



NEW ZEALAND'S  
BIOLOGICAL  
HERITAGE

Ngā Koiora  
Tuku Iho

National  
**SCIENCE**  
Challenges

# New Zealand's Biological Heritage *Ngā koiora tuku iho* A National Science Challenge

*Landcare Research Link Seminar*

*Featuring Programme 2*

*Maureen O'Callaghan, Nick Waipara, Andrea Byrom*

*March 2017*

# Science Challenges are...

- Addressing big national goals
- A change in the NZ science system
- Intended to align research efforts nationally
- Intended to align stakeholder needs nationally
- Mission-driven, outcome-focussed





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## MISSION

Reverse the decline of New Zealand's biological heritage, through a national partnership to deliver step change in research innovation, globally-leading technologies, and community and sector action

## OBJECTIVE

Protect and manage our biodiversity, improve our biosecurity and enhance our resilience to harmful organisms



# Biological Heritage Challenge

- Bringing *both* biodiversity- and biosecurity-related research together
- One of the biggest Challenges - 17 Parties (8 Universities, 7 CRIs, MPI and DOC)
- Not business as usual – future focussed research
- Identifying and addressing research gaps
- Landscape scale
- Broad in scope...



# Production and conservation sectors

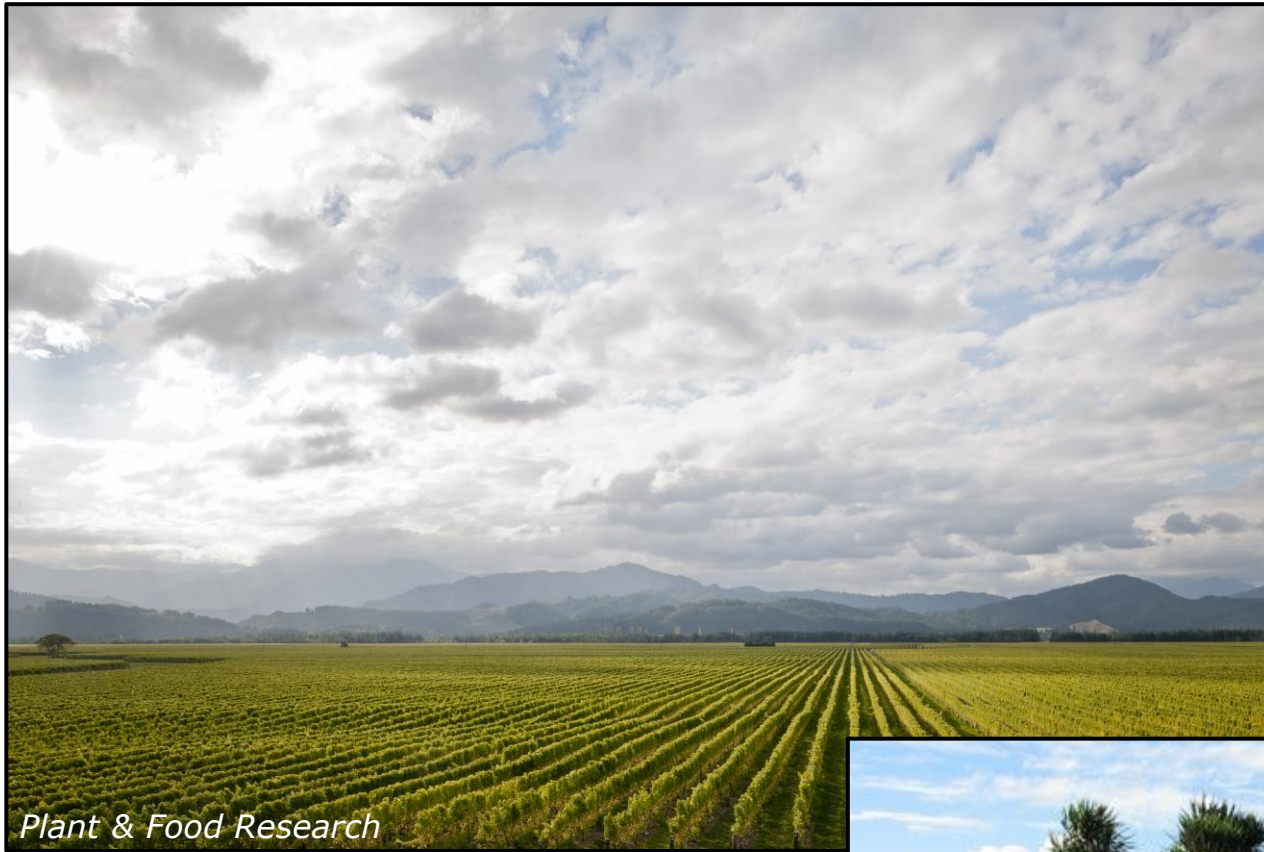




# Terrestrial and freshwater ecosystems

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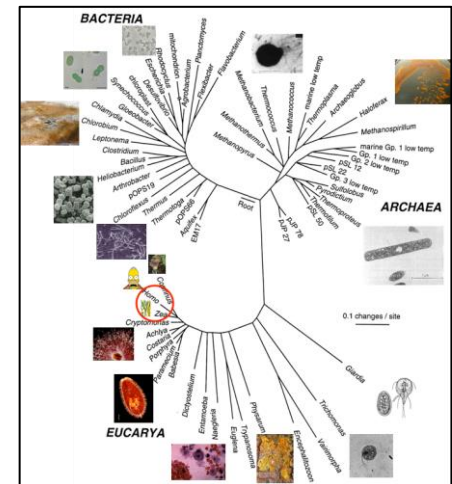
