## MANAGING BIOSECURITY RISK:

Better protection and more value

## JOINING FORCES:

Uniting to fight kiwifruit's biggest threats

## INNOVATION:

Creating smart biosecurity tools

## ALWAYS PREPARED:

Planning for the unexpected and unwanted

## WORLD WATCH:

Eyes on the most menacing pests and diseases

**Image credit:** Steve Ausmus, US Department of Agriculture

KVH
KIWIFRUITVINEHEALTH

# ANNUAL UPDATE 2019/20

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# How biosecurity risk is changing

**SPOTTED LANTERNFLY**
The threat of this pest increases as it invades the USA, where its range has expanded across five states. It causes significant impacts to horticulture, but we now have greater awareness and preparedness efforts which include risk management at our borders and increasing pest education.

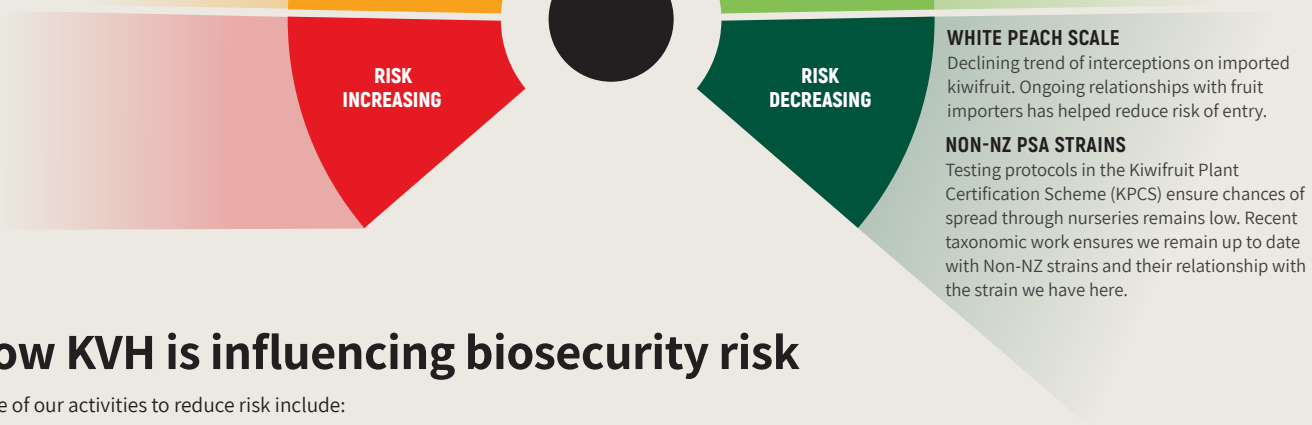
**FRUIT FLIES**
Queensland Fruit Fly is a major threat as evidenced by the recent year-long Auckland response and frequent detection at our borders. However, the reduction in international travellers during COVID-19 has greatly reduced this risk.

**INVASIVE PHYTOPHTHORAS**
Research underway to understand *Phytophthora* biodiversity in kiwifruit in New Zealand. Possibly the greatest risk is organisms that may already be here undetected and spreading through tools, machinery, and plant material.

**BROWN MARMORATED STINK BUG (BMSB)**
Global expansion continues and BMSB is now present in 35 countries, but mandatory offshore treatments have proven successful with declining numbers of interceptions at our border. Readiness programmes advance our preparedness as an industry and a nation.

**VERTICILLIUM WILT**
Detection methods improved indicating organisms causing impacts in Chile are different to Verticillium species isolated in New Zealand.

**CERATOCYSTIS FIMBRIATA**
Readiness efforts continue, including testing management techniques that evaluate host specificity to ensure entry pathways are well managed.




**WHITE PEACH SCALE**
Declining trend of interceptions on imported kiwifruit. Ongoing relationships with fruit importers has helped reduce risk of entry.

**NON-NZ PSA STRAINS**
Testing protocols in the Kiwifruit Plant Certification Scheme (KPCS) ensure chances of spread through nurseries remains low. Recent taxonomic work ensures we remain up to date with Non-NZ strains and their relationship with the strain we have here.

# How KVH is influencing biosecurity risk

Some of our activities to reduce risk include:

### UNDERSTANDING OUR EMERGING RISKS

KVH continues to work closely with the Ministry for Primary Industries (MPI), the science community, kiwifruit growers and other industries (both locally and around the world) to learn more about global biosecurity threats and better understand risks. There is a continuing priority on understanding threats to kiwifruit in China by translating Chinese language publications, with a focus on the impacts of Yellow Spotted Stink Bug and Spotted Lanternfly.

### READY TO RESPOND

KiwiNet (our industry biosecurity champions and deployment network) continued its significant contribution to biosecurity with a total of 44 people contributing over 687 people days into the 2019/2020 Auckland fruit fly response. Alongside Zespri and MPI, our annual Kiwifruit Grower Biosecurity Day included an expert from Brazil to advance Ceratocystis fimbriata preparedness. Readiness programmes across our most unwanted threats continue.

### BIOSECURITY AWARENESS

KVH champions a national biosecurity team and collaborates on several initiatives including having an active role in Tauranga Moana Biosecurity Capital, an iwi-lead programme showcasing regional biosecurity activity. KVH also leads the Sentinel Gardens in schools project to encourage the next generation to actively look for pests. Along with regular publications and newsletters, a new booklet has been launched to help ensure everyone who has a connection to the kiwifruit industry is aware of biosecurity and potentially wide-ranging community impacts of an incursion.

### ON-ORCHARD BIOSECURITY

As well as new on-orchard biosecurity guidelines, KVH has developed two pest specific guides for growers; one on fruit flies to help understanding of what would happen if we had a detection in a growing region, and a BMSB one which outlines long-term management options should this pest establish. When growers report unusual vine symptoms KVH ensures samples are tested - 58 reports were followed up over the last year. More effort is needed to ensure we can confidently detect new threats at an early stage.

**Note:** Green on the dashboards indicates where we are well prepared, red indicates where improvement is needed.

# Foreword from the Board Chairman: Better biosecurity, better protection

The year started with a continuation of the fruit fly response in the greater Auckland area, and finished with a global pandemic on the horizon. It has been a year where all our systems, and our preparedness have been tested.

The KVH Board recognises a very positive last 12 months for the organisation, proving yet again its worth to growers and the kiwifruit industry through strong leadership, clear strategy, and practical innovation.

One area of KVH's work that has required all three of the above is the planned move to a pathway plan system (page 8) to manage biosecurity risk through better protection, more value for money, and increased simplicity around standards for various activities e.g. on-orchard biosecurity planning and hygiene.

A key driver for the work is to ensure that measures are in place to prevent the spread of a broad range of biosecurity threats, rather than a single organism (Psa). It means everyone associated with or involved in the kiwifruit industry has a clear role in biosecurity and knows the benefits of the very best practice being in place.

In late 2019, KVH announced to growers that this work was starting to get underway and asked for feedback on early, high-level thoughts about specific activities the plan will help manage, and how it will be put into action. The feedback was supportive, with growers and industry considering the concept a logical and sensible way to manage biosecurity risk going forward, especially if this can be achieved without an increase in cost to growers.

Development of the plan is advancing well and continues to be a priority piece of work for KVH. A detailed draft and standards have been prepared and as I write this the team are continuing to work with the Ministry for Primary Industries (MPI) to ensure it aligns with over-arching biosecurity legislation and regulations. There will be a full plan and implementation schedule shared for input before it is finalised and I know I speak for all the KVH Board when I encourage you to take part in this process so that your views are taken into account; this is about us as an industry, how we manage big risks and how we ensure better preparedness for the next biosecurity event.

One of the reasons the KVH Board views this piece of work as so important is because it reflects the organisations goal of ensuring the New Zealand kiwifruit industry is committed to biosecurity excellence, working together as one, taking collective ownership. Everyone will have a clear role to commit to in this plan, helping sustain a culture of accountability.

The activities and programmes mentioned on pages 15-17 are practical and innovative examples of how KVH has worked over the last year to build this culture. It reminds me what an honour and privilege it is to serve in the governance team. These examples are not anywhere near an exhaustive list of all that has been undertaken, but they are a fair representation of key achievements and help demonstrate the way in which KVH is taking a leadership role not just across the kiwifruit industry but also across the wider primary sector.

In this last year, the Board were pleased to launch the refreshed strategy for 2020-2025. The key priorities and focus for KVH contained within this strategy will help take the organisation forward over the next five years to ensure ongoing biosecurity risk management. Details of this strategy are covered in the Chief Executive's Foreword.

Over the last 12 months the KVH team has continued to perform, ensuring the industry keeps raising the bar, ensuring preparedness for biosecurity incursions, and therefore better protection from the potential damage of unwanted pests and diseases.

Thank you to Stu and the team for the dedication demonstrated every day – it is a pleasure to work with you. Thank you also to my fellow Board directors for their commitment and expert input. This past year we said farewell to Associate Director Dave Darcy, as he returned to a role at Zespri, and welcomed Cody Bent into this important governance development role. We also said farewell to Nathan Flowerday and welcomed Craig Thompson as the Zespri Representative on the Board.

I end by assuring you that your KVH team, both Board and staff, are committed to ensuring that KVH is well governed and set up strongly to deliver a biosecurity resilient kiwifruit industry.

# Foreword from the Chief Executive: Keeping kiwifruit ahead of the game

The last 12 months have been quite eventful, with major biosecurity and health responses, high-profile industry and community biosecurity events, and as the KVH Board Chairman mentioned in his Foreword – an innovative new way of thinking about how we best manage the biosecurity threats we face going forward.

The KVH team are a small, highly performing group who have taken all the above in their stride and gotten on with 'doing-the-doing' so that as an organisation we continue to ensure the very best biosecurity protection and advocacy for all parts of the kiwifruit industry.

A few months ago, we implemented a new KVH Strategy which will guide us through to 2025 and make sure that we have very clear goals as we build on our work. The Strategy is a refresh of the approach that KVH takes to delivering biosecurity resilience for the kiwifruit industry. It refines our recognising that many of the fundamentals of biosecurity best practice are available, but now we need to prioritise and imbed these into the businesses of all participants within the industry.

