.
- The Ministry for Primary Industries, with the support of industries, is currently developing the Plant Producers Biosecurity Scheme (PPBS), which is a certification-based approach to nursery biosecurity management, aiming to be introduced in 2020. For more information on this nursery certification scheme please visit www.nzppi.co.nz.
- **Use only clean propagation material independently tested free of pests and diseases.**
- A visual inspection does not ensure plant material health since many viruses may show no symptoms during the first few years after infection.
- Infected propagation material introduced as new plantings could infect your entire orchard in the long term through the action of vector insects.
- Ask your nursery for more detailed information regarding the source of budwood, the mother tree phytosanitary testing regime, and where possible, visit their facilities and foundation blocks to assess management practices.
- **Before transport to the orchard, check nursery trees thoroughly for symptoms of pests or diseases** and randomly select a few trees to examine the root system as well.
- **Ensure traceability of all your plant material** is well established across the supply chain and production processes. Keep records of where inputs were sourced from, as this will give you the ability to trace-back and trace-forward.
- For more comprehensive information on planting and propagating material see the Nursery tree handling protocols and the Nursery tree checklist available on the Summerfruit NZ portal under Main Menu/Publications/Orchard management.



3.4. Visitors and people movements

Visitors and orchard workers can unintentionally spread weed seeds, diseases and insects across different blocks or properties. Management activities such as pruning, thinning, spraying, harvesting, and pest monitoring require close contact between orchard workers and trees. In this context people may become a vehicle for the spread of pests and diseases, thus increasing the biosecurity risk. **Where feasible, limit the number of people who visit your property and ask yourself if they really need to come.**

Procedures to mitigate the risk from people movements need to be implemented and well communicated to everyone entering the orchard. Here are some examples of people who can increase the biosecurity risk while visiting your orchard or as part of their activities.



- You and your family
- Casual workers
- Backpackers
- Agronomists and consultants
- Earthmoving companies
- Research personnel
- Utility providers
- Contractors
- Other people entering for work or non-work purposes



Any of these people could potentially carry and spread pests and pathogens on their footwear, clothing, equipment, vehicles and work tools onto susceptible crops. Ensuring they all understand the biosecurity measures taken at your property is an important part of keeping the orchard free from the introduction of exotic threats.

The following measures can be implemented to reduce the likelihood of a biosecurity incursion caused by people movements.

- **Keep a register of all visitors.** Ideally there should be only one entry point to the orchard for visitors and all access should be authorised by management. Limiting access to the property is important to keep track of all visitors and minimise the likelihood of a biosecurity threat arriving unnoticed. In order to properly assess the risk, ask your visitors to inform you of other crops they visited before arriving at your orchard. Record keeping is important in the event of a disease or pest outbreak. Your records can help to trace back or trace forward the source or cause of the outbreak.
- **Communicate biosecurity requirements.** People entering the orchard need to be informed of the potential impact of their visit and made aware of the biosecurity requirements of the orchard. This can be done through clearly displayed signs, documented biosecurity policy and an explanation of the orchard hygiene procedures upon entering the property. Have signs around your property that show where people can and cannot go.



- **Inspection and cleaning facilities.** Visitors' footwear, clothing and equipment need to be inspected and cleared before entering a production area. Provide cleaning materials such as scrubbing brushes, footbaths, disinfectants and handwashing facilities to remove possible contaminants. If a visitor is assessed as high risk, take action to lower that risk, for example, providing them with clean boots or overall to wear.
- **Fruit from outside your orchard.** Visitors should not be allowed to bring fruit into your orchard to avoid the risk of spreading pests and diseases from elsewhere. Fruit from workers' lunch should be consumed in designated areas away from the production site, and not in the orchard.
- **Biosecurity signs.** Biosecurity signs and notices should be displayed at the entrance, washing facilities, parking and working areas to remind people of the importance of maintaining orchard hygiene and their obligations in relation to biosecurity. Keeping biosecurity fresh in everyone's mind is essential for making sure your procedures are working effectively and your crop is protected.