# Research Programmes

- **Programme 1:** Real-time Biological Heritage assessment - *“What have we got?”*
- **Programme 2:**  
Reducing risks and threats across landscapes –  
*“Keep it out” / “Get rid of it”*
- **Programme 3:**  
Enhancing and restoring resilient ecosystems –  
*“Take a whole-system view”*

# Programme 1: *“What have we got?”*

**Goal: NZ wide framework for biological heritage measurement**

- Environmental-DNA monitoring frameworks
- Groundwater biodiversity  
DNA profiling biodiversity important in water quality





# Programme 2: “Keep it out” or Get rid of it”



# Programme 3: “*Whole-of-system view*”

## Goal: Improving resilience of vulnerable ecosystems

preventing irreversible biodiversity loss and damaging invasions

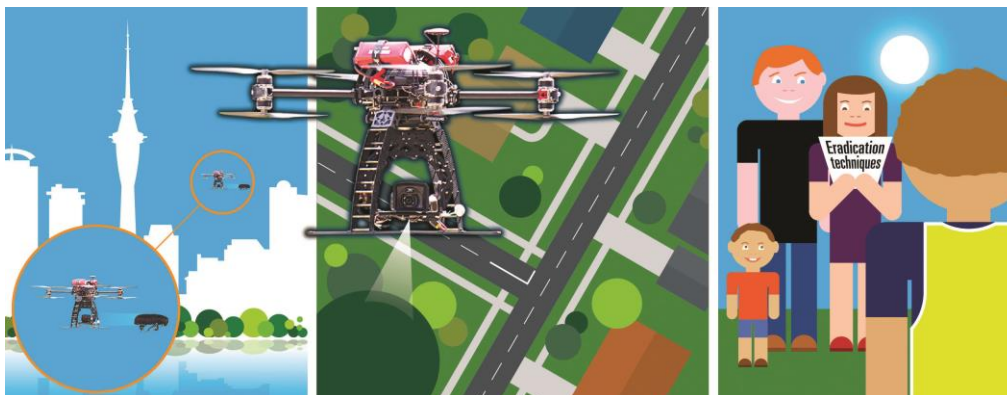
- Effectiveness of customary practices – legal, cultural context
- Predicting ecosystem tipping points
- Recovery of degraded streams and rivers



# Aligned Research

- Challenge funding alone can't deliver Mission
- Parties have agreed to:
  - Align research funded from other sources
  - Contribute to priorities
- CRI core funding
- University funding
- Private sector

*Scion's  
'urban battlefield'  
project*



**SCION**   
forests · products · innovation

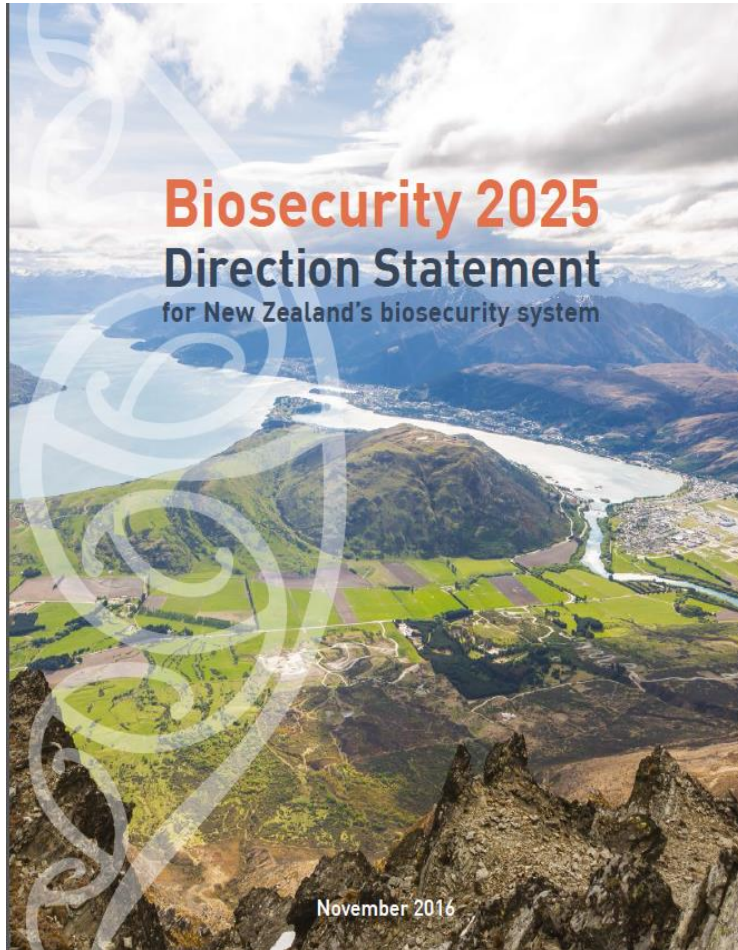
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# Strategic alignment