Pathway risk management (meaning we focus on risk pathways to reduce pest and disease transmission rather than individual organisms) is a priority that involves a large piece of work. Detailed on page 8, what we are ultimately talking about is a new regulatory framework and standards for the way we manage biosecurity risk that offer better protection to growers and the industry, more benefits, and more value for money (there is no intention to introduce any new cost to growers). There's a lot involved in creating this but we're well on the way and it will make a difference to awareness of risk as well as preparedness for the arrival of unwanted threats.

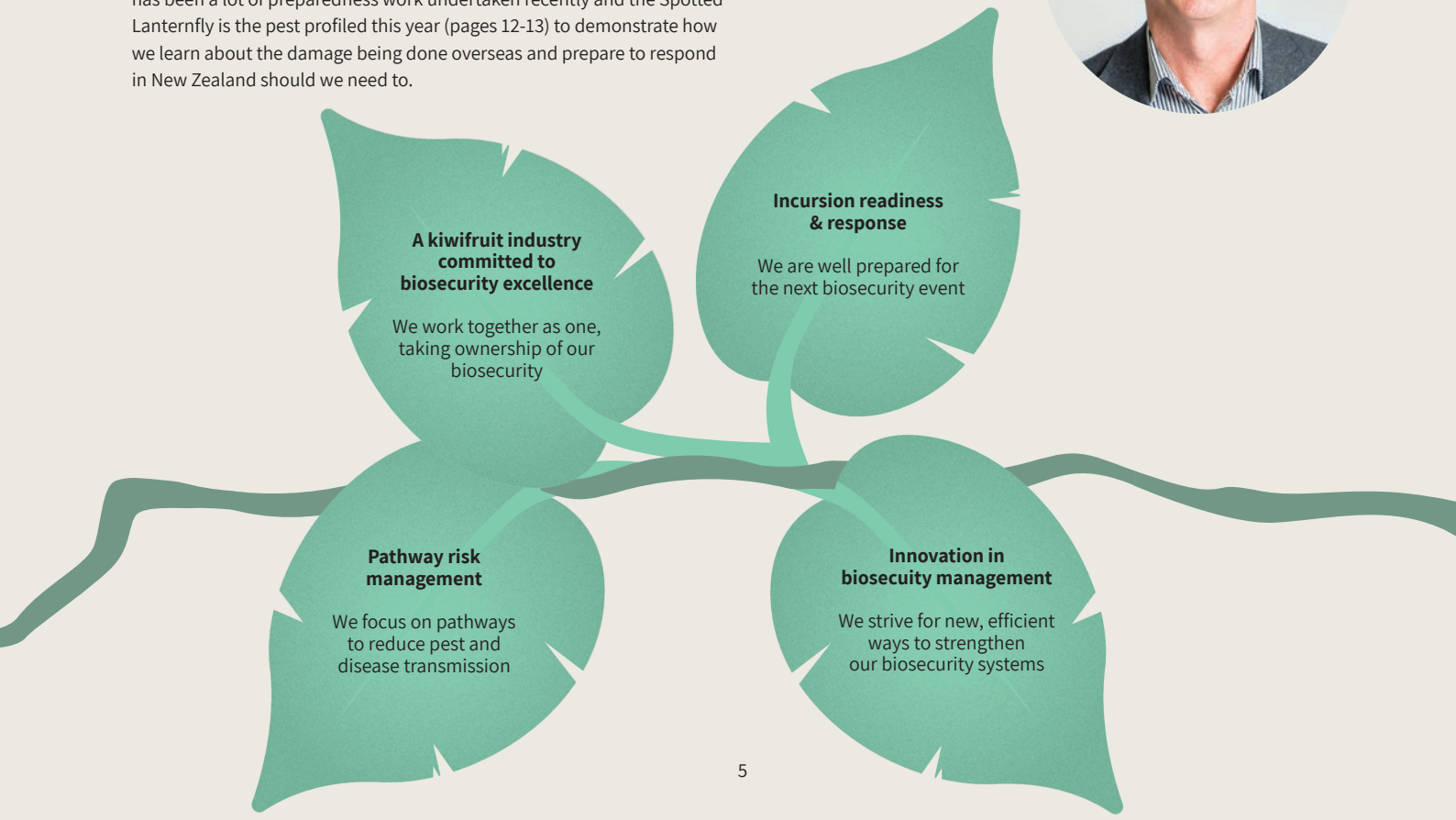
Preparedness is a priority area in itself. We must keep on top of global biosecurity risks, have a range of surveillance methods, and robust plans for responses. The importance of this was clearly indicated during the recent Queensland Fruit Fly response, where having quality standards and tested plans meant this incursion was able to be controlled and New Zealand declared fruit fly free again from February 2020. There has been a large volume of work undertaken in this space over the last year. There has been a lot of preparedness work undertaken recently and the Spotted Lanternfly is the pest profiled this year (pages 12-13) to demonstrate how we learn about the damage being done overseas and prepare to respond in New Zealand should we need to.

These are not things that KVH can do on their own. All the kiwifruit industry needs to be committed to biosecurity, working together as one. This is another priority area for us and you can read on pages 15-17 about just some of the work the team have initiated across not only the industry but also the wider community, to encourage everyone into a culture where biosecurity activities and systems are essential. KVH has the influence required to keep educating, making biosecurity personally relevant, and ensuring we have a wide network of enthusiastic and creative biosecurity champions across a wide range of roles.

That's where innovation comes in. Our priority in this area is to make sure we are always striving for new, better, and more efficient ways to strengthen our biosecurity systems. Whether it be the creation of new and different tools that allow us to work smarter (page 11), extensive research and development (pages 15-16), or the aforementioned new framework for pathway management, we have to be innovative and embrace change if we're going to keep a step ahead and stay on top of the potentially devastating pest and disease risks we could face.

I'm sure the year ahead will be just as successful as the previous one. I thank the KVH team for their hard work. Thank you also to the KVH Board for their guidance and encouragement.

Thank you to growers, Zespri, NZKGI and the many others across the industry for your support over the last 12 months. This is a strong, resilient industry with a fresh and open approach to constant improvement and growth, and the combined commitment to managing biosecurity risk will help keep it on this pathway.



# What's happening around the world?

## USA

- Spotted Lanternfly (SLF) continues to wreak havoc in the five Mid-Atlantic states it has quickly spread to. First found in Pennsylvania in 2014, reports suggest it could drain the state's economy of at least $324 million annually.
- Giant Asian Hornet found in Washington for the first time. It's invasive and decimates whole bee colonies within several hours, significantly affecting already diminishing bee populations and their ability to pollinate.
- Almost two decades on from initial Brown Marmorated Stink Bug (BMSB) detection, growers in the Pacific North West states are still experiencing up to 30% damage in crops, particularly pipfruit and nuts.

## EUROPE

- BMSB populations growing and expanding - now present in 26 countries.
- New Zealand's high-risk country list has extended - 36 countries must undertake pre-arrival treatment to manage the threat of BMSB reaching our borders.
- Georgia continues with a proactive national BMSB strategy, including a lot of community interaction. Control is heavily reliant on chemical use, with up to 30% reduction in populations indicated.
- *Xylella fastidiosa* is now in Italy, France, Portugal, and Spain. $10 billion annual production losses estimated if spread continues throughout the European Union. Kiwifruit not a reported host, but multiple strains found globally so potential threat unknown.

## SOUTH AMERICA

- BMSB confined to Santiago, Chile with no reports of further spread.
- New tools developed to support future Spotted Wing Drosophila (SWD) eradication, including sterile insect technique, biological control, and lure and kill technologies.

**Keeping pace with change:** Biosecurity risk constantly changes as new organisms are discovered, expand their host range, or invade new geographic areas. These pages illustrate some of the key events over the past 12 months that influence risk for the New Zealand kiwifruit industry.

## ITALY

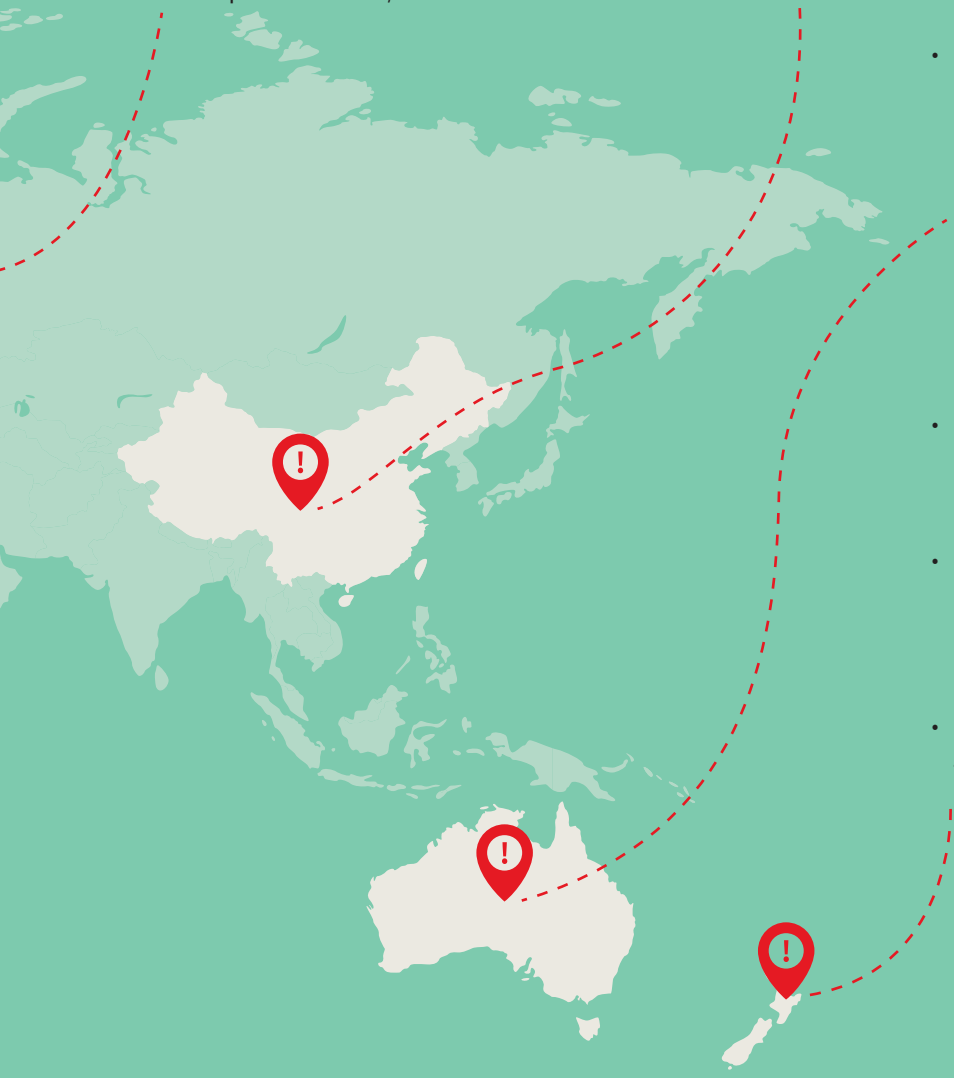
- First reports of Oriental Fruit Fly (OFF) in a production region anywhere in Europe when found in kiwifruit regions in Italy.
- BMSB continues to cause problems for growers in Italy, with reports of up to 30% damage in badly affected areas. KVH and Zespri are doing trials to learn about suitable management options for New Zealand.
- Samurai Wasp biocontrol programme started in northern Italy which will help New Zealand learn how to run our own version.
- Kiwifruit Vine Decline Syndrome (KVDS; formerly Moria Disease) continues causing problems in Italy. Research shows that while pathogens are involved, other drivers like waterlogging may be causing disease.
- White Peach Scale (WPS) interceptions on imported Italian kiwifruit have decreased with only one border interception for the 2019/20 season.

