ScionConnections

SCION NEWSLETTER ■ ISSUE 28 ■ JUNE 2018

Myrtle rust Austropuccinia psidii.

Citizens report on myrtle rust

A biosecurity battle erupted in New Zealand the day myrtle rust was discovered on the mainland. Since then, biosecurity officials have done everything possible to stop the fungus from taking hold, but in April the Ministry for Primary Industries conceded that we must now focus on long-term management options, turning the battle into a slowly-waged war.

In this long drawn out fight for Myrtaceae we are now in reconnaissance mode. Data is more important than ever and citizens can play an important role in gathering information. The Myrtle Rust Reporter (MRR) smartphone app developed by Scion's Dr Steve Pawson is one of the key weapons we have in the armory.

Long-term management of myrtle rust in New Zealand

No one knows exactly how or what impact myrtle rust will have on taonga species, including pōhutukawa, ramarama, northern and southern rātā and mānuka, nor the horticultural crops or wider forest ecosystems. The response is now focused on science, learning about myrtle rust, and developing ways to treat it in New Zealand.

Through the MRR app, citizens can help officials monitor how myrtle rust is affecting Myrtaceae across New Zealand and, if very lucky, find plants with a level of natural resistance.

Myrtle Rust Reporter

The logic behind the app is simple. By giving the public a channel to report information straight from the source, you can exponentially increase the number of eyes on the ground. At its best, the sheer scale of data contributed from volunteers enables observations to occur over large geographic areas.

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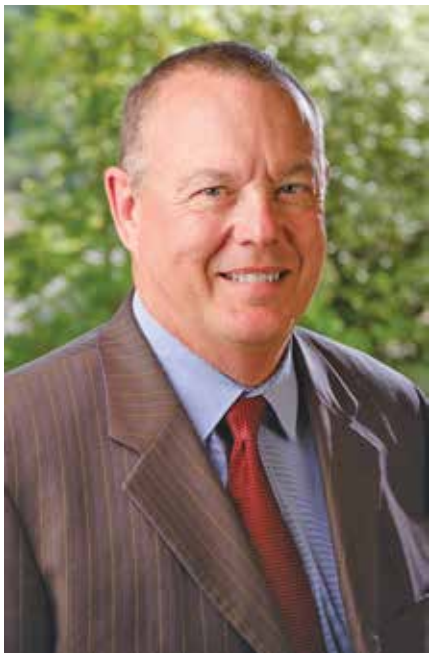
Examining our core purpose



Through our strategy refresh process we have been questioning the place of Crown research institutes and, in particular, the role or purpose of Scion. This process will culminate in July with the presentation to Parliament of our Strategy to 2030 incorporating our Statement of Corporate Intent.

One important matter that was reinforced was the relevancy of our Statement of Core Purpose and the direction it gives Scion to drive innovation and growth in the forestry, wood and biomaterial manufacturing sectors, along with bioenergy, for the economic, social and environmental benefit of New Zealand.

This directive was formulated into a mission statement for Scion – "Enhancing New Zealand's prosperity, well-being and environment through trees. *Kia piki te ora, te taiao me te whai rawa o Aotearoa mā te ngāherehere.*"

Once our Strategy to 2030 document has been published it will be time to challenge ourselves, the industry, partners and government on what will actually be needed to deliver on the opportunities identified. In this, Scion's role must be one of enabling outcomes through research and development that is utilised by others to create the benefits we seek as a country. My belief is that this will identify gaps and barriers that we will collectively have to work on to truly deliver impact.

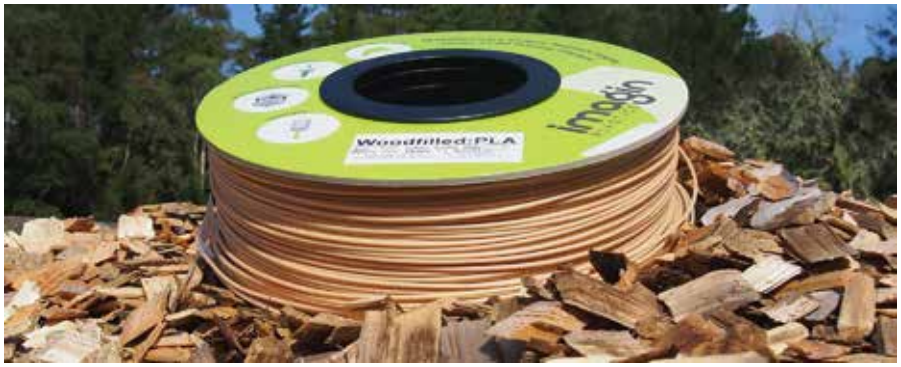
For Scion to deliver on its core purpose then it must enable other businesses to act. A key aspect of this will be the funding of programmes of duration and nature, working with the right partners, through to the delivery of the desired impact not just getting the research completed.