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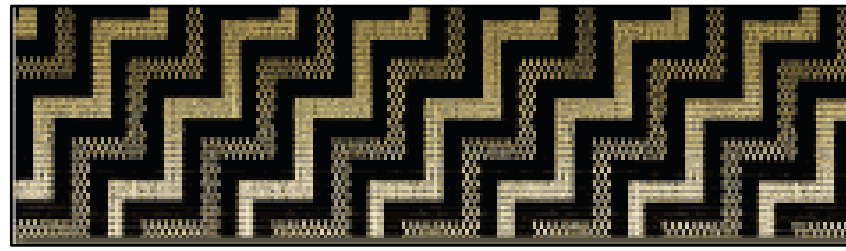
# Partnership with Māori



*Integrate VM and MM into research*



*Build capability*



*Protect tāonga species*

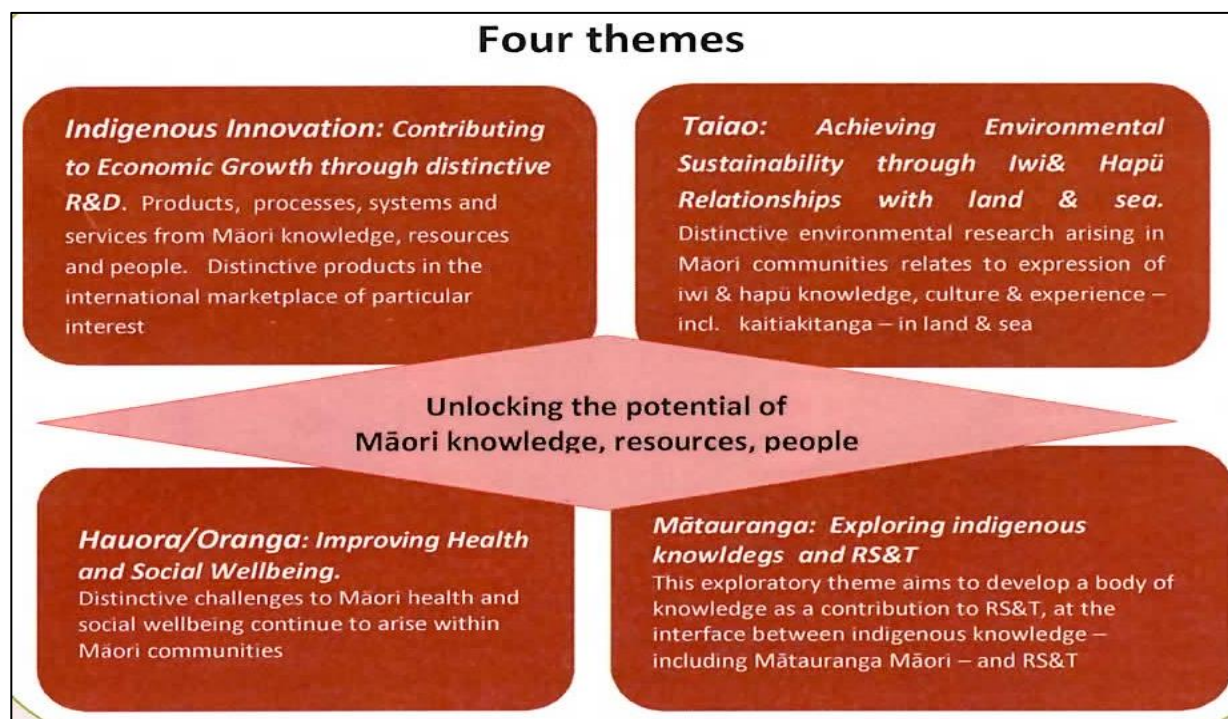


# Vision Mātauranga

**New knowledge / Māori knowledge:** unique traditional & evolving knowledge base; tikanga Māori, discovery processes

**New science capability / Māori people:** skills, creativity, youthful growing population, indigeneity, access to communities, tikanga-led ways of engaging, social structures