## CHINA

- Translations of Chinese literature to better understand emerging risks (such as the SLF) highlighted several other pests not previously reported in English literature. Work to understand potential impacts is ongoing.

## AUSTRALIA

- Queensland Fruit Fly (QFF) continues to be a risk in parts of Australia with incursions in previously pest free areas, such as Perth. Eradication attempts underway.
- A significant year for Mediterranean Fruit Fly (Med Fly) with new incursions in South Australia.
- The fight against BMSB continues, alongside New Zealand. Both countries actively collaborating to align BMSB procedures and mitigations so that risk is well managed.
- Fall Army Worm was first recorded in Australia in January 2020 on two Torres Strait islands and is now found in Queensland, Northern Territory and Western Australia. Kiwifruit not a known host, but the closely related Tropical Army Worm is present in New Zealand and has been known to cause issues for kiwifruit orchards.



## NEW ZEALAND

- Another significant year for fruit fly detections - there were no post-border interceptions that led to responses, but there were multiple detections at the border including the high-risk OFF and QFF.
- BMSB remains a high-risk with 57 live interceptions on imported goods between September 2019 and May 2020. However, four times as many were found the previous year – indicating successful offshore treatment requirements.
- National BMSB surveillance programme established with just over 2,000 trap inspections so far and only one BMSB find (which was investigated).

# New plan for better biosecurity protection

*KVH is developing a National Pathway Management Plan to better protect our industry from future biosecurity incursions - at no additional cost from the current state. This article explains what we are doing and why.*

Plant health is a big deal. The Food and Agriculture Organization of the United Nations (FAO) estimates that up to 40% of food crops worldwide are lost annually due to plant pests and diseases. This not only reduces income for primary sectors, it leaves millions without sufficient food to eat.

The problem is so large on a global scale that the United Nations General Assembly declared 2020 as the International Year of Plant Health. When this was announced in 2018, it was considered a once in a lifetime opportunity to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development.

**"Protecting plants from pests and diseases is far more cost effective than dealing with plant health emergencies.**

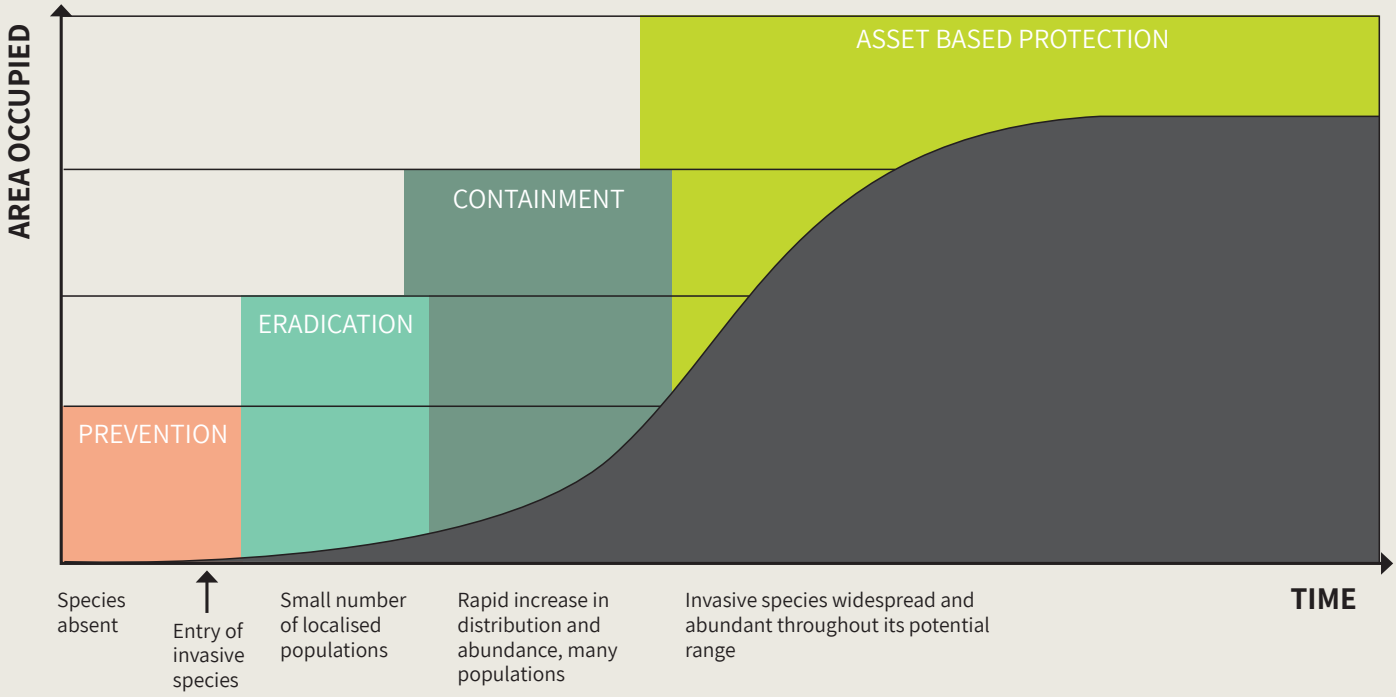
**Plant pests and diseases are often impossible to eradicate once they have established themselves and managing them is time consuming and expensive.**

**Prevention is critical to avoid the devastating impact of pests and diseases on agriculture, livelihoods, and food security and many of us have a role to play.** - FAO

Unfortunately, the Year of Plant Health has been overshadowed by a global human health pandemic and economic recession of historic proportions. However, there are principles from COVID-19 that apply to plant health and our New Zealand kiwifruit sector.

Firstly, it's all about prevention. A fundamental principle of biosecurity is early detection followed by strong action up front. This provides the best chance of success, as in the popular mantra "hit it hard, hit it early". If not controlled early on, problems rapidly escalate to the point where control options become very limited and expensive, with wide reaching collateral damage. In biosecurity we commonly refer to an invasion curve (as illustrated below) which shows that the closer to the point of introduction that detection occurs, the more likely eradication will be. Failure to eradicate results in a challenge for growers that must be dealt with year upon year, with associated economic impacts and management costs.

## GENERALISED INVASION CURVE SHOWING ACTIONS APPROPRIATE TO EACH STAGE




**ECONOMIC RETURNS (INDICATIVE ONLY)**

| 1 : 100 Prevention | 1 : 25 Eradication | 1 : 5-10 Containment | <1 : 1-5 Asset Based Protection |
|---|---|---|---|

COVID-19 has also clearly illustrated another fundamental biosecurity principle, in that we may not know when a new organism has arrived as the host may be asymptomatic (not showing any symptoms). While in COVID-19 the asymptomatic phase was typically two weeks or less, it may be months or even years in plants. For some of the kiwifruit industry's most significant threats, like *Ceratocystis fimbriata* (the pathogen that is causing vine losses of over 50% in Brazil), we don't know exactly how long the latency period in kiwifruit is, but it is thought to be about seven months in other hosts. We know that with no controls a lot could happen in seven months and detection at this point would probably result in a pathogen that is not able to be eradicated and could jeopardise our economic livelihoods. This has been the case for every country that has *Ceratocystis fimbriata* to date and no country has been able to successfully eradicate it.

So, using our current knowledge plus what we have learnt from recent examples like COVID-19, we know beyond any doubt that we need measures in place all the time to manage the risk of asymptomatic spread. To give us the best chance of eradicating any new incursions, our challenge is to always apply biosecurity practices so that if a new pathogen were to arrive, we wouldn't be spreading it around unknowingly. We must also acknowledge however that too stringent measures can have severe economic impacts and we need to strike a balance that supports the long-term growth and success of the kiwifruit industry.

KVH proposes that introducing a National Pathway Management Plan (Pathway Plan) would significantly improve our resilience to any future biosecurity incursions and greatly improve the likelihood of minimising impacts to our industry.

A Pathway Plan is a tool under the Biosecurity Act to manage biosecurity pest and disease risk associated with the movement of risk goods on different pathways across the kiwifruit industry such as plant material, rootstock, budwood and pollen, as well as machinery and other items that could transport and spread the next big biosecurity threat. While there are controls already in place for our industry to help manage many of these risks under the current National Psa-V Pest Management Plan (another tool under the Biosecurity Act), they are limited to the management of Psa only and cannot be widened to include other biosecurity risks and other pathways, leaving us vulnerable to future incursions.