As I stated in my last editorial, "We see truly legacy-creating opportunities through planting the right trees in the right places for the right purposes" as we all together unleash the power of forestry.

I welcome your thoughts on this topic and any other matters raised in the issue of *Scion Connections*.

Dr Julian Elder
Chief Executive

FOR FURTHER INFORMATION
contact Dr Julian Elder at julian.elder@scionresearch.com



NZ made, wood fill 3D printing filament hits the 'shelves'

Imagin Plastics have launched a new 3D printer filament made from a Scion-developed compound containing 10 per cent by weight New Zealand pine. The filament is 100% biobased and compostable.

For Imagin Plastics, the product will serve the growing share of their customers interested in sustainability and biobased plastics.

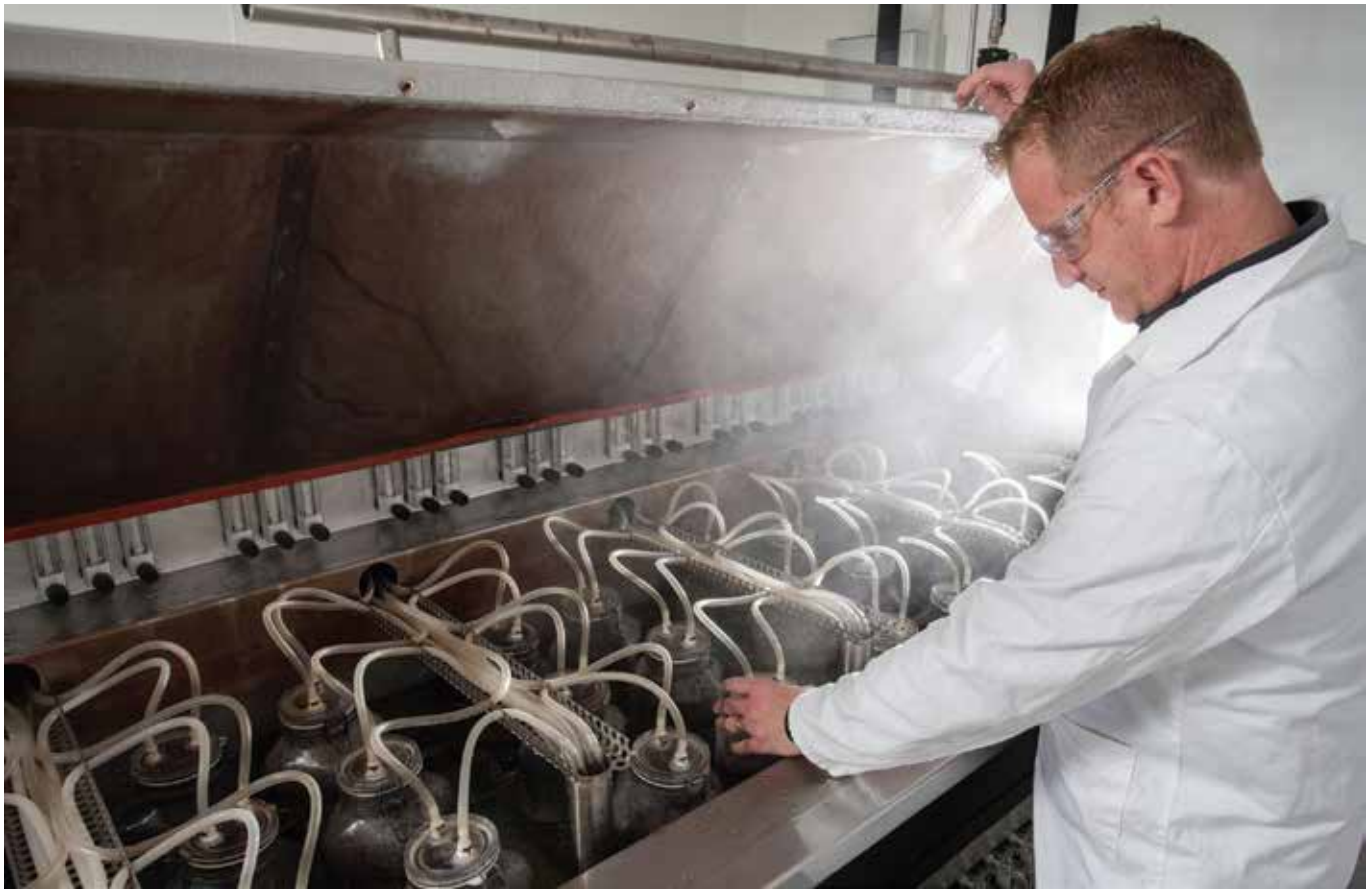
Imagin Plastics National Sales and Technical Manager Ben Blakley says "As FDM (fuse deposition modeling) 3D Printing grows across all sectors we want to have high-quality options for our clients and biobased materials is a good one. Being able to work closely with Scion to see a research project over the line and make it to market is an asset to 3D printing in New Zealand".