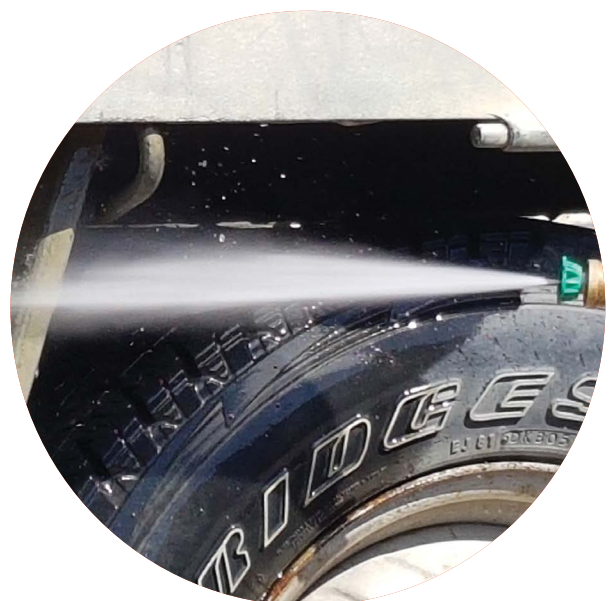
Biosecurity Clean Down Point

Before entering please ensure footwear is free from mud & soil.
Clean footwear with the footbaths provided.

3.5 Vehicles and machinery

Always remember that inspecting and cleaning equipment and vehicles entering your property, is more time and cost effective than having to control a new pest or disease introduced to your orchard. Manage how vehicles enter your property. Limit the number of entry points to as few as practically possible. Vehicles and orchard equipment such as tractors, sprayers and trailers can carry seeds, pests and pathogens in adhering soil and plant material. Movement of this machinery needs to be controlled and subjected to appropriate checks and hygiene measures. These measures include:

- **Arriving vehicles.** Have clear signs and your contact details at all entrances. Make sure everyone coming into your orchard knows what to do on arrival. This includes using the correct entrance, getting permission to enter and ensuring their vehicle is clean. It is good practice to give drivers a short briefing on your biosecurity requirements, particularly if anything has changed since you saw them last.
- **Designated parking areas.** Movement of outside vehicles must be restricted to a designated visitor parking area close to the entrance and away from the production area. Preferably use orchard vehicles to carry visitors around. Orchard machinery should not be parked in the same area to avoid cross-contamination with outside vehicles.
- **Vehicle inspection.** Before entry, an inspection of the vehicle should be carried out to prevent soil, seed or plant material lodged onto the tyres or underneath the vehicles from making its way onto the orchard. Make sure they know the cleaning standards expected of their vehicles, what areas of your orchard they can visit and the hygiene practices they need to follow.
- **Wash-down facilities.** Undercarriages, grills, floors and trays can all carry weed seed, soil, plant materials or manure that may be harbouring pests or diseases. A designated wash-down area with high pressure water should be available to remove plant material from vehicles and orchard machinery. This facility must be away from waterways and production areas (can be the same area used for agrichemical wash-down). Ideally it should have a concrete or gravel surface and provide a sump or collection area for easy inspection and waste management.
- **Vehicle movements.** Where possible minimise vehicle movements in your property. Ask contractors to stay on formed roads and tracks whenever possible. If you need to transport visitors around your orchard use your own vehicle. If you are using the same equipment for multiple jobs such as transporting produce or disposing of infected plant material always thoroughly clean it between jobs. Sharing equipment between properties also increases the risk of spreading pests or diseases. If you borrow or lend equipment, or purchase second hand machinery, thoroughly clean and disinfect it before using it in your own orchard.



4 Pests and diseases

4.1. Pest and disease surveillance

Finding exotic organisms as soon as they arrive in the country and pinpointing their exact location through surveillance programmes is vital for a successful response.

At the orchard level you can help in achieving early detection through your regular pest and disease monitoring programme.

It is very important to be familiar with the common pests and diseases in your orchard, so you can distinguish them from exotic organisms.

Any signs of uncommon organisms or unidentified damage to trees should be registered in a separate column on your monitoring sheet, since you could be looking at the first signs of a potential biosecurity incursion. If you do not find anything unusual this should also be recorded to help in determining the timing of a possible incursion.