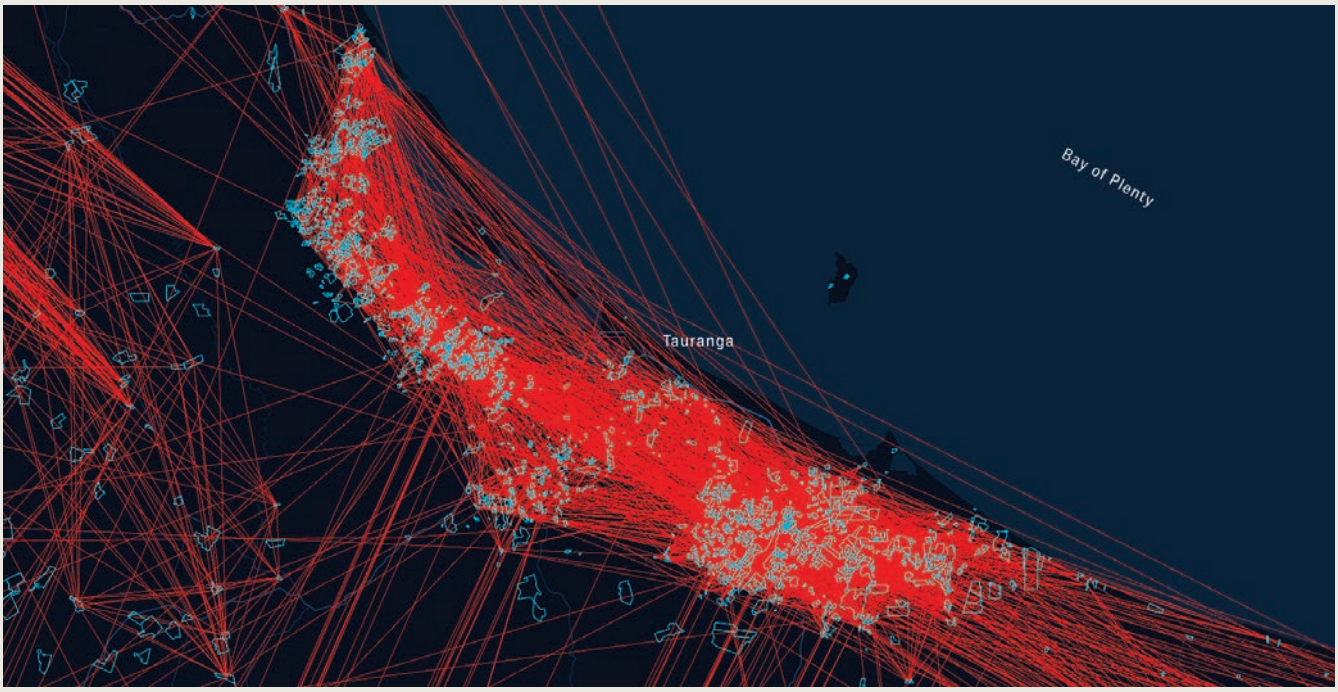
We see a new Pathway Plan as an affordable, practical, and effective means of consistently managing risk across the industry. Consistency is key and an important concept. If we manage some pathways well and not others, we will be vulnerable. If top operators manage risk and their neighbours don't, we will be vulnerable.

Like most legislation, the new Pathway Plan is a big undertaking and it won't happen overnight - it is likely that any new measures won't be introduced until 2022. But we need your support and your feedback, as ultimately KVH exists to protect your investment from what is considered one of the most significant strategic threats to businesses and livelihoods.

KVH is also putting in place a set of implementation tools to ensure that compliance with the new Pathway Plan is simple, easy, and practical for everyone in the kiwifruit industry. Some of these are already in existence - the Kiwifruit Plant Certification Scheme (KPCS) and on-orchard biosecurity guidelines for example - and are not expected to change.

More information about the development of the Pathway Plan is available on the KVH website. A detailed consultation on content and timings for implementation begins in September.

KIWIFRUIT PLANT
KPCS
CERTIFICATION SCHEME




*15,058 people movements were mapped between January - May 2020 by OnSide, used by over 2,500 properties in the Bay of Plenty to record who comes and goes, and when.*
*Image credit: OnSide.*

# Importance of traceability

One of the most fundamental aspects of any disease control programme is the ability to trace the movements of material capable of transmitting the disease or pest.

This aspect has been clearly shown during the COVID-19 pandemic where New Zealand borders were closed to prevent people bringing in the virus and huge emphasis was placed on being able to record where people had been to assist in contact tracing should a new case be found.

A second example is the *Mycoplasma bovis* eradication programme where significant resource is applied to being able to contact trace animal movements using tools such as NAIT and trucking records to understand where potentially infected cattle have come from, or more importantly, where contacts from them have moved to.

The same principles apply for the plant sector. Many diseases are capable of being transmitted either on or within plant material (such as rootstock, budwood, pollen or mature plants) when it is moved from one location to another. The ability to be able to move kiwifruit plant material is a fundamental component of the annual industry growth process, so understanding the risks associated with this and being able to record, retrieve and analyse these movement events in a simple, rapid, and accurate manner means a much higher chance at early eradication.

The proposed Pathway Management Plan focuses on understanding and managing (reducing) plant disease transmission risks across multiple pathways. Tracing becomes an essential tool to understand spread, diagnose and then rapidly control disease should we get an outbreak. Contact tracing has often been the most expensive component of any new disease control programme because in so many instances good systems of tracing were not put in place and used prior to the arrival of the organism. This means significant time and investment must be put in to catching up. Examples seen recently are again the COVID-19 and *Mycoplasma bovis* incursions.

So how could this work within the kiwifruit industry? Currently there are already several tracing activities in place for the movement of rootstock through the Kiwifruit Plant Certification Scheme (KPCS) and budwood supplied by Zespri. However, this only covers a proportion of all plant material movement within the industry. KVH is currently expanding the KPCS to include other material as part of the wider risk management being developed under the Pathway Management Plan process.

Traceability is already a fundamental part of our supply chain for fruit, from orchard forwards – it's in place to meet the requirements of the market, the expectations of the customer, and the reputation of the brand. While we also have existing traceability systems for plant material movements into the orchard, their robustness can be improved to ensure they won't ever fall short in the event of another biosecurity incursion.

Growers are currently required to keep records of plant material inputs such as rootstock, budwood and pollen. Providers of this material are also required to hold records that can trace material back to source, as well as to the KPIN it has been delivered to. These records are captured in systems such as Zespri GAP, but they are also legal requirements under the National Psa-V Pest Management Plan. Nurseries, budwood providers and pollen mills all retain traceability data and KVH audits these on an annual basis. This system is a great base to build from and has supported KVH to trace plant material movements for Psa movements. However, if we were tested with a response would the integrity of this data hold up and would all growers be able to quickly supply complete and accurate records of all inputs into their property? This was the challenge seen with *Mycoplasma bovis*, where despite a traceability system being in place, they were let down by its usage, with upwards of 40% non-compliance when tested in a response.

So, while growers should continue to manage their own risk by recording where any new plant material arriving at their orchard has come from and understanding where it goes, KVH is also exploring new ways to make these actions more efficient. The goal is to have simple, easy to use, accessible tools that will streamline movement recording and connect with other on-orchard management processes.

Ultimately, there will be a single point of data entry available that can be utilised across multiple requirements day-to-day. This will make processes easier for growers, and more robust and powerful for biosecurity agencies should we be faced with a future biosecurity incursion.


*GPS mapping can be used in a biosecurity response to identify and share precise locations of pest or disease detections in relation to orchards, businesses and other relevant buildings or structures. Image credit: GPS-it.*

# Creating smart tools

KVH has a vision of a biosecurity resilient kiwifruit industry, prepared for not only high-profile pests like the Brown Marmorated Stink Bug (BMSB) and Queensland Fruit Fly (QFF), but also the unknown threats; those which may be undiscovered, new to science or not yet well understood.

Preparation for unknown biosecurity threats relies on having consistent risk management practices in place across our internal pathways to prevent spreading pathogens before they are discovered (page 8), and having sound traceability so that if a new threat is discovered on our orchards we can trace back to determine where this may have come from and trace forward to determine which other orchards may also be infected (page 10).

To achieve this, innovation plays a key role. As an industry, it's how we've gotten to where we are today and how we've seen off some of the challenges of the past, including Psa where the breeding programme played a key role in our recovery and saw the roll out of the more tolerant Gold3.

While the breeding programme and research and development may well play a significant role in any future biosecurity incursions, there are some more fundamental practices that we know will be imperative, regardless of the threat we face. One such practice is GPS mapping.

The kiwifruit industry is advanced in our GIS capability and businesses such as Zespri, GPS-it and post-harvest organisations have been using GPS mapping for years, building capability that is used for licence enforcement and on-orchard productivity practices.

It also provides an extremely valuable tool for biosecurity readiness and response. In the event of an incursion, whether it be BMSB, QFF or Psa, the ability to know where our orchards are (as well as pack-houses, nurseries, and pollen mills), allows KVH to work with the Ministry for Primary Industries (MPI) to minimise the impacts to our industry. By knowing where our host material is, we can make more informed decisions to minimise impacts to the industry, and ensure we are engaging with the right people, keeping everyone informed of what is happening every step along the way.

These principles are not new, but the technology that provides the platforms to access this information is rapidly advancing. As a small organisation, KVH doesn't necessarily drive all innovation, however we are making sure that our industry partners are aware of our needs and that we can leverage and keep pace with the innovation of others, so that if an incursion were to occur we can act in a timely and effective manner with compatible systems and information.

It is for this reason that KVH asks growers to share the property and KPIN information contained within their Zespri registration forms with us, so that in the event of a big biosecurity response we have accurate information to feed into our smart response tools.

# A beauty that is a beast of a problem: the Spotted Lanternfly

There is no doubt that the Spotted Lanternfly (SLF) has a strikingly vibrant appearance that catches the eye, but don't admire it for too long as this insect is proving to be a problem overseas and has quickly become a significant emerging biosecurity threat to kiwifruit and many other horticultural industries.

Native to Asia, SLF invaded the USA in 2014 and has taken a foothold in the Mid-Atlantic states of Pennsylvania, Virginia, Delaware, Maryland, and New Jersey. It is considered a hitchhiker pest, thought to have first entered the country on imported paving stones from China.

