



Potential easterly airbridges that may have brought a Fall Army Worm moth to Aotearoa (this pest has now established).

Protecting Aotearoa from aerial invaders in a changing climate

The wind provides aerial pathways to assist flora and fauna to reach Aotearoa. With a changing climate we are seeing more unwanted organisms coming in on these pathways.

It's time to learn how we can strengthen our "biosecurity net" to predict when organisms may arrive and which are more welcome than others.



Background

Over time, New Zealand has battled multiple unwelcome insects and pathogens which arrived by wind and are now established. Here and globally there is a critical gap in biosecurity defences allowing this spread.

The problem could worsen with the changing climate so it is time to strengthen our biosecurity net and develop advanced warning of arrivals.

Aims

'Protecting Aotearoa from aerial invaders in a changing climate' is a Scion-led research programme to develop a novel warning system titled Aerobiological Surveillance and Prediction System (ASaP) to alert us when conditions are right for the aerial arrival of insects and pathogens. It runs from October 2023 to September 2028.

The team aims to overcome critical knowledge gaps in atmospheric science, aerial invader biology, how organisms survive the journey in extreme atmospheric conditions, modelling techniques for how airbridges connect Aotearoa New Zealand to other landmasses, and how materials are deposited on land.

A baseline dataset of species arrivals will be established with help from Taranaki Mouna Project.

Partnership

The project has a strong partnership with Taranaki Mouna Project, working together to find locations for scientific monitoring and supporting the integration of the science into efforts to protect their mouna. They will help with surveillance and identify research that can benefit Taranaki iwi and mana whenua to meet the needs and wants of their whenua.

The programme includes outreach, education and development opportunities that will expose Taranaki tamariki to hands on science education.

Outcomes

The warning system (ASaP) will help predict when organisms may arrive, if they are a threat and flag locations for surveillance before insects and pathogens could become established.

A successful programme will:

- Modernise outdated conventional wind trajectory modelling.
- Understand which land masses aerial invaders come from, how frequently 'airbridges' form, and how the frequency and locations of these airbridges are changing.
- Develop new knowledge about how insects and microbes move from airbridges to the ground.
- Fill knowledge gaps on insect and microbe survival/mortality in extreme atmospheric conditions during long-distance transport.
- Enable continued research in Taranaki through community and tamariki (youth) engagement.
- Partner with Māori kaitiaki to quantify a baseline of aerial invader arrivals to monitor future changes.

The science team estimates preventing establishment of just one serious pest would recover programme costs 10 to 100 times (NZ\$0.125b-1.25b) through avoided losses to our economy in the forestry and/or horticulture sectors, maintenance of carbon sequestration, and biodiversity conservation.

The warning system will be run in hindcast to inform optimal surveillance locations, in forecast to predict invasions before they occur, and in hindcast and forecast to predict where organisms could travel within New Zealand after arrival.

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About Scion

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