Appendix 2 has an example of a monitoring sheet that you could use. You could also modify your own monitoring sheet to include the recording of exotic pests and diseases.

Do not think these things don't happen in New Zealand orchards.

Here are some examples of recent findings:

- Psa-V on kiwifruit
- Guava moth on feijoa
- Potato mop-top virus
- Tomato psyllid
- Pea weevil

catch it



snap it



report it

4.2. Use of agrichemicals

- How we use agrichemicals is a key part of maintaining biosecurity. **Using the wrong product, rate or application technique increases the risk of pests and diseases becoming resistant to chemicals.**
- **Always make sure the person applying agrichemicals is trained** to apply agrichemicals, follows the instructions on the label and uses the correct protective clothing and equipment.
- A good pest management programme can help reduce or minimise the impact of biosecurity threats.
- Correctly using agrichemicals also helps to manage pests and diseases of concern to importing countries. This means their market access requirements are more likely to be met and access maintained.



4.3. Reporting suspect pests

Some organisms must be notified to MPI if they're spotted in New Zealand. **Pests such as brown marmorated stink bugs (BMSB) and fruit flies are classified as notifiable organisms and need to be reported.** If a notifiable organism becomes established in New Zealand, it could severely affect our primary production or trade and market access. If you spot a notifiable organism, you have a legal obligation under section 44 of the Biosecurity Act 1993 to tell MPI. **To report a notifiable organism, including any of the summerfruit high priority threats, call MPI's pest and disease hotline on 0800 80 99 66.**

To report suspected exotic land,
freshwater and marine pests, or exotic
diseases in plants or animals, call:

0800 80 99 66



Biosecurity New Zealand

Ministry for Primary Industries

Manatū Ahu Matua

4.4. Most unwanted – High priority threats for the summerfruit industry

The following table provides an overview of the top ranked biosecurity threats for the New Zealand summerfruit industry. These pests and pathogens are not currently present in New Zealand and are also listed by MPI as unwanted organisms.

Following the risk assessment of a wider list of pests and pathogens affecting summerfruit, 13 organisms that are a high priority threat to the industry were identified. This list includes insects, fungi, viruses, and one bacterium. Some of these, such as the group of fruit flies, *Drosophila suzukii* and BMSB, are not only relevant to summerfruit but also to other horticultural industries. For these organisms, research and a coordinated strategy are being developed under GIA.

This list is by no means an exhaustive account of the main threats potentially affecting our industry. There are a number of unknown organisms with an unknown effect on summerfruit that are not included here due to lack of information and research. Be familiar with the common pests and pathogens affecting your orchard so you can distinguish them from these exotic organisms.

Common name	Scientific name	Organism	Primary host
Peach twig borer	<i>Anarsia lineatella</i>	Lepidoptera	Apricot, plum, peach
Oriental fruit fly	<i>Bactrocera dorsalis</i>	Diptera	Peach, plum, apricot
Queensland fruit fly	<i>Bactrocera tryoni</i>	Diptera	Peach, plum
Peach fruit fly	<i>Bactrocera zonata</i>	Diptera	Peach, apricot
Mediterranean fruit fly	<i>Ceratitis capitata</i>	Diptera	All summerfruit
Plum curculio	<i>Conotrachelus nenuphar</i>	Coleoptera	Plum, peach, cherry
Spotted wing drosophila	<i>Drosophila suzukii</i>	Diptera	Cherry
Brown marmorated stink bug	<i>Halyomorpha halys</i>	Hemiptera	Peach, nectarine
European brown rot	<i>Monilinia fructigena</i>	Fungus	Cherry, plum, apricot
Asian brown rot	<i>Monilinia polystroma</i>	Fungus	Cherry, plum, apricot
Sharka disease	<i>Plum pox virus</i>	Virus	All summerfruit
European cherry fruit fly	<i>Rhagoletis cerasi</i>	Diptera	Cherry
Phony peach disease	<i>Xylella fastidiosa</i>	Bacterium	Peach