**New ways of discovery / Māori resources:** access to significant resources, stewardship, models, investments in productivity and sustainable development





# Engagement with Māori

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*Increasing level of Māori impact*

Whakamōhio Inform	Whakauia Consult	Whakauru Involve	Mahi Ngātahi Collaborate	Whakamanahia Empower
<b>MAORI PARTICIPATION GOAL</b>				
To provide Māori (whānau, hapū, iwi) with balanced and objective information to assist them in understanding the Challenge.	To obtain Māori (whānau, hapū, iwi) feedback on the Challenge and its research, direction etc.	To work directly with Māori (whānau, hapū, iwi) throughout the Challenge process to ensure that issues and concerns are consistently understood and considered.	To partner with Māori (hapū, iwi) in each aspect of the decision-making, development and implementation of the Challenge.	To place ultimate decision-making power in the hands of Māori (hapū, iwi).
<b>PROMISE TO MAORI</b>				
The Challenge will keep Māori (whānau, hapū, iwi) informed.	The Challenge will keep Māori (whānau, hapū, iwi) informed and will listen to and acknowledge concerns and, provide feedback on how Māori input has influenced the Challenge and its decisions.	The Challenge will work with Māori (whānau, hapū, iwi) to ensure that their concerns and aspirations are directly reflected in the Challenge and its research and provide feedback on how Māori input influenced the Challenges decisions.	The Challenge will look to Māori (hapū, iwi) for direct advice and innovation in formulating solutions and, incorporate their advice and recommendations into the decisions to the maximum extent possible.	The Challenge will implement what Māori (hapū, iwi) decide.
<b>EXAMPLE TOOLS</b>				
<ul style="list-style-type: none"> <li>Open days (via research programmes)</li> <li>Fact sheets</li> <li>Media releases</li> <li>Websites</li> <li>Hui</li> </ul>	<ul style="list-style-type: none"> <li>Focus groups</li> <li>Surveys / response requests</li> <li>Hui</li> </ul>	<ul style="list-style-type: none"> <li>Wānanga</li> <li>Workshops</li> <li>Kaihautu</li> <li>Kāhui Māori</li> </ul>	<ul style="list-style-type: none"> <li>Co-governance/Co-management</li> <li>Kāhui Māori</li> <li>Kaihautu</li> </ul>	<ul style="list-style-type: none"> <li>Treaty Settlement Legislation</li> <li>WAI 262</li> </ul>

# Case study: Te Turi Whakamātaki - Māori biosecurity network

- Inclusion of Māori kaitiaki,
  - Biosecurity rangatahi (intern) programme
  - Māori Biosecurity Network
- Te Turi Whakamātaki







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# Reducing risks and threats across landscapes