Dr Marie Joo Le Guen, who led the project says, "This product is a great example of research and industry collaboration, and how it could strengthen New Zealand plastic manufacturing industry through innovation".

The wood within the plastic is a waste stream from the wood milling industry. It is a sustainable resource that would otherwise be discarded or burnt.

The product was officially launched on 1 May in Auckland at EMEX 2018. EMEX is New Zealand's largest technology trade show for the manufacturing, engineering, machinery and electronics industries.

FOR FURTHER INFORMATION
on Scion's bioplastic compounds, contact Dr Marie Joo Le Guen at mariejoo.leguen@scionresearch.com



Steam rises on an experiment in the biodegradation testing facility.

How eco-friendly are your winter woolies?

Every time a synthetic garment is washed, it sheds thousands of fibres. These tiny fibres escape waste water treatment plant filters and end up in the ocean and along shorelines near waste water release sites. Fabric structure and composition affect fibre release. Studies have found that polyester fleece jackets can shed up to 0.2% of their weight with each wash and as the jackets age they shed even more.

These fibres from our clothes could be having a disastrous effect on marine life. Microfibres have been found woven into the gastrointestinal tracts of fish and have potential to bio-accumulate in larger animals, spreading throughout the entire food chain.

The Florida Microplastic Awareness Project advocates for cotton, hemp and linen as alternatives that break down and don't threaten marine life. But what about wool?

AgResearch and Scion are collaborating on a project that compares woolen fibres from garments and carpet with their common synthetic counterparts. Together we are looking at how the fibres break down in ocean water, using Scion's newly commissioned biodegradation testing facility.

Marine merino

Scion's biodegradation testing facility can assess how different materials like bioplastics, wood or packaging materials break down over time and in different conditions, such as in compost, sea or freshwater.

For this experiment, the amount of carbon inherent in samples of woollen and synthetic fibres from garments and carpet is measured. Then these samples will spend 90 days submerged in aerated jars of seawater collected from the ocean and heated to 30ºC while the amount of carbon dioxide flowing out of the jars is measured by sensors.

Carbon dioxide is a product of the aerobic degradation process. When the microorganisms in the seawater break down the microfibres, they release carbon dioxide. This study is comparing degradation of the wool and synthetic fibres. The samples that biodegrade the most over the 90-day time frame will show the most measured carbon content transformed into carbon dioxide.

Scion's biodegradation facility is the only automated biodegradation testing facility in New Zealand.