5 Best practice checklist

The following checklist will help you identify those activities that could put your orchard at risk of a biosecurity threat. It will guide you in the implementation of practical measures that can protect your orchard against the introduction and spread of new pests and diseases. A template has been provided as an appendix. Note that space has been left for you to add your own best practice activities specific to your orchard. It can either be printed out and filled in or saved separately as an editable form for you to adapt. Below is an example:

Biosecurity best practice checklist

Appendix 1

Biosecurity best practice	Yes	No	Actions to be taken
Biosecurity awareness			
Orchard staff can distinguish between common and new pests, diseases or symptoms		✓	<i>Further training required</i>
Staff is familiar with the high priority exotic organisms (summerfruit's Most Unwanted poster)		✓	<i>Get more posters from Summerfruit NZ</i>
Orchard staff know how to report a new pest or disease	✓		<i>MPI's pest and disease hotline available in shed</i>
Biosecurity training is included as part of induction for orchard staff	✓		<i>Training up to date</i>
Orchard hygiene			
Fallen or waste fruit have been removed from the orchard floor		✓	<i>Schedule this job for next week</i>
Mummified fruit have been removed from trees and disposed of		✓	<i>As above</i>
Pruning remains have been disposed of or mulched in between rows	✓		<i>Double check in the field</i>
Secateurs and other pruning tools are clean and disinfected	✓		
Regular monitoring identified affected plants for further control or branch removal		✓	<i>Schedule another pest monitoring round</i>
Harvest equipment is cleaned of dirt and plant debris before and after use	✓		<i>Double check</i>
Propagation material			
Only plant propagation material from a reputable source has been used		✓	<i>Investigate origin further</i>
Plant material has been independently tested and found free of viruses		✓	<i>Investigate further</i>
Before purchase, plants have been thoroughly inspected for pests and diseases	✓		
Plants are treated with an appropriate fungicide or insecticide at time of planting			
Traceability of plant material is assured through the production chain			<i>Unsure. Assess traceability</i>
Visitor and people movements			
All visitors sign a register on arrival and are informed of biosecurity measures	✓		
Biosecurity signs are visible to advise visitors of measures in place	✓		
Biosecurity measures are communicated to staff during induction	✓		<i>Schedule training session for new staff</i>
All clothing, footwear and tools are inspected and cleaned before entry			
Cleaning equipment and cleaning facilities are provided			
Footbaths and scrubbing brushes are available	✓		<i>Check condition of these</i>
Vehicles and equipment			
Visitor parking area is clearly designated away from production area			
Vehicles and contractor equipment are inspected for pests, soil and plant debris			
Wash-down facilities including high pressure water or air are provided		✓	<i>Look into implementing this in the future</i>
Outside vehicles are not allowed into production areas			
Pruning tools are disinfected as required	✓		
Bins and harvest equipment are stored free of soil and plant material			

6

Summerfruit's most unwanted – fact sheets

Fruit flies

[Oriental fruit fly](#)

[Queensland fruit fly](#)

[Peach fruit fly](#)

[Mediterranean fruit fly](#)

[European cherry fruit fly](#)

Other pests

[Peach twig borer](#)

[Plum curculio](#)

[Spotted wing drosophila](#)

[Brown marmorated stink bug](#)

Diseases

[European brown rot](#)

[Asian brown rot](#)

[Sharka disease](#)

[Phony peach disease](#)

Bactrocera dorsalis

Bactrocera tryoni

Bactrocera zonata

Ceratitis capitata

Rhagoletis cerasi

Anarsia lineatella

Conotrachelus nenuphar

Drosophila suzukii

Halyomorpha halys

Monilinia fructigena

Monilinia polystroma

Plum pox virus

Xylella fastidiosa



Brown marmorated stink bug

Halyomorpha halys

BIOSECURITY FACT SHEET

What is it? Brown marmorated stink bug (BMSB) is a suboptimal stink bug native to Asia. In Europe and the USA serious crop losses have been reported for apples, peaches, sweetcorn, peppers, tomatoes, vegetables and row crops such as field maize and soybeans since 2010. It is a nuisance due to its overwintering behaviour of entering human-made structures in large numbers. If it were to enter New Zealand it would have no problem establishing due to our highly suitable climate and abundance of host material. BMSB adults and nymphs cause feeding damage on fruit, vegetables, ornamentals and many other crops. Economic damage has resulted in increased pesticide sprays and secondary pest outbreaks. In the USA, up to four-fold more pesticides were applied in some affected orchards.