Maureen O'Callaghan  
Programme 2 Leader



# Numerous, diverse threats to productive and natural ecosystems

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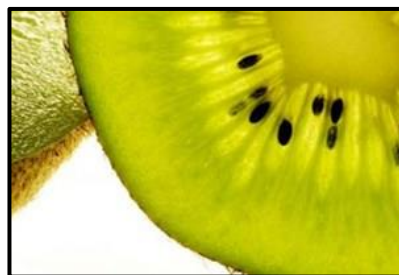
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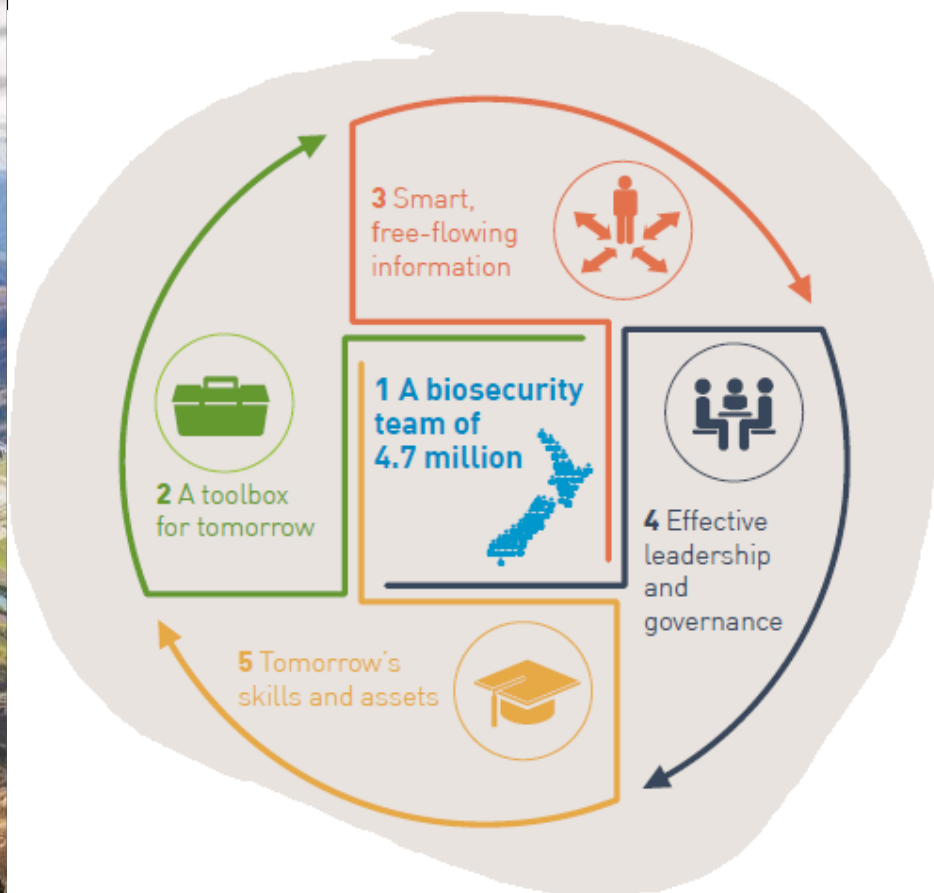
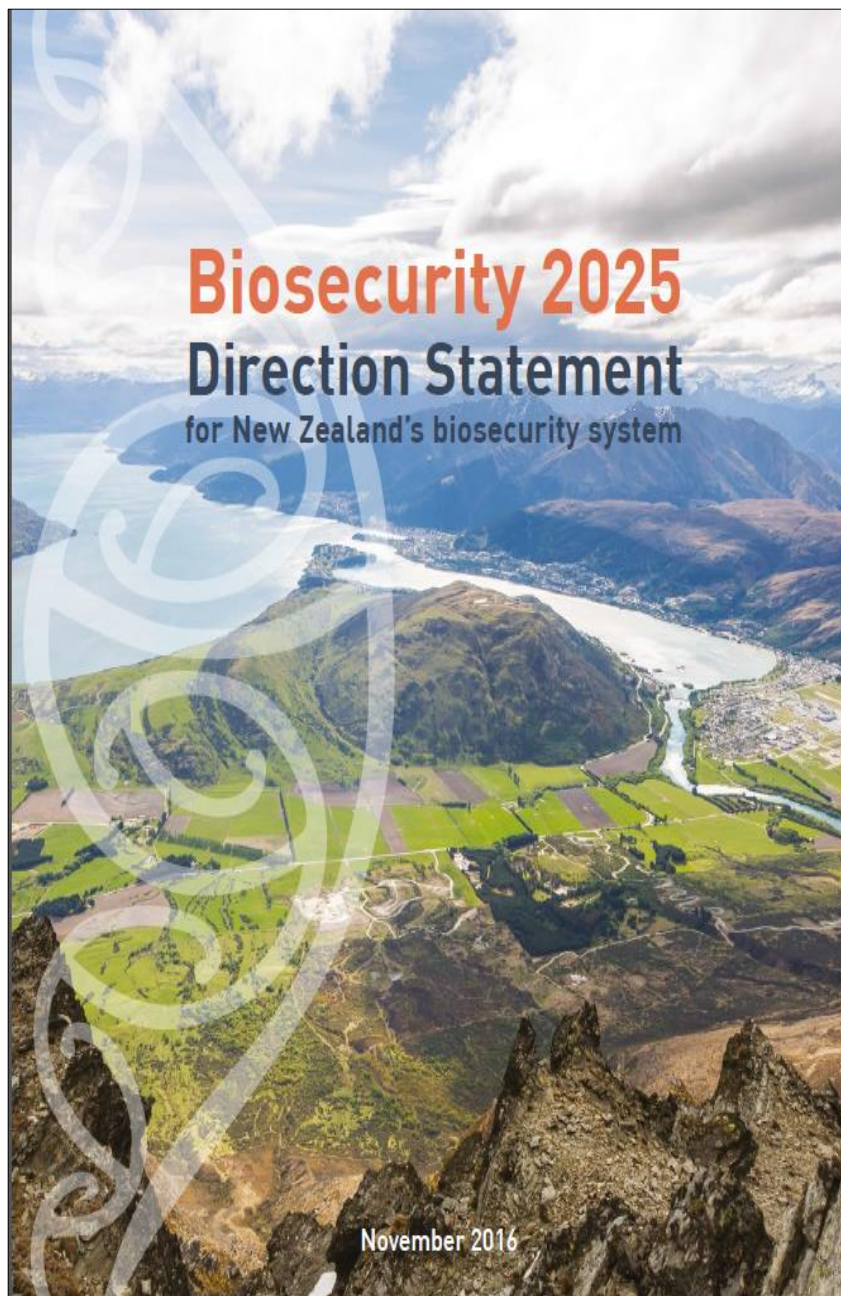
Images: MPI, DOC, Landcare, Zespri, AgResearch