While adult SLF can fly, the more worrisome movements are those of their egg masses. SLF can lay eggs on almost anything but prefer hard, smooth surfaces such as tree bark, shipping pallets, containers, and many other outdoor items. Egg cases can travel long distances on imported goods and are easily overlooked because they look like a smear of mud – they have a waxy layer that makes them hard to see and treat with insecticide.

## WHY TRY AND STOP IT?

The SLF is an invasive pest with a healthy appetite for many horticultural crops, and it could be a significant nuisance to New Zealanders way of life and enjoyment of the outdoors.

It feeds on over 70 hosts and while it prefers Tree of Heaven (which is considered an invasive weed in New Zealand), it also has a strong preference for many economically important crops, including kiwifruit, grapes and pipfruit.

The adults and nymphs feed on sap, damaging the plant, and excrete large amounts of a sticky liquid, called honeydew. This honeydew promotes the growth of sooty mould which marks fruit, rendering it unsaleable to markets and attracts wasps and ants which can have impacts on many beneficial insects.

Our industry is already battling sooty mould problems (caused by established pests such as passion vine hopper and cicadas) with impacts reported to cost the kiwifruit industry $44 million annually. Observations from overseas suggest sooty mould damages from SLF could easily surpass this, and overall impacts may be more significant than Brown Marmorated Stink Bug (BMSB).

Growers aren't the only ones who will be impacted if SLF establishes here. Homeowners can be left with a sticky mess to regularly clean up on anything the SLF rests on while they are feeding, including patios, cars, and outdoor furniture.

*SLF egg masses on kiwifruit.*
*Image credit: Gonzalo Avila, Plant & Food Research.*

*The open Spotted Lanternfly is identifiable by it's vibrant red hindwings and spotted forewings.*
*Image credit: Lawrence Barringer, Pennsylvania Department of Agriculture.*

## HOW ARE WE PREPARING?

While well-established readiness and research programmes exist for known invaders such as BMSB and fruit flies, the SLF is fairly new to us, and so is its readiness programme.

The Ministry for Primary Industries (MPI) has recently completed a Pest Risk Analysis for SLF which investigates in-depth all import pathways into New Zealand and their likelihood to harbour viable SLF life stages. This is an important piece of work as it ensures that those high-risk pathways are managed appropriately at our borders.

Because SLF is only a recent invader outside Asia, there is sparse English language reference to the damage it causes, however we know kiwifruit is a host through reports in Chinese language literature. Major impacts to other crops such as apples and grapes have been reported in invaded countries (USA and Korea), but not much is known about impacts to kiwifruit. KVH and Zespri have recently commissioned field research in China to help quantify the damage seen there and understand the SLF lifecycle in kiwifruit. This helps our preparedness by ensuring the timing and targeting of management techniques are correct.

We know SLF is a crafty hitchhiker that has continued its spread throughout the USA by travelling across state lines on inanimate goods like vehicles and machinery. To combat this, many states have set up quarantine zones which require preventative measures, such as machinery wash downs, to take place prior to any further movement. This is a simple and clear example of the importance of managing our own internal kiwifruit pathways to prevent spread of all pests and ultimately give us the best shot at preventing the establishment of new ones.

## HOW CAN YOU HELP?

The SLF is notoriously great at evading sprays, returning to continue its damage when it is safe to do so. Control methods overseas heavily rely on growers and homeowners helping authorities by scraping egg masses from trees, posts, and outdoor furniture during winter, or applying a sticky band around host trees to manage the movement of the nymphs (young life stages). Support such as this from growers and the greater public is critical.

While we are fortunate enough to not have this pest in New Zealand yet, experience from the USA tells us that early detection is vital if we are to have the best attempt at a successful eradication. So we ask everyone to keep an eye out for any "mud like" smears of egg cases on any imported goods from Asia or the USA, or the vibrant red wings on the adult during the high-risk season each year between September and April. If you see anything catch it, take a photo of it, and report it to MPI on 0800 80 99 66.

*SLF egg masses on tree bark.*
*Image credit: Anne Nielsen, Rutgers University.*

*SLF infestation on a backyard tree trunk in Pennsylvania, USA.*
*Image credit: Pennsylvania Department of Agriculture.*

# Surveillance for early detection

New Zealand is always on the lookout for pests and diseases that might have arrived from overseas. Finding them early is vital for a successful response.

## GENERAL SURVEILLANCE

New Zealanders report about 10,000 suspected pests and diseases to the Ministry for Primary Industries (MPI) on the 0800 hotline every year – this is critical as the more sets of eyes we have looking and reporting, the better.

Over the last 12 months kiwifruit growers and other members of the industry reported 30 potential sightings of unwanted pests directly to KVH (fortunately, none of which were exotic species) and made 27 unusual symptoms reports.

Reports of unusual and potential disease symptoms are particularly important because even in times of quieter trade and international travel - as we have been facing recently - biosecurity risk still exists, especially from the spread of kiwifruit pathogens that may already be here in their latent (not showing symptoms) form. COVID-19 has clearly illustrated the challenge of managing pathogens during the latency period, where they can spread silently between asymptomatic hosts.

It's also important to make reports so that KVH and MPI can follow up and undertake diagnostic testing to be sure that any biosecurity risk is identified and managed, and so that growers involved are well supported if any further action needs to be taken.

KVH prepares full reports on every investigation and publishes them online. This information is provided to help everyone identify similar symptoms they may be seeing on their own properties.

## SPECIALISED PROGRAMMES

There are 13 targeted programmes across New Zealand, focusing on specific pests, diseases, and biosecurity risks. Two of these are for kiwifruit's most unwanted threats, the Brown Marmorated Stink Bug (BMSB), and fruit flies.

The current national BMSB programme builds on an earlier pilot and is jointly funded by the BMSB Council (a group of industry organisations, including KVH, that partner with Biosecurity New Zealand through the Government Industry Agreement for Biosecurity Readiness and Response).

Traps have been installed at 80 sites considered to be high-risk for BMSB and maximise the likelihood of finding these pests if they are here. These sites were selected based on BMSB detections over the past five years, as well as being in areas where large volumes of cargo arrive from countries where this stink bug is known to be present. There are two traps at each site that use an attractant lure and a sticky card to draw the BMSB into the vicinity. Inspectors also check vegetation near the trap to look for any bugs.

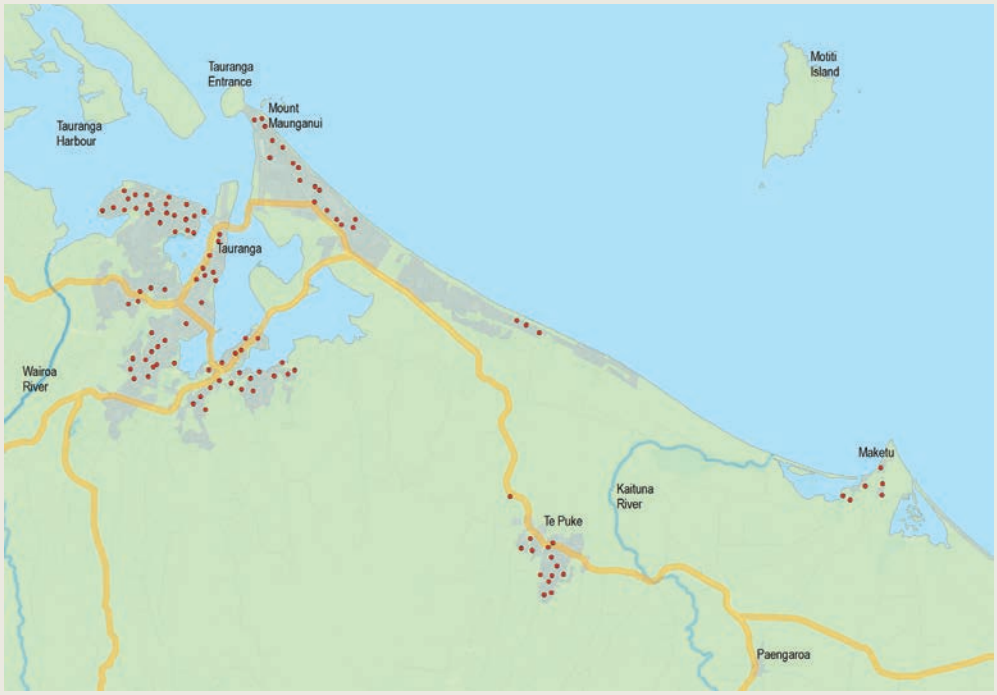
In the Bay of Plenty, traps are monitored fortnightly for the duration of the high-risk season (which is September through to the end of April) at 10 locations running from the Port of Tauranga in Mount Maunganui to Whakatane. This was the first year of a regional trapping programme (which is part of the national programme and co-funded by Zespri and KVH) and no BMSB were found.

New Zealand also has a comprehensive fruit fly surveillance programme in place which involves almost 8,000 pheromone traps checked fortnightly (starting October and continuing through until July). The trapping network is designed for early detection of breeding populations and uses three different lures which can detect several economically significant fruit fly species including the Queensland Fruit Fly, Mediterranean and Oriental species.

The traps are placed in potential host trees and arranged in a specific pattern to cover areas identified as likely points of entry and detection because of their vicinity to international air and sea ports, presence of host material, and habitat suitability (temperature in particular).

This high-risk season (which is the same as the BMSB and runs from September through to the end of April) almost 4,500 samples from the traps were collected and submitted for testing, all negative for exotic fruit flies.

While these targeted surveillance and trapping programmes won't guarantee early detection of pests entering New Zealand, combined with general surveillance they will greatly increase our chances of detecting them early enough to be able to do something about them.




*Red dots show locations of fruit fly traps in the Bay of Plenty. Image credit: MPI Atlas of Biosecurity Surveillance 2020.*

*BMSB trap in Mount Maunganui (top) and fruit fly backyard trap during the 2019/20 Auckland response (bottom).*

# Making our biosecurity system stronger, together

## INDUSTRY PRACTICES PREPPING FOR FRUIT FLY

New Zealand is one of the only countries in the world that has a major horticultural industry free of economically important fruit flies, such as Queensland Fruit Fly. This freedom provides significant advantages to our growers and is something that New Zealand works hard to maintain.