Distribution. BMSB has become a major pest in the mid-Atlantic region and Pacific Northwest in the USA. BMSB is native to China, Japan, Korea and Taiwan. They have been reported also in Canada, Switzerland, Germany, Italy, France and Hungary. Ecological niche modelling indicates that the area of invasion suitable to BMSB is quite extensive worldwide. It has recently been found in Chile where authorities are carrying out a response to attempt eradication. For current distribution go to <https://igf.appsi.usda.gov/WALYHA/distribution>



Morphology. Although somewhat variable in size and coloration, adult specimens of BMSB range from 12-17mm in length and 7-10mm in width. It has a shield-shaped body that is mottled brown with white banding on the abdomen and alternating light/dark bands on the outer edge of the abdomen. Eggs are smooth and pale in colour, approximately 1.3mm in diameter, by 1.6mm in length and are laid in clusters of 20-30 eggs. There are five nymphal instars. The brightly coloured, black and reddish-orange first instars remain clustered around the egg mass after hatching, and move away once moult to second instars has occurred.

Biology. Non-reproductive adults overwinter in artificial and natural shelters, and gradually emerge from these sites during spring. Females typically lay clusters on the underside of leaves. Adults readily move from plants with early ripening fruit to ones with later ripening fruit. Adults seek concealed, cool, tight and dry locations to overwinter. Because of this behaviour and need for specific microhabitats, many suitable sites can be generated by human-made materials and used by this insect as overwintering sites such as inside cardboard boxes, shipping containers, luggage, between wooden boards, within layers of folded tarpaulins, and within machinery motors and vehicles.

Dispersal. BMSB can hitchhike on inanimate objects during trade from Asia, the USA and Europe. Multiple aggregations of BMSB have been intercepted at the New Zealand border on vehicles, shipping containers and timber. Individuals have been intercepted on smaller items such as passenger luggage and mail.

Symptoms. Feeding injury on fruit causes depressed or sunken areas that may alter its shape as the fruit develops. Late season injury causes early spots on the fruit. Feeding may also cause fruiting structures to abort prematurely. Similar damage occurs in fruiting vegetables such as tomatoes and peppers, although frequently later in the season. Sources: CSIRO

Preventative measures:

- Become familiar with BMSB in all its different life stages.
- Thorough visual inspection is required on shipments of goods arriving to your orchard from areas where BMSB is present.
- Adults and nymphal populations can be detected throughout the active growing seasons using baited pheromone traps and blacklight traps.
- In crops, adults and nymphs can be detected through whole plant inspections, beat sheet counts and sweep netting.
- If you believe you have found BMSB in your orchard, call MPI's pest and disease hotline on 0800 80 99 66 or contact Summerfruit NZ.

Familiarise yourself with the common pests and diseases in your orchard so you can distinguish them from the attack of exotic organisms.





To report any suspected exotic organism, call MPI on **0800 80 99 66**

If you have any queries please contact Juan Rosales on 022 513 1953 or email juan@summerfruitnz.co.nz