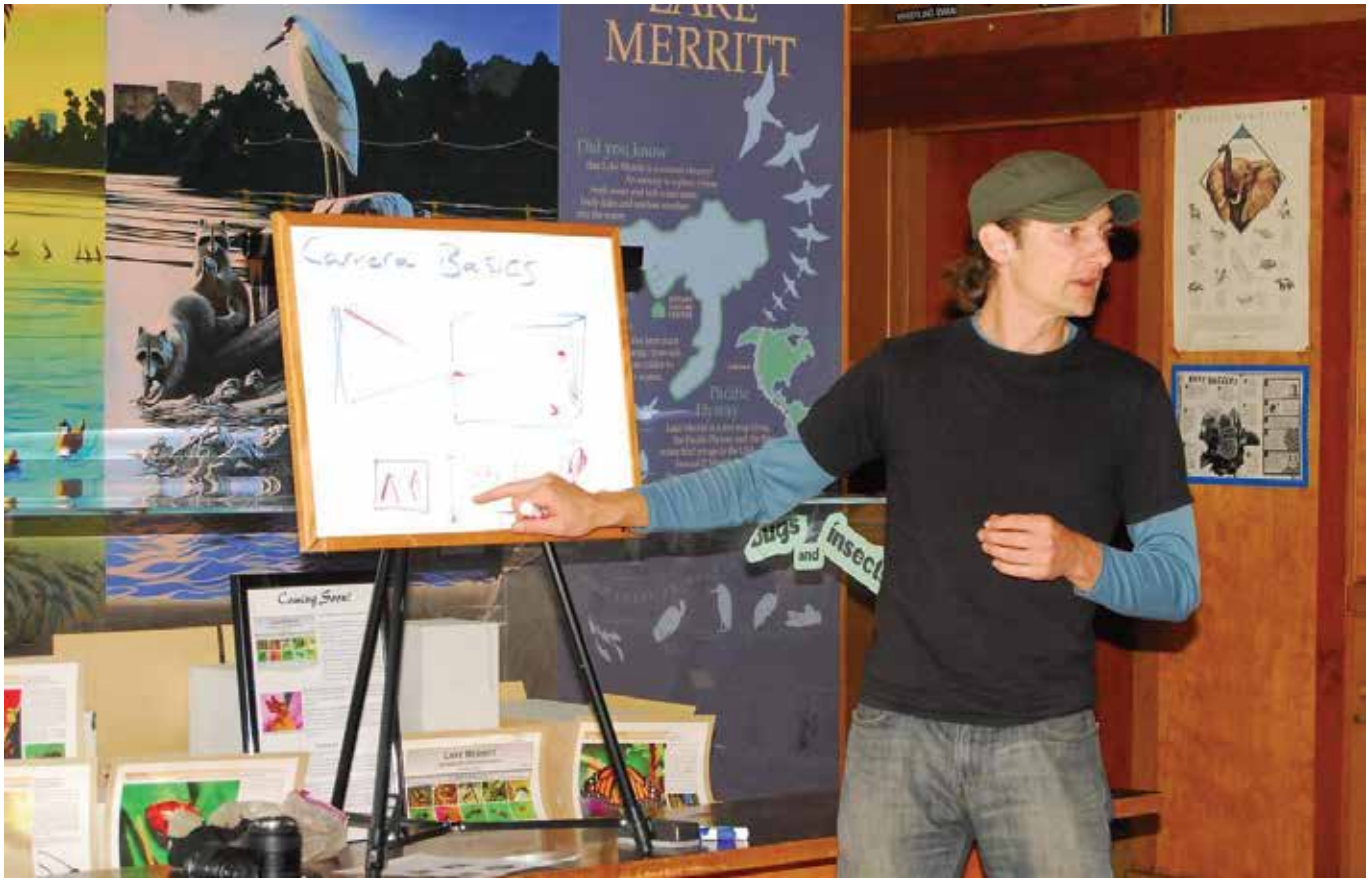
Results help conscious consumers

The results from this study will help to establish the sustainability of New Zealand's wool products.

Scion Technology and Service Leader Lou Sherman says, "This kind of information will help consumers make informed choices about the products they buy".

The study will be completed in August 2018.

FOR FURTHER INFORMATION about our biodegradation testing facilities, contact Lou Sherman at lou.sherman@scionresearch.com



Citizen scientist extraordinaire Damon Tighe teaching camera basics for organism documentation at Lake Merritt, California.