# Challenge outcomes relating to biosecurity

- Public confidence and active engagement in NZ's biosecurity system is enhanced
- Primary sector market access and future investment opportunities are maintained and enhanced as a result of confidence in NZ's biosecurity system
- Resilience of natural and productive ecosystems to new and existing pests is enhanced
- New technologies and practices for cost effective, humane and sustainable biosecurity risk mitigation (pre-border, border, post-border) developed and introduced







Source: MPI



# Programme 2: Reducing risks and threats across landscapes

- Eight projects
- National and Challenge priorities
- Interdisciplinary, multi-institute
- Vision Mātauranga
- Social and culturally acceptable solutions
- Community engagement

# Science to future-proof NZ's biosecurity system

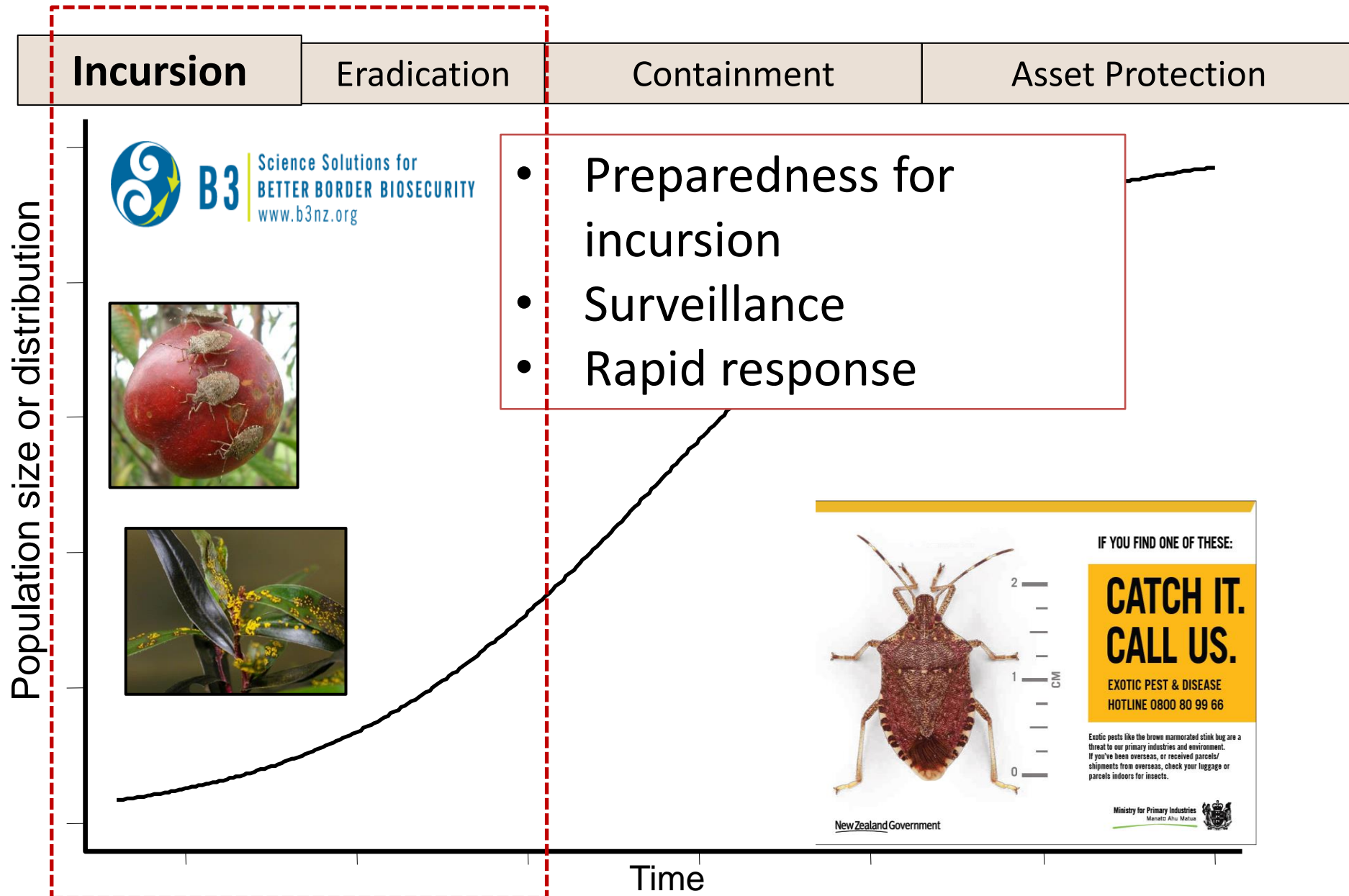
Incursion	Eradication	Containment	Asset Protection
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Population size or distribution