January 2019

Biosecurity best practice checklist

Biosecurity best practice	Yes	No	Actions to be taken
Biosecurity awareness			
Orchard staff can distinguish between common and new pests, diseases or symptoms			
Staff is familiar with the high priority exotic organisms (summerfruit's Most Unwanted poster)			
Orchard staff know how to report a new pest or disease			
Biosecurity training is included as part of induction for orchard staff			
Orchard hygiene			
Fallen or waste fruit have been removed from the orchard floor			
Mummified fruit have been removed from trees and disposed of			
Pruning remains have been disposed of or mulched in between rows			
Secateurs and other pruning tools are clean and disinfected			
Regular monitoring identified affected plants for further control or branch removal			
Harvest equipment is cleaned of dirt and plant debris before and after use			
Propagation material			
Only plant propagation material from a reputable source has been used			
Plant material has been independently tested and found free of viruses			
Before purchase, plants have been thoroughly inspected for pests and diseases			
Plants are treated with an appropriate fungicide or insecticide at time of planting			
Traceability of plant material is assured through the production chain			
Visitor and people movements			
All visitors sign a register on arrival and are informed of biosecurity measures			
Biosecurity signs are visible to advise visitors of measures in place			
Biosecurity measures are communicated to staff during induction			
All clothing, footwear and tools are inspected and cleaned before entry			
Cleaning equipment and cleaning facilities are provided			
Footbaths and scrubbing brushes are available			
Vehicles and equipment			
Visitor parking area is clearly designated away from production area			
Vehicles and contractor equipment are inspected for pests, soil and plant debris			
Wash-down facilities including high pressure water or air are provided			
Outside vehicles are not allowed into production areas			
Pruning tools are disinfected as required			
Bins and harvest equipment are stored free of soil and plant material			

Pest monitoring data sheet

Orchard:		Block name:			Area (ha):		Monitor:			Date:	
Tree number	Number of sites examined	Common pest/fresh damage detected			Exotic pest/fresh damage detected			Comments			
		Pest A	Pest B	Pest C	Pest A	Pest B	Pest C				
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Observations:

Visitor register

Appendix 3

Date	Time on property		Visitor's name and organisation	Reason for visit	Blocks visited	Vehicle registration	Mobile phone	Date/location of other summerfruit orchard visited in the last 7 days
	Arrival	Departure						

Most unwanted

Be familiar with the common pests and diseases in your orchard so you can distinguish them from exotic organisms.
Report any suspected exotic organisms.



Peach twig borer

(*Anarsia lineatella*)

- Major pest of peaches, nectarines, apricots and plums.
- Very similar damage to the attack of oriental fruit moth.
- Present in Europe, Middle East, North Africa & North America.
- The first sign of its presence may be wilting or flagging of new growth in spring time. Later generations can damage the fruit.
- Larvae are 12mm long and adults are 8-12mm long.

Photo – H. Audemard, INRA, Montfavet, Bugwood.org



Oriental fruit fly

(*Bactrocera dorsalis*, *B. papayae* & *B. carambolae*)

- OFF is a fruit fly complex of three very similar *Bactrocera* species.
- Major pest of summerfruit. Highly invasive, attacking over 300 hosts.
- Present in South Asia, Indonesia, Kenya, Tanzania, California & Hawaii.
- Fruit damage occurs when larvae feed inside the fruit causing rots through secondary infections.
- Larvae are 7.5-10mm long, adults are 6-8mm long.

Photo – Scott Bauer, ARS - USDA



Queensland fruit fly

(*Bactrocera tryoni*)

- QFF is the most damaging horticultural pest in Australia.
- Affects all summerfruit.
- Found in NSW, NT, Qld & Vic. Also, New Caledonia & French Polynesia.
- Fruit damage is caused by larvae feeding inside the fruit followed by pulp decay due to secondary fungal and bacterial infections.
- QFF larvae are 9mm long and adults are 7mm long.

Photo – G.T. O'Loughlin, Department of Agriculture, Bugwood.org



Peach fruit fly

(*Bactrocera zonata*)

- Polyphagous species with a very high reproductive potential. Peaches are the main summerfruit affected by this fruit fly.
- Produces several generations in a year with a rapid dispersal ability.
- Present in South Asia & North East Africa.
- Damage typical of other fruit flies.
- Larvae are 7-10mm long, adults are 5-6mm long.

Photo – Vivat Wormoapporn / IAEA



Mediterranean fruit fly

(*Ceratitis capitata*)

- All commercial summerfruit affected through larvae feeding on flesh and pulp decay caused by secondary pathogens.
- High economic impact affecting production costs and market access.
- Medfly is a highly invasive pest present in several countries across Europe, Africa & South America. It is also present in Western Australia.
- Traps baited with male lures can be used to monitor Medfly where present.
- Medfly adults are 3-5mm long and larvae are 7-8mm long.