Citizen science saves the day

It was a bright and sunny December day last year when Scion entomologist Stephanie Sopow found herself up a ladder in downtown Oakland, California. Stephanie was on a mission to collect giant willow aphids (GWA) *Tuberolachnus salignus* and their natural enemy, a tiny parasitoid wasp in the genus *Pauesia*.

At the bottom of the ladder, Steven Seybold, an entomologist with the USDA Forest Service, guarded the collection gear. In the trees down the street other students and staff from the University of California Davis were also collecting.

These aphids and wasps had proven especially difficult to find. Through the citizen science network iNaturalist, Stephanie made contact with Damon Tighe, citizen scientist extraordinaire and science educator based in California, who was able to give her the help she needed.

Four years earlier

GWA was first discovered in New Zealand near Auckland in December 2013, and since then it has popped up all over the country. For such a small seemingly innocuous insect, these pest aphids cause a lot of problems.

Megan Siefker is a student at the University of Californa Davis who came to help collect aphids in Oakland.

> Parasitoid wasps like *Pauesia* are ideal biocontrol agents. Their ability to search out and destroy only their desired targets is extremely useful because it prevents the need for any chemical control.

The aphids suck the life out of willows depleting them of liquids, weakening the trees which are widely used in New Zealand for slope stabilisation, flood protection and as vital pollen and nectar resources for honey bees in the early springtime.

Feeding aphids secrete a sticky honeydew that supports the growth of

sooty mould that covers cars, decks, barbeques, kiwifruit vines, fruit trees and livestock. Pest wasps and bees are also drawn to the honeydew, creating a twofold problem for the beekeeping industry. The honeydew leads to an increase in pest wasps that kill honey bees and rob honey. Beekeepers also lose productivity because honey produced from this honeydew is granular and can't be extracted.

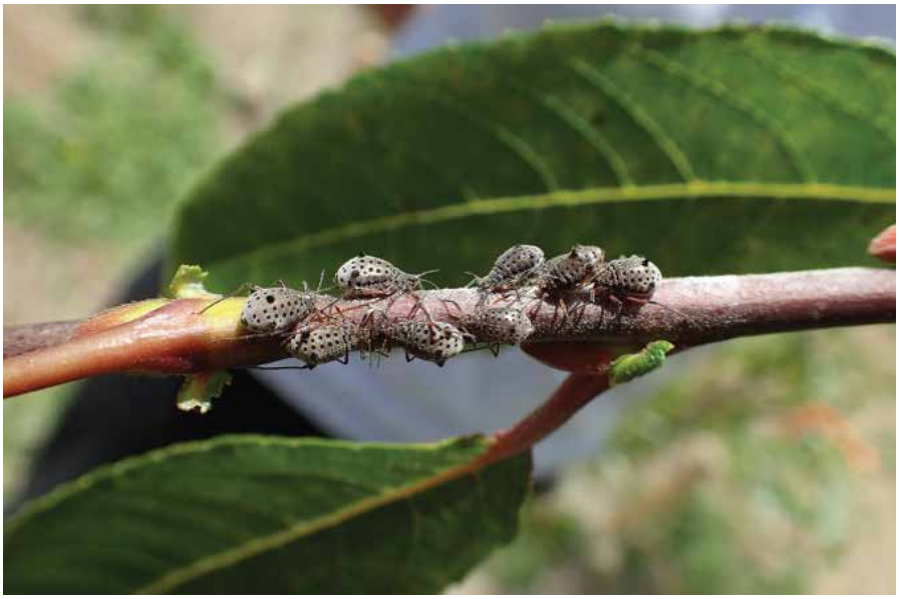
Pesticides are not an option for GWA control because they would transfer into the honeydew, putting nectar feeders such as honeybees, tui and bellbirds at risk.

Finding parasitoid wasps

To fight the good fight against this aphid, Stephanie is leading a research project supported by the Ministry for Primary Industries' Sustainable Farming Fund to identify possible biocontrol options for GWA.

Parasitoid wasps like *Pauesia* are ideal biocontrol agents. Their ability to search out and destroy only their desired targets is extremely useful because it prevents the need for any chemical control. The parasitoid wasp lays an egg in the aphid, a larva hatches, and this then kills the aphid host as it develops. In two to three weeks a new adult wasp pops out of the dead aphid. These tiny wasps have been noted in the scientific literature on GWA, but have never been deliberately released as a biocontrol agent and as such, very little is known about them.