To help inform the kiwifruit industry of the likely sequence of events should a fruit fly be found in a production region, and thus to allow for better business continuity and contingency planning, KVH and Zespri visited post-harvest companies to run fruit fly exercises.

The exercises stimulated conversation to help identify knowledge gaps for the overall response to a fruit fly find and to better inform business continuity and contingency planning. They covered things like how a biosecurity response of this scale and nature would be activated and run by government and industry; different types of response restriction zones and how the rules around these are set; and expectations for communication channels between everyone involved – including growers, contractors and those in the logistics chain.

The exercises also ensured that going forward, post-harvest companies have procedures in place and capability for managing possible restrictions on fruit movements associated with a response.

Run nine times with post-harvest organisations (with more planned in the future), they were a great opportunity to carry out scenarios involving a range of people and have allowed for connections both within and between organisations that will mean better fruit fly preparedness across the kiwifruit industry.

In terms of activities to improve readiness for such an event, there were a few themes consistently coming through in all exercises which are being worked on, mainly related to the value of post-harvest organisations pre-agreeing principals for collaboration in adverse events. For example, there would be value to the industry if those pack-houses caught within an Export Restriction Zone could pack as much fruit from that zone as possible, and those growers with no restrictions could use a pack-house outside of the zone.

On the back of the simulations KVH developed a helpful new guide for growers, detailing the likely sequence of events if a fruit fly response was to occur in a kiwifruit growing region, to allow for business continuity planning at orchard level. The guide (available on the KVH website) is split into several different sections and includes information about what activities can take place on-orchard in responses, and how growers and orchards are affected by export restrictions.

## SHARING THE HIGH COST OF INCURSIONS

Discovering the vine disease Psa on his orchard was like going down a long black, dark tunnel, former Zespri chairman Peter McBride told those who attended Tauranga Moana Biosecurity Capital's (TMBC) Biosecurity Week symposium in late October.

McBride was one of the featured speakers during the day-long event, which celebrated the past 12 months of leading and taking collaborative action towards biosecurity excellence after TMBC formed in 2018.

More than 80 members of the local biosecurity community attended the day, which had a theme of 'This is Personal', highlighting how biosecurity incursions affect us all. For McBride, the Psa outbreak was a stark reminder of the personal intrusion a biosecurity outbreak takes.

"The impact was quite profound, especially in terms of property rights," he explained.

"Most people don't realise how these can be taken away from you, including the loss of freedom to operate your business to a large extent. For a period of time, you could not do anything and for affected parties, loss of control was the first impact."

"The second was uncertainty - we were going down a long black dark tunnel. The other part was a community perspective. When an orchard was identified as having Psa, you became a leper in the local community. There was a lot of blaming."

His comments were echoed by Waikite dairy farmer Shirley Trumper, a guest speaker who told the symposium that the negative and uninformed criticism by farmers after a cow in her herd tested positive to *Bovine tuberculosis (TB)* was particularly hard to endure. She gave a moving address, describing the impacts - both emotionally and financially - on herself, her husband, family and staff at the discovery first of TB in their dairy herd and then of *Mycoplasma bovis.*

The cow that carried TB had been in the herd, undetected by testing, for years. Trumper said the experiences of both diseases had brought home how crucial it was to always record all movements in order to trace the source of infections.

KVH is a founding member and active partner in TMBC. The initiative's success in building biosecurity awareness and education was evident during the day - one example was the unique project led by KVH called Sentinel Gardens, raising biosecurity awareness at schools and assisting with surveillance for biosecurity threats. The gardens could provide early warning indications of insects or pathogens that could affect kiwifruit orchards so are monitored regularly for any signs out of the ordinary.


*Tauranga Moana biosecurity staff and community members meet at the annual Biosecurity Week symposium.*

## GROWERS PUT ON THE SPOT: HOW EFFECTIVE IS YOUR BIOSECURITY?

Biosecurity Week also featured a Kiwifruit Grower Biosecurity Day, jointly hosted by KVH and Zespri, providing the opportunity to learn more about the work underway to protect the industry from unwanted pests and diseases.

Around 80 growers and industry members were treated to a series of presentations that covered current research and development initiatives, the readiness work of KVH, and the current biggest threats to kiwifruit.

*Ceratocystis fimbriata*, is one such threat. Special guest speaker Professor Acelino Alfenas, from the University of Viçosa in Brazil, talked about the impacts and control of wilt caused by the disease on kiwifruit in his home country.

Professor Alfenas outlined the history of this invisible soil-borne pathogen and how serious and lethal it has been in Brazil, noting that in some orchards, 25-30 percent of plants may die every year.

*Ceratocystis fimbriata* has a wide host range and is known to spread via soil, packing materials, logs, pallets, wood chips, souvenirs, and by cuttings. It relies on humans for long distance spread and the highest risk pathway is on the footwear of someone who has worked on an orchard overseas and comes to New Zealand. This led to questions from presenters to those in the audience about how effective biosecurity practices are on their orchards to manage the risk and keep it out.

The key message was that we all need to be our own biosecurity agents, understand risks, and have biosecurity proactiveness in place now, before an incursion.

Dr Sonia Whiteman from the Zespri Innovation team also mentioned this when outlining her teams upcoming pieces of work. Pathogens (*Ceratocystis fimbriata* and *Phytophthora)* are a priority, as is gaining a greater understanding of barriers to the adoption of best practice biosecurity guidelines which were created and implemented by KVH earlier in the year.


*Erin Lane from KVH reminds growers of the pests effective biosecurity will keep out of orchards at the Kiwifruit Grower Biosecurity Day.*

## CELEBRATING A PEST FREE PORT

A biosecurity excellence programme runs year-round at the Port of Tauranga and to coincide with the Symposium there were morning teas on offer as a team comprised of Port, Biosecurity New Zealand and KVH visited smoko huts and staffrooms to chat to frontline staff about their work and how they identify and report potential biosecurity threats.

Over two days, there were visits to busy staffrooms on both the Mount Maunganui and Sulphur Point sides of the Port, full of passionate people who know biosecurity is a critical issue that can affect everyone in the community.

Resources that help identify pests – including the annual pest calendar and ID posters – were distributed, and staff were given the results of the programme's biosecurity awareness surveys from the year prior, which many of them took part in.

As a result of positive feedback from the visits this year, new mobile biosecurity kits are being placed in staffrooms across the Port so that staff can more easily and quickly catch and report anything unusual that they may spot while working. Interestingly, numerous staff suggested similar sessions for senior managers, so the programme has organised presentations and workshops for senior management from local stevedore companies and transitional facilities (places where goods are held and inspected before being cleared). The programme team and social scientists will return during the 2020 Biosecurity Week to do more surveys and monitor the change in biosecurity awareness amongst Port staff, as well as the usefulness of tools such as education materials and the mobile kits.

## KIWIFRUIT COMMUNITY BIOSECURITY

Everyone connected to the kiwifruit industry can help protect what we've got and keep unwanted pests and diseases away.

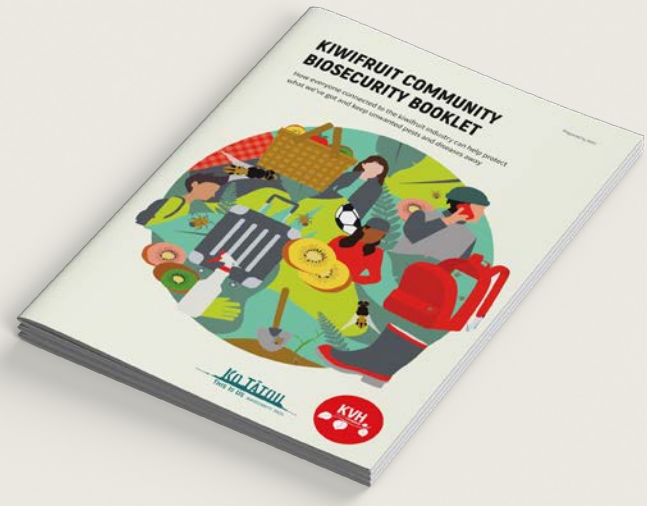
A new booklet from KVH provides guidance about how everyone in or close to the kiwifruit community can help identify biosecurity risks and address them. The bright, colourful guide is split into four easy sections detailing how everyone can:

- Keep watch (what to look out for and what big biosecurity responses cost if we don't keep our eyes and ears peeled)
- Check and clean (how to look out for new pests coming into New Zealand)
- Report the unusual (how to make a report and what happens next)
- Lead by example (what everyone can do at home, work, and school to be biosecurity aware always).

The importance and enormity of the biosecurity task means that it is vital everyone pitches in and has accountability for keeping out pest and disease threats that could severely impact the kiwifruit industry and have flow-on effects for our livelihoods, and our communities. The next big threat could be here, undetected and spreading but everyone has the power to protect what we've got with the easy steps covered in this booklet.

The Kiwifruit Community Biosecurity Booklet is free and available from KVH and will be distributed at industry events like those mentioned throughout this Annual Update.

*Key workers from on and around the Port of Tauranga join KVH and Trevelyan's on a field trip to see orchards and pack-houses that they help protect with their biosecurity best practice.*



# The common threads that weave sustainability and biosecurity

*Weeds have been removed and the stream margins protected by native plants in the Kenna-Wright Katikati orchard.*

KVH works to achieve great biosecurity outcomes – it is a win-win when populations of pests and the habitat for them are removed, whilst environmental sustainability is enhanced.

KVH works closely with regional councils and landowners to ensure wild kiwifruit plants are destroyed before they take over bush and forestry blocks or provide habitat for pests which could then jump into orchards. Contractors have destroyed more than 20,000 wild kiwifruit plants in the last year alone. A contract team from Full Circle Arboriculture has spent most of the summer abseiling to infestations in the deep gullies of Te Puke and Omanawa, work undertaken in partnership with Bay of Plenty Regional Council, the Department of Conservation and other landowners. KVH has also partnered with Project DeVine and Tasman District Council to destroy wild kiwifruit in the Golden Bay area.