Photo – Scott Bauer, ARS - USDA, Bugwood.org



Plum curculio

(*Conotrachelus nenuphar*)

- Presence restricted to the east of the Rocky Mountains in the USA.
- All commercial summerfruit and apples are potential hosts.
- Damage caused through feeding and oviposition. Larvae feeding causes internal pulp damage and exit holes on the skin.
- Oviposition leaves a half-moon shaped scar. Damaged fruit drops early.
- Larvae are white with a brown head, curved and legless. They are 6-9mm long and adults are 5mm long.

Photo – E. Levine, The Ohio State University, Bugwood.org



Spotted wing drosophila

(*Drosophila suzukii*)

- SWD is a serious economic threat to cherries and other soft summerfruit.
- Native to Asia, present in North America, Europe, Chile & Argentina.
- High reproductive capacity and dispersal ability. 13 generations per year.
- SWD larvae cause damage by feeding on the pulp inside fruit. The oviposition scars are a point of entry for secondary pathogens causing rots.
- SWD adults are 2-3mm long. Males have spots on their wings.

Photo – McEvey, Shane (2017), Australian Museum



Brown marmorated stink bug

(*Halyomorpha halys*)

- A major nuisance in USA mid-Atlantic and Pacific Northwest regions.
- Polyphagous and highly invasive, serious losses on apples and peaches.
- Present in Europe, USA, Chile, Japan, Korea & Taiwan.
- Feeding injuries produce sunken areas of damage. Chemical control has resulted in increased use of sprays causing secondary outbreaks.
- BMSB present five nymphal stages. Adults are 12-17mm long.

Photo – David R. Lance, USDA APHIS PPO, Bugwood.org



European brown rot

(*Monilinia fructigena*)

- Not as bad as other *Monilinia* but has serious effects on market access.
- Currently present in many countries in Europe and Asia.
- It spreads readily by means of *Conidia* carried by the wind or insects.
- Infections start with the flowers and continue on mature fruit.
- Symptoms on ripe fruits are small, circular brown spots that quickly begin rotting.

Photo – Rasbak 2010



Asian brown rot

(*Monilinia polystroma*)

- Initially known only in Japan. Currently in Europe and parts of Asia.
- Dispersal most likely to occur through infected stock or fruit.
- Causes very similar symptoms to other *Monilinia* pathogens.
- Can only be distinguished from other brown rots by laboratory testing.
- Disease incidence can significantly be reduced by removing rotten/mummified fruit early in the season.

Photo – Algirdas 2006



Sharka disease

(*Plum pox virus*)

- One of the most destructive diseases of summerfruit.
- PPV is easily transmitted by many aphid species and nursery grafting and affects all commercial summerfruit species.
- Present in Europe, Asia, Chile, Canada & Argentina.
- Symptoms vary widely causing chlorotic spots on leaf and fruit deformity.
- Where possible, work only with certified plant propagation material.

Photo – European and Mediterranean Plant Protection Organization, Bugwood.org



European cherry fruit fly

(*Rhagoletis cerasi*)

- The most important pest of cherries in Europe. Also found in Asia.
- Tissue around oviposition puncture marks will appear soft and brownish.
- Larvae cause internal feeding damage and rots. Losses may reach 100%.
- Yellow sticky traps are highly recommended to monitor adults.
- Adults are 3.5-4mm long. Larvae third stage are 5-6mm.

Photo – Jeff DeLong



Phony peach disease

(*Xylella fastidiosa*)

- Peaches are a major host of *X. fastidiosa* causing phony peach disease.
- Affects xylem vessels blocking transport of mineral nutrients and water.
- Infected peach trees appear more compact, leafier and darker green.
- Production falls and become economically unviable after 3-5 years.
- Sharpshooters are reported as major vectors for this bacterium.
- Control methods include elimination of infected trees and vectors.

Photo – M. Scortichini, Istituto Sperimentale per la Frutticoltura, Rome (IT)

For detailed information, see the Factsheets under **Biosecurity** on www.summerfruitnz.co.nz

STOP

To report any suspected exotic organism, call MPI on:

0800 80 99 66