Part of Stephanie's research included travel to California to collect wasps to bring back to New Zealand, but finding the wasps wouldn't be so easy. "On my first trip to California, I came back empty handed. I found a few small aphid colonies, but none of the aphids brought back to New Zealand contained parasitoids."



Giant willow aphids.

The frustration of this led to a new plan of attack in preparing for the second collection trip. Using citizen science platform iNaturalist, Stephanie contacted Californian-based entomologists, willow enthusiasts and GWA observers as scouts to locate GWA colonies and, in particular, those that had been parasitised by the wasps.

One of these citizen scientists was Damon Tighe. Damon used the information provided by Stephanie to find the GWA colony in Oakland where Stephanie was able to collect enough parasitoids to start a new colony to test in New Zealand. Damon says, "Through iNaturalist and Stephanie's requests through the platform, I became aware of GWA's impact in New Zealand and the desire to find parasitoids from a Californian population. I know next to nothing about insects, but iNaturalist facilitated my general curiosity in the organisms around me and combined with Stephanie's expertise, created a potential solution for a very real problem."

Stephanie Sopow inspects a sample of giant willow aphids.

Back in New Zealand...

The parasitoids are now safely in the containment facility in Rotorua. Stephanie has managed to breed six generations and about 1700 individuals from the specimens she collected in Oakland. These are now being tested to ensure they won't attack New Zealand's native aphids.

"Some of New Zealand's native aphids are rare and very hard to find, so we will test the parasitoid against a phylogenetically representative selection of aphids to ensure that no native aphids are threatened by *Pauesia*."

If the native aphids are shown to not be at risk, we'll initiate the Environmental Protection Agency biocontrol release process. Until then Stephanie says, "It was Damon and the citizen scientists in California, and our peers at the USDA Forest Service and University of California Davis that helped us get this far. To them - thank you."

FOR FURTHER INFORMATION on our GWA biocontrol research contact Stephanie Sopow at stephanie.sopow@scionresearch.com