Time

# Science to future-proof NZ's biosecurity system





## 2.4: Māori solutions to biosecurity threats and protection of tāonga species

Amanda Black (LU), Nick Waipara (Auckland Council)

**Mātauranga approaches included in iwi and Māori organizational responses to biosecurity risks and threats**

- Disease of indigenous taonga species – Myrtle rust



# NZ readiness, preparedness and response plans for myrtle rust in place e.g. DOC; MPI; Councils

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- Previous analyses (Ropata 2015; Tuelon et al 2015; Clark 2011) identified myrtle rust as having “moderate to high potential socio-cultural consequences for Māori”
- No Māori led responsiveness or prioritisation in place – cultural risk impact // assessment
- 2.4.1 will address this gap using engagement framework & matauranga Māori
- Build on, & align with current national initiatives e.g. DOC/MPI



Ministry for Primary Industries  
Manatū Ahu Matua

## A BIOSECURITY RISK FOR NEW ZEALAND

### MYRTLE RUST *Puccinia psidii*

Also known as guava rust, eucalyptus rust or ohia rust



Myrtle rust on willow myrtle (*Agonia flexuosa*).



Myrtle rust on pohutakawa (*Metrosideros* species).

**The threat**  
Myrtle rust is a plant pathogen which can have serious consequences to various species of plants in the Myrtaceae family. The Myrtaceae family includes eucalypts, feijoas, guava and New Zealand native plants such as pohutakawa, rata, and manuka. While the susceptibility of plants in New Zealand is unknown, some native plants, amenity plants, forests and cut flowers are at risk.

**WHAT IS MYRTLE RUST?**  
Myrtle rust is caused by the fungus *Puccinia psidii* which is native to Brazil. In 2010, myrtle rust was detected in Australia where it has affected more than 200 plant species. Many of the known host plant species in Australia are also grown in New Zealand. Plant susceptibility to this disease is quite varied depending on location and environmental conditions – i.e. this disease affects different species of Myrtaceae in different countries.

**HOW DOES IT SPREAD?**  
Myrtle rust spores cannot be seen with the naked eye. The spores are easily transported large distances via wind and contaminated clothing and equipment as well as shorter distances via insects and rain splash. Myrtle rust is currently not known to be present in New Zealand. If it were to arrive, early detection is critical as this disease would be extremely difficult to eradicate.

**WHAT TO LOOK OUT FOR**  
The identifying symptom of this disease is powdery bright yellow or orange-yellow pustules on actively growing leaves, shoots, flower buds and fruits of infected plants. Leaves may become buckled or twisted and die off. Severe infections can lead to death of susceptible host plants.

If you see myrtle rust in New Zealand, please contact the Ministry for Primary Industries immediately on the

**Pests & Diseases Hotline**

**0800 80 99 66**

and report the location.

If possible take a photo. **DO NOT ATTEMPT TO COLLECT SAMPLES** as this could increase the spread of this disease. MPI will dispatch investigators to collect samples safely.

**MORE INFORMATION**  
The following websites provide useful information about myrtle rust:

<http://www.biosecurity.govt.nz/pests/guava-rust>

[http://www.outbreak.gov.au/pests\\_diseases/pests\\_diseases\\_plant/myrtle-rust/index.html](http://www.outbreak.gov.au/pests_diseases/pests_diseases_plant/myrtle-rust/index.html)

**www.biosecurity.govt.nz**

New Zealand Government

Growing and Protecting New Zealand

June 2013

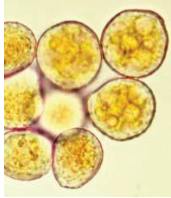


# Whakawāteatea riha rāwaho: Myrtle rust case study



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## 5-year outcome (end of project):

- Iwi, hapu, whanau, Māori organisations and Māori community rōpū will have access to information, methods and strategies that will ensure a Māori response to the incursion and management of myrtle rust in New Zealand.

## 10-year outcome:

- Preparing Aotearoa against all exotic unwanted organisms: Tangata Whenua (iwi, hapu, whanau, Māori organisations and Māori community rōpū) will be prepared, and in full partnership for all pre border biosecurity responses that are a priority to Māori.



## 2.5: Mobile technology to protect NZ from biosecurity threats

Steve Pawson (Scion)

### Equipping NZ's 4.7M biosecurity defence force for surveillance of high priority threats

- Flexible model for fast, easy to use system for identifying, reporting, and responding to plant and animal pests
- Link to NatureWatch NZ site and other databases
- Proof-of-concept in two case studies – primary sector and public participation



Incursion

**Eradication**

Containment

Asset Protection



**B3**

Science Solutions for  
BETTER BORDER BIOSECURITY  
[www.b3nz.org](http://www.b3nz.org)

Population size or distribution



Eradication response



1996

Time

Images: MPI, MAF

## 2.2 Novel pest control technologies

Phil Lester (Victoria University)