Managing reject kiwifruit so that softening fruit is not consumed by a multitude of birds is essential in reducing the number of wild infestations. Fruit processing is the best option as seed is destroyed and it adds value to the fruit product. KVH considers composting to be the next most preferred option and works with manufacturers to ensure both reject fruit and pack-house waste is composted effectively, with seed and disease organisms destroyed.

Plateau Compost at Kawerau take 3,000 tonnes of reject kiwifruit every year and mix it with green waste from Rotorua and Whakatane councils, pulp waste and other inputs to produce a balanced, rich compost able to be spread onto Psa-positive orchards in Recovery regions. Psa is one of the disease's destroyed by high temperatures within the composting process; kiwifruit seed is also destroyed.


*Left above: turning fresh green waste at Plateau Compost, Kawerau; and at right, turning a wind-row of compost containing reject kiwifruit.*

*Left above: pampas infesting an orchard margin; and at right, passion vine hopper on woolly nightshade leaves.*

Other composting companies approved by KVH include Revital Fertilisers, Mount Maunganui and BioRich, Napier. Also, Trevelyans in Te Puke compost all pack-house plant material waste at their No 1 Road site. Landowners and growers also have an important role in controlling invasive weeds and protecting native bush on their orchard property. KVH provides regular reminders about removing weeds such as moth plant, woolly nightshade and the South American pampas from shelter belts and orchard margins.

All three weeds are major hosts of passion vine hopper. This insect secretes honeydew onto fruit, allowing sooty mould to develop, which is a major reject factor costing the kiwifruit industry millions yearly in lost production. Pampas seeds fly in the wind in autumn and are also a major reject factor when they are attached to fruit. An increasing number of orchardists are replacing these weeds growing adjacent to their orchards with suitable native plant species.

Planting weedy margins around an orchard can have added benefits for productivity, slowing water run-off and sustainability. Less woolly nightshade and pampas means less fruit affected by passion vine hopper or pampas seed. Water run-off from storm events is less likely to cause erosion and streams are more likely to have clear water. Also, biodiversity within the stream is increased – meaning more native kōkopu, eels and other stream-life.

## Case Study: Stephen Kenna and Phillipa Wright, Ongare Point, Katikati

Stephen, Phillipa, and son Daniel, manage a 10-hectare SunGold kiwifruit orchard at Ongare Point, Katikati. The orchard is V-shaped with flat to steep contour, with the small, spring-fed, Ongare Stream running through the middle.

Twenty-five years ago, Stephen and Phillipa began planting the banks of the stream with native plants including cabbage trees, pittosporum, totara, kowhai, kahikatea, tanekaha, flax, carex grasses and mānuka. The native plants are now well established and prevent weeds from dominating the stream margins. At the same time, a grass/herb sward was allowed to establish in the strips beneath vines.

The combined effect was that there is less run-off of soil and other contaminants into the stream. The water was shaded and cooler, with increased numbers of eels, koura, kokopu and other stream-life. The Kenna-Wright initiative won three categories within the 2015 Ballance Farm Environment Awards.

Restoration has been extended along the stream and now includes more neighbouring commercial properties. These are managed by the Ongare Point Waterway Restoration Group. The Bay of Plenty Regional Council provides funding support and practical advice to the group and offers landowner subsidies of up to 50% for eligible work.

# Research and development: the science behind our progress

Research and development priorities for both Psa and wider biosecurity are delivered to the kiwifruit industry by Zespri, under contract from KVH.

This work is completed under the Innovation Platform - Protect Supply with projects led by Dr Sonia Whiteman and Dr Elaine Gould. There is a strong collaborative effort between the Zespri team and key KVH staff including Matt Dyck, Erin Lane and Linda Peacock.

Good progress has been made over the last 12 months, with a key highlight being popular industry events to discuss projects underway with growers and technical experts. Below is a summary of key programmes of work.

## BIOSECURITY PORTFOLIO

***Brown Marmorated Stink Bug (BMSB) – tackling one of our most unwanted***

BMSB continued to be intercepted during the 2019/20 high-risk season and remains a major focus of research with projects taking place in Italy and China, where it is known to be a pest of kiwifruit. This research is of immediate benefit to European based growers and will inform management practices should BMSB become established in New Zealand.

In Italy, a recently completed trial which investigated the lifecycle and impacts of BMSB on kiwifruit in both netted and unnetted orchards, with no additional control, has shown losses of between 30-50%, with fruit drop occurring in Gold3.

The industry is currently reliant on a combination of netting and agrichemical applications to maintain an adequate level of control, as netting (even though a promising control option) has proven to be ineffective when used alone. There are several reasons for this:

- Nets being left open until after pollination and after BMSB come out of overwintering.
- Opening of nets to undertake on-orchard practices.
- BMSB in netted orchards being able to survive solely within that block.
- BMSB overwintering in orchard structures.

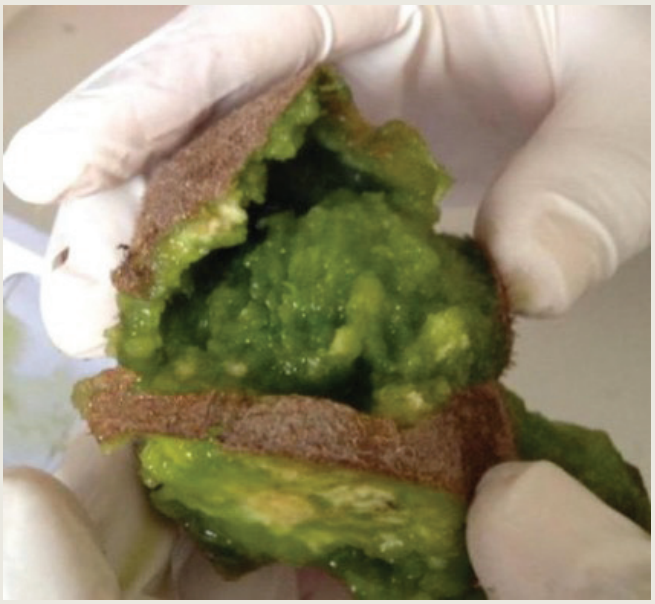
***Ceratocystis fimbriata – world expert famous in New Zealand***

*Ceratocystis fimbriata* is our most unwanted pathogen and the soil-borne fungus was the focus of the 2019 Kiwifruit Grower Biosecurity Day.

KVH and Zespri, thanks to funding from Agmardt and Biosecurity New Zealand under the Government Industry Agreement (GIA) partnership, were delighted to host Professor Acelino Alfenas, a Brazilian based pathologist, at the event.

Professor Alfenas shared his experience of the impacts of *Ceratocystis fimbriata* on a range of crops, including kiwifruit and forest species. He reported significant impacts (which were sobering for all to hear), shared his views on the importance of well-managed risk pathways, and highlighted the value of the work done by KVH and Biosecurity New Zealand in this area. If *Ceratocystis fimbriata* should arrive Professor Alfenas' resounding message was the need for resistant cultivars to protect the industry, which is an avenue currently being explored.

In a workshop session Professor Alfenas discussed the current GIA readiness plan for *Ceratocystis fimbriata* (of which KVH is a key industry partner) and was able to fill in several knowledge gaps. A comprehensive programme of work to address remaining questions started in June 2020.



*BMSB feeding damage in kiwifruit, showing typical corking under the skin.*

*Professor Alfenas learnt about the New Zealand production system while here – valuable context given the research he is doing for us. Here he (front left) visits a Whitehall property in the Waikato hosted by Orchard Manager Miguel Peterle (front right) and accompanied by PhD student Samuel dos Santos (back right) and Plant and Food Research Scientist Joy Tyson (back left).*

## RANKING RISK

The list of potential biosecurity threats to the kiwifruit industry is long and KVH/Zespri must make key decisions about which ones to focus on at any given time. The starting point is often a review of all available information to determine the exact risk an organism presents to kiwifruit. Below is a summary of such work from the last year:

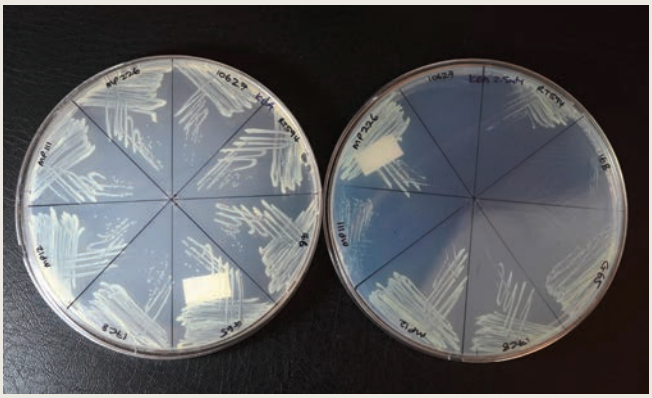
- *Xylella fastidiosa* is a bacterium which is having a significant impact on both the wine grape and olive industries offshore. A recent review of risks to New Zealand horticulture failed to find any evidence of it causing disease on kiwifruit, however it will remain on the industry's watchlist.
- A review of the potential threat *Phytophthora* pose to kiwifruit was prompted by devastating impacts on kauri, Kiwifruit Vine Decline Syndrome in Italy, and forestry industry concerns. An accompanying research programme will start in September 2020 to understand baseline *Phytophthora* biodiversity in New Zealand kiwifruit orchards.
- Investigations of a vine decline issue in Motueka were expanded to include surveys on orchards around New Zealand. Good progress has been made in identifying fungal organisms commonly associated with these declining vines and next steps will determine relative pathogenicity of the organisms. This work has helped build understanding of kiwifruit biodiversity, which can be useful in an incursion.
- Guava moth was detected in 2018 in fruit in Northland and investigated. Research has shown it is unable to develop fully in kiwifruit and seemed to be an opportunistic visitor. Removal of host material (e.g. feijoas) around orchard blocks reduced the number of infestations and it is now considered a non-risk.
- Spotted Lanternfly has been added to KVH's Most Unwanted list and has become a major pest in the USA. Translation of literature has shown that it is a pest on kiwifruit in China (its home range) where a trial will soon start to investigate impacts.