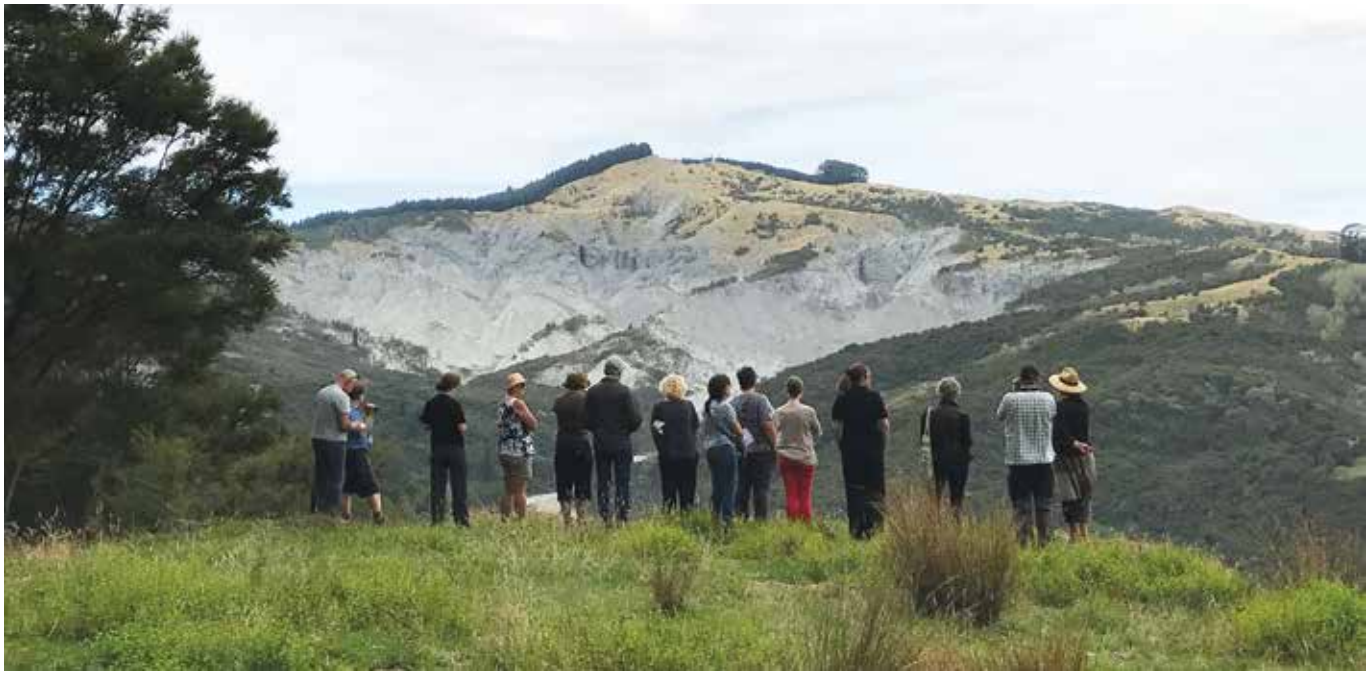


Photo: Tui Aroha Warmenhoven, Ngāti Porou

Erosion is a complex, non-linear problem that requires non-linear solutions. Bartons Gully, Waiapu catchment, East Coast, New Zealand.

Adaptive governance for transformational change

Environmental problems today are complicated. They involve clashing public perceptions, moving targets, differing stakeholder aspirations, and long-term time-frames that often stretch over generations. They are also multi-dimensional, with multiple causes, impacts, parties and shifting objectives.

Where do we even begin to address problems like these? A Scion-led team is exploring how adaptive governance approaches can be used to make transformational progress on complex environmental problems.

The approach

Adaptive governance has been used to address a number of environmental problems around the world. The concept is founded on recognising the complexity of social-ecological problems and advocating for a flexible and collaborative approach to help solve them.

One of the benefits of adaptive governance is that it rejects a "one-size-fits-all" approach. Instead, adaptive governance methods hinge around building mutual understanding, promoting joint learning, developing ongoing dialogue, and creating a safe space for experimentation. These foundations allow decision-makers to more easily adapt to changing environmental circumstances.

The problem

The Waiapu catchment is facing some of the most severe erosion rates in the world, with grim consequences for catchment health and the people who live there. To combat the erosion, the Ministry for Primary Industries, Gisborne District Council and Te Runanganui o Ngāti Porou signed a 100-year Memorandum of Understanding (MoU) in 2014 with an aim of restoring the catchment and achieving their goal 'healthy land, healthy rivers, healthy people.'

To help make progress toward this goal, Scion launched a research programme in 2015 to test a series of adaptive governance tools for environmental problem-solving. The team designed a series of role-playing simulations, a social network analysis, ran regional and national forums and will produce a set of adaptive governance guidelines that can be applied elsewhere.

The toolbox

Throughout the research programme, the team ran three role-playing simulations. The simulations prompted participants to think about their approach to problems from another perspective and increased their understanding of each stakeholder's outlook.

The team also undertook a social network analysis. This involves mapping out relationships between people, groups and organisations. The information is used to help community members identify their influencers and leaders, while also learning who has skills and knowledge in different areas and what the gaps are.

Running regional hui was another way the research team was able to give a voice to the stakeholders affected by the issues in the catchment. The team then took those views, and relayed them to the joint governance group responsible for overseeing the MoU. National hui were also carried out, with the idea of helping researchers in New Zealand understand how we can use adaptive governance.

Wrapping up

This programme concludes in late 2018. The final piece of work to be completed is for the team to produce 'Good practice guidelines for adaptive governance'. Programme leader Sandra Velarde says, "Our guidelines will help to facilitate debate and give agencies and communities the tools to better understand each other. The aim is to help plant more seeds for transformational change".

FOR FURTHER INFORMATION on adaptive governance and environmental decision-making, contact Sandra Velarde at sandra.velarde@scionresearch.com

Observing Myrtaceae species at a Myrtle Rust workshop run by Te Tira Whakamātaki.