### Next generation tools for landscape scale control of existing pests and combat incursions

- Wasps as case study – public nuisance, impacts on native fauna and productive sector
- State of the art technologies (RNAi, Trojan female technique)
- Delivery of pheromones and insecticides
- Eradication strategies – modelling
- Social acceptability of tools





## 2.6: Public perceptions of the use of novel pest control methods

Edy MacDonald (DOC)



### Impact of beliefs, attitudes and values on public acceptance of novel technologies

- Two case studies – wasps and rats
- Large scale survey data
- “General public” and key stakeholders
- Assisting DOC, MPI, RCs to commence public engagement on potential novel technologies



Incursion

Eradication

**Containment**

Asset Protection

Limiting spread of incursion pests, weeds and diseases

Population size or distribution



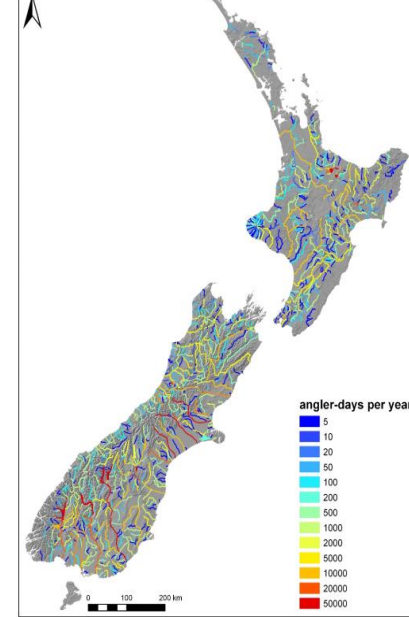
Time

## 2.1 Biosecurity network interventions

Philip Hulme (Lincoln University)

### Human assisted networks that underpin spread of pests, weeds, and diseases

- Four diverse networks – livestock, nursery, waterways, tourists
- Generic patterns in introduction and spread?
- Identifying critical intervention points – surveillance and spread, economic impact
- Multiple stakeholders - MPI, RCs, DOC





## 2.8: Stopping kauri dieback in its tracks

Monica Gerth (University of Otago)

### Inhibiting the spread of kauri dieback pathogen – *Phytophthora agathidicida*

- Biochemical basis of attraction of spores to kauri trees
- Preventing spread to uninfected trees
- Linking with Tangata Whenua Rōpu – compatibility of treatments with tikanga



Incursion

Eradication

Containment

**Asset Protection**

Population size or distribution



- Protecting productive and natural ecosystems
- Preserving and enhancing biodiversity



Time





[Home](#) > [Our work](#) > [Predator Free New Zealand 2050](#)



# Predator Free New Zealand 2050

*Predator Free New Zealand is an ambitious, world-leading \$28 million project to fight back against the introduced pests which threaten our nation's natural taonga, our economy and primary sector.*

Eradication of predators from island reserves and large areas of unfenced landscape; science capable of eradicating one small mammal predator



## 2.3: High-tech solutions to invasive mammal pests

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James Russell (University of Auckland)

### Tools and deployment strategies to eliminate small mammal pests across natural and productive sectors

#### Affordable landscape-scale control tools

Rats, stoats and possums

Genome mining to design host-specific toxin for possums

Identify NZ appropriate options for genetic-based population suppression

- Trojan Female Technique – proof-of-concept, non GMO approach



# High-tech solutions to invasive mammal pests

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## Novel tools for landscape-scale surveillance and detection

- Designer lures for stoats
- Biosensors for mammal pests
- Bioethics panel
- Social licence to operate
- Community group hui (Northland, Hawkes Bay, Otago)



Image: DOC



# Reversing decline of NZ's biological heritage through community action....

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Images: MPI, Kauri Rescue



## 2.7: Community control of kauri dieback: Tiaki mo kauri

Ian Horner (Plant & Food)

### Kauri Rescue: a citizen science initiative

- Waitakere residents implementing proven remedy on infected trees
- Exploring ideas from community
- Social science
- What works? Best practice

1 A biosecurity team of 4.7 million



#### Social Science Input

Kaitiaki - community & science working together

Focus of activity in THREE communities

- Partnership
- Community Engagement
- Collaborative learning
- Integrating Scientific & Local knowledge

# Citizen Project Kauri Rescue is underway...

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<http://www.kaurirescue.org.nz/>

To learn more...



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8-10 May, 2017, Te Papa

Biosecurity 2025, Indigenous values – biocultural heritage,  
Predator-free NZ 20150, Genomics and disruptive  
technologies, Social licence to operate, Ecosystem restoration,  
Threatened species summit



# How to connect with the Challenge

[www.biologicalheritage.nz](http://www.biologicalheritage.nz)

@BioHeritage\_NZ



New Zealand's Biological  
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# National **Science** Challenges

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Hosted by



**Landcare Research**  
Manaaki Whenua