*Spotted Lanternflies on a tree with a bee feeding on the excreted honeydew, which leads to the development of sooty mould.*

## PSA PORTFOLIO

Psa continues to be our most problematic on-orchard disease issue both in terms of production loss (bud rot and secondary symptoms) and a desire to move to a less intensive spray programme. Key highlights from the last year include:

- The GoldFutures project demonstrated that change is possible. The project has run over four years and paired 10 Gold3 blocks that were challenged by Psa with 10 Gold3 blocks in close proximity (so similar environment) that were managing Psa. By implementing best practice management in the Psa challenged blocks the difference in OGR/ha between the two blocks was significantly reduced.
- A review of what best practice for cutting out secondary symptoms looks like (delivery to industry is under development).
- A three-year project designed to answer the question 'do I need to frost fight during the dormant phase to protect my vines from Psa' was completed. It was identified that frost temperatures above -6 degrees Celsius do not appear to damage dormant canes. Based on this information and analysis of long-term weather sets, the work concluded that protecting dormant canes during mild frosts (for example frost protection and/or copper applications), as are generally experienced in the North Island, is not necessary.
- Completion of a three-year intensive study of copper resistance that provided reassurance that Psa is still controlled by standard copper rates (based on testing of a large culture collection including evaluation in a plant-based assay); definitive data that use of low rates of copper causes the development of strains resistant to low concentrations of copper; and information that copper resistance is a very fluid system.
- Exciting laboratory results were received for two biologically based products under development. Pending continuing successful results, it is hoped these products can move to glasshouse evaluation in the coming year.



*Agar plates without (left) and with (right) copper added showing the impact on Psa growth (creamy smears). Strains showing growth on copper amended plates were then evaluated in a plant assay where in all cases label rates of copper achieved high levels of control (as determined by measuring leaf spotting).*

# Psa: the year that was

The 2019 winter period was relatively mild – it was the seventh warmest on record, with near normal rainfall. Psa exudate was reported from late July, initially on Waikato sites.

Spring Psa impacts were reported as similar or slightly worse than the year before for most regions, with symptoms showing fairly strongly in the usual areas of cold sites and poorly sheltered or stressed blocks. Young blocks and developing canopies were often more affected and for some, cane die-back and leader deaths continued through until December. More reports of Gold3 flower-bud abortion were received than usual, notably for blocks on bounty rootstock. Prevalent south-westerly winds through early spring and higher rainfall during September and October are likely contributors to this.

These reports align with recordings from the Psa Risk Model, which showed most regions having high weather-related Psa risk during spring, with levels higher than 2018. Gisborne and Hawke's Bay had lower risk than in September 2018 but October hail in the Hawke's Bay amplified bud-rot and leafspot for Hayward crops in the area. Wanganui Hayward growers reported a 15-20% drop in production, particularly where pre-flower girdles were not applied. Waikato Hayward organic blocks also saw low production numbers, in part due to significant reduction in flower numbers through Psa budrot.

Later into the season, summer temperatures were above average, and rainfall was below normal. Psa weather-related risk dropped away sharply from November with little Psa activity reported through summer and autumn periods.

Product use followed similar patterns to previous years, with growers keen to incorporate Aureo Gold into their programmes – the product will be available again in 2020.

### ANNUAL MONITORING ROUNDS

KVH annual monitoring rounds to confirm presence/absence of disease across Exclusion and Containment regions were completed in November 2019.

In the Nelson/Tasman region, 30 blocks from Waimea to Takaka were monitored including Gold3 and Hayward. There were 29 samples (from orchards with leaf spotting) confirmed as Psa not-detected.

In the Whangarei region, 14 KPINs were monitored. The focus was on blocks close to Psa positive orchards and/or those with more vulnerable (young or newly grafted) plants. Seven leaf samples were taken, with testing confirming three new Psa positive sites.

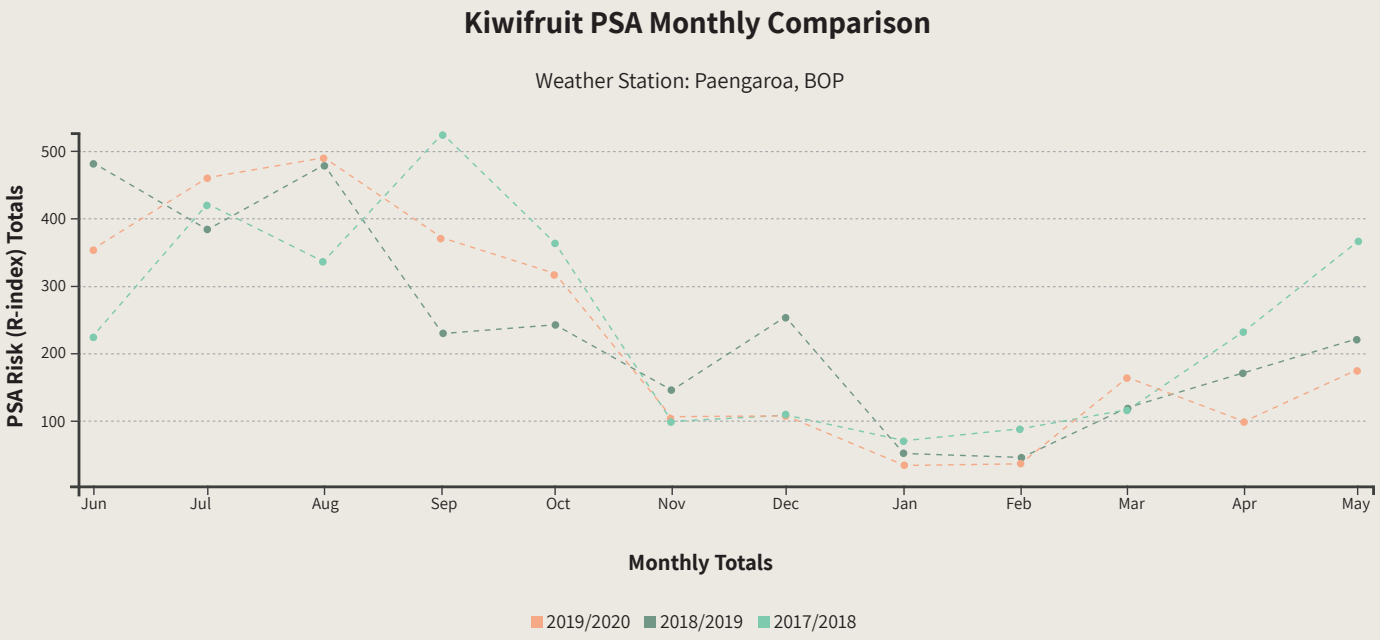
The South Island and Far North retain their status as Exclusion regions, with no Psa detections. Whangarei remains a Containment region with only limited Psa positive sites.

Overall, there are currently 3031 orchards identified with Psa and 93.5% of New Zealand's kiwifruit hectares are on orchards identified with the disease.

### RED 19 MONITORING ROUNDS

Red19 trial blocks across the Bay of Plenty were selected by Zespri for the KVH new variety monitoring programme. The six blocks, all on Bruno rootstock, had been grafted with Red19 between 2015 and 2017.

Information from early and late spring monitoring rounds supported preparation of the on-orchard and technical Information presented within the Red19 New Variety Information Guide released in 2020.



## RESISTANCE RESULTS

Zespri and KVH commissioned a Psa resistance monitoring programme in November 2011 with the aim of identifying any emergence of Psa strains with resistance to bactericide and copper control products.

In the November 2019 sampling round 21 orchards were tested, with Psa detected in 17 samples. Results showed all Psa isolates tested negative for resistance to Kasugamycin. Resistance to streptomycin remained stable at 10% of isolates, while results for copper showed a continued upward trend with 78% of isolates with some copper resistance.

Most of the copper resistant isolates were resistant to low concentrations of copper only, and therefore would be expected to be easily controlled by copper products applied at label rates. Testing of the strains resistant to high copper concentrations also showed successful control was achieved with copper at label rates.

Using crop protection products with different modes of action, following label rates, and only applying products when needed, continues to be the recommendation to growers to prevent resistance occurring.

## RESEARCH UPDATES

At the annual Psa research day event, work on Gold3 bud loss was presented. This described and quantified two different bud loss syndromes seen on Gold3 orchards - bud abortion (believed to be a vine physiological response) and budrot (believed to be associated with Psa infection).

For budrot, which was observed in late October when flowers were about to open, 77% of monitored canes were affected and the associated flower loss was 29%. Of 50 symptomatic buds, 49 tested positive for Psa suggesting a strong association between presence of Psa and Gold3 budrot. Growers experiencing Gold3 budrot are prompted to utilise all Psa management options - cultural and chemical - to keep inoculum levels down, with a reminder the pre-flower girdle used for green cultivars is not recommended for Gold3.

Results from trials on Hayward sites heavily affected by Psa suggested pre-flower girdles were a critical tool to manage budrot. However, there is potential for long-term impacts on vine health and productivity if applied over multiple years and followed by size and dry matter girdles within the same season. The pre-flower girdle is a tool to be used on healthy vines - other cultural and Psa control options (including copper bactericides and biologicals) may be the best options in conditions where vines appear stressed.

Results from Year 3 of the Gold Futures project identified that improved management practices had lifted the performance of blocks challenged by Psa. There are 10 of these blocks in the project, each paired with a nearby block with similar characteristics but Psa managed with limited impact. Improved drainage, increased shelter, stringing, removing innoculum sources, good tool hygiene, maintaining a protectant programme after harvest and during dormancy as well as optimising plant health all added to the diminishing differences in OGRs between the different blocks.

## NEW FORECASTING TOOL FOR GROWERS

A new and improved KVH web-based Weather & Disease Portal was introduced in April 2020, providing a new mobile-friendly interface for users.

Everything from the older Psa Risk Model is still available, as well as new features including a Psa monthly comparison tool. This gives an idea of how much Psa risk pressure there is in the current season compared to previous seasons and helps growers refine their yearly Psa management risk strategies. Other new tools and forecasts include a National Weather Outlook, Ground Frost Forecast, and Temperature / Rainfall Seasonal Comparisons.

An additional weather station at Waihi provides better weather and Psa risk forecast information for growers in this region.

A log-in to access the portal is available to all growers.

*Psa infected flower buds on Gold3.*
*Image credit: Shahjahan Kabir, scientist at Plant & Food Research.*

# Our Team

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