Citizens report on myrtle rust

(Continued from page 1)

The MRR app goes one step further than Scion's existing citizen science biosecurity surveillance apps (NZ Eucalyptus Pests). Instead of logging a myrtle rust infection and that being the end of it, the MRR app encourages citizen scientists to select uninfected plants, log them in the app and return to them, continuing to monitor their health and if they see symptoms of myrtle rust to report them.

Users log recordings of the Myrtaceae plants through the app (which is connected to the NatureWatch NZ and the international iNaturalist platform), and return regularly to check for myrtle rust, and monitor any infections.

Using a citizen science-based approach was the initiative of Te Tira Whakamātaki the Māori Biosecurity Network. Speaking on behalf of Te Tira Whakamātaki, CEO Melanie Mark-Shadbolt said "we always prefer a citizen science-based approach to our work, partly because we find it complementary to the way Māori work anyway, but mostly because citizen science allows for large numbers of volunteers to generate observations at scales unattainable by individual researchers or research teams. Plus we wanted kaitiaki mapping the myrtle rust spread because they are the ones most familiar with the ngahere (bush) and able to move through it without causing undue damage."

To ensure that MRR reaches its key users, it has also been made available in te reo Māori. Mel explains why: "It was vital that this app drew a Māori audience, and one way to do that is via te reo Māori, especially as we aim to reach our kaitiaki out in the regions and out on the land. The other important reason is language protection and capability building. If we want to ensure the language is kept alive then we need to continue to grow capability in the field of translation by providing employment, and we need to promote conversations about language changes and uses, like do we create new words for plant diseases that aren't part of Te Ao Māori?"

The app is good for a number of reasons

To date, the app has been well used. Installed over 600 times, with ~300 uploads from ~66 citizen reporters. Dr Steve Pawson says the beauty of the app as a tool lies in its efficiency.

Steve explains, "The nature of the app means that we get information from a wide range of sources that have already been checked by the NatureWatch NZ community. Their data is sent directly to the labs making the transition of information virtually seamless".

Zoe Ogilvie from Biosecurity New Zealand's Long Term Planning and Transition team says, "Citizen scientists can meaningfully contribute to the biosecurity response. That experience is invaluable if we are going to get every New Zealander involved in biosecurity".

Wero: a challenge

As temperatures cool and the number of myrtle rust identifications slows down, there is still much to be done. Steve has set a wero, or challenge, to readers. "Download the Myrtle Rust Reporter app and help us map the disease, with this vital information in our fight against Myrtle Rust in New Zealand."

Myrtle Rust Reporter has been supported by the Northland Regional Council, Envirolink, Te Tira Whakamātaki (Māori Biosecurity Network), Biological Heritage National Science Challenge and the Ministry for Primary Industries.

Download

Myrtle Rust Reporter at
www.scionresearch.com/myrtlerust

Richard Parker pitching his heart out.

Pitching for a prize

A live audience watched human factors researcher Dr Richard Parker deliver his first ever pitch for research funding to a panel of three judges. Richard was taking part in a Dragon's Den style pitching competition run by the Science for Technological Innovation National Science Challenge (SFTI NSC), and he won $10,000 for his efforts.

The SFTI NSC is charged with accelerating New Zealand's hi-tech economy. It also invests in capability building to help researchers expand their communication skills to promote the value of their ideas and learn how to tailor their communications to their audience. This includes attending a 'pitching workshop' with pitching guru Daniel Batten.

Richard's pitch, 'Robots for Forestry', drew on his own experience as a professional tree feller-turned human factors scientist. He says, "I was hit by a tree, it shattered my pelvis and my femur, I had three operations and spent two years on crutches. It cost the health system a fortune".

This experience left Richard feeling that there had to be a safer way to harvest trees. Years later, working for Scion, Richard's past motivated him to create the tree-to-tree robot. This robot would allow tree felling without risking human safety and also minimising the impact of tree felling on the landscape.

Richard says, "Robots are already being used in a number of high-risk industries like mining, nuclear decommissioning, and oil and gas production. I'll be using the winnings from my pitch to learn from the experiences of these industries, and apply it to forestry in New Zealand".

The development of the tree-to-tree robot has also been supported by the Steepland Harvesting Primary Growth Partnership funded by the Ministry for Primary Industries.

FOR FURTHER INFORMATION on Richard's research, contact him on richard.parker@scionresearch.com

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