

Natural Enemies – Natural Solutions for Pacific Weeds



Manaaki Whenua
Landcare Research



PRISMSS



NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere



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Weeds in the Pacific



- So many species requiring management already & the list keeps growing.
- Big issue for agriculture & horticulture (= food security).
- Reduce access to & quality of water.
- Cause human & animal health issues.
- Threaten biodiversity.



Climate Change



- Weeds will get worse.
- Increasing CO₂, temperatures and disturbance will all favour weeds.
- Weeds need to be better managed for Pacific Communities to be more resilient to the impacts of climate change.



Biocontrol is the only Answer



- All Pacific islands have little capacity to manage weeds safely or sustainably.
- Biocontrol is the only safe, effective and sustainable method for controlling widespread weeds.
- 100 year history worldwide, including the Pacific. Well developed underpinning science and an excellent safety/success record.
- Many weed issues in common e.g. mile-a-minute, African tulip tree, so it is possible to have a regional focus.



But...



- It can take 5-10 years to find and develop agents for new targets & release them widely, requiring significant & stable funding.
- Biocontrol can lack visibility. When weeds slowly disappear credit for the approach is not always given.
- Some are afraid/suspicious because of ill-conceived introductions, including regulators.
- Assistance from developed countries with containment facilities will always be needed.
- Many research organisations can only work on projects of immediate relevance to their country, but not MWLR!



A Forgotten Tool?



- Since 1911, 17 PICTs have released 68 natural enemies against 27 weeds.
- Some stunning successes, but activity fell away in recent decades.



Salvinia (*Salvinia molesta*) on the Sepik River, PNG, before and after the release of the salvinia beetle (*Cyrtobagus salviniae*)

Assault on the Sepik video: <https://youtu.be/pioCVfr3dsY>



Teouma River, Efate,
Vanuatu, 2004 before
biocontrol.

2008 after release of a
weevil (*Neochetina
eichhorniae*).



2009 This Story Begins



Project in the Cook Islands



- Smothering vines cause deforestation in Rarotonga's forested watershed.
- Potential risk to the island's hydrology/water supply.
- Also threatening endemic plant species (1 already extinct & 9 critically endangered).
- Ambitious project required. Necessary to target multiple vines concurrently.
- Also other weeds threatening food security & biodiversity.



Remote-sensing image illustrating the extent of invasive vines (in red) on Rarotonga.

6-Year Project

- Began November 2013.
- Funded by MFAT ~\$1m.
- Developed an approach to assist countries to determine their priorities.
- Delivered 6 agents for 6 targets. 3 known agents and 3 novel.
- Developed 7th agent delivered in 2021.
- Highly successful. Some great results achieved quickly.

Mile-a-minute (*Mikania micrantha*)



Biocontrol agent: *Puccinia spegazzinii* rust fungus

Cocklebur (*Xanthium pungens*)



Biocontrol agent: *Puccinia xanthii* rust fungus

Red Passionfruit (*Passiflora rubra*)



Biocontrol agent: *Heliconius erato cyrbia* butterfly

African tulip tree (*Spathodea campanulata*)



Biocontrol agent: *Colomerus spathodeae* mite

Strawberry guava (*Psidium cattleianum*)



Biocontrol agent: *Tectococcus ovatus* scale insect

Grand balloon vine (*Cardiospermum grandiflorum*) *micrantha*



Biocontrol agent: *Puccinia arechavaletae* rust fungus



Turangi Valley, Rarotonga,
2017, before release of agents
for mile-a-minute, grand
balloon vine & red passionfruit.

Turangi Valley, Rarotonga,
2019, after release of mile-a-
minute rust, grand balloon
vine rust & the red postman
butterfly.





Rarotonga, December 2017,
before balloon vine rust was
released (left) and after,
November 2018, (below),
balloon vine virtually gone.



Vanuatu Project



- Began July 2018.
- Focus on supporting beef industry.
- Working with Biosecurity Vanuatu and the VARTC to build new biocontrol capacity.
- Develop biocontrol for 3 novel targets and utilise agents for 5 existing targets.
- Aim to ultimately benefit wider South Pacific.
- Significant challenges from coconut rhinoceros beetle incursion, covid & cyclones.





- Prickly solanum (*Solanum torvum*)



- Hibiscus burr (*Urena lobata*)

- Wild peanut (*Senna tora* & *S. obtusifolia*)



Utilise Existing Agents



- Lace bug (*Carvalhotingis visenda*) for cats claw creeper (*Dolichandra unguis-cati*).
- Gall mite (*Colomerus spathodeae*) for African tulip tree (*Spathodea campanulata*).
- Beetle (*Zygogramma bicolorata*) for parthenium (*Parthenium hysterophorus*).
- Psyllid (*Heteropsylla spinulosa*) for giant sensitive plant (*Mimosa diplotrica*).
- Bud mite (*Aceria lantanae*) and/or fly (*Ophiomyia camarae*) for lantana (*Lantana camara*).



PRISMSS



- Pacific Regional Invasive Species Management Support Service.
- Established in 2019.
- A service available to the whole Pacific.
- Regional mechanism to facilitate the scaling up of invasive species management in the Pacific.
- Provides management support for on the ground invasive species actions, through streamlining and coordinating activities and invasive species management experts.

<https://www.sprep.org/invasive-species-management-in-the-pacific/prismss>

PRISMSS Partners & Programmes



viclink

Protect Our Islands

National and inter-island
biosecurity and EDRR



Department of
Conservation
Te Papa Atawhai

Predator Free Pacific

Removal of mammalian predators
from islands



War on Weeds

Management of High Priority
Weeds



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Natural Enemies-Natural Solutions

Biological control of widespread
weeds



Department of
Conservation
Te Papa Atawhai

Resilient Ecosystems- Resilient Communities

Priority area ecological restoration



MISCCAP



- Managing Invasive Species for Climate Change Adaptation in the Pacific: a PRISMSS-NZ Collaboration for Pacific Resilience.
- Began March 2020.
- Collaboration between SPREP, MWLR, NZDOC.
- Funded by the NZ Ministry of Foreign Affairs & Trade. \$9.9m over 4 years.
- Involves the Cook Is, Fiji, Niue, Marshall Is, Samoa, Tonga, Tuvalu & Vanuatu.
- Designed to complement other invasive species projects underway funded by others e.g. GEF-6.



Natural Enemies – Natural Solutions



- Build capacity and capability to undertake NENS.
- Support collaboration through the sharing of lessons, stories, expertise, and natural enemies already present in the Pacific.
- Develop better information about what NENS opportunities are available to PICTs and determine the top priorities.

← → ↻ 🏠 🔒 <https://nensoption.com>

Biocontrol For Pacific Weeds Main ▾ Biocontrol Status ▾ FAQs ▾ Contact Us ▾

Main ▾

 **Pacific Weeds**

All weed species reported in each of the Pacific island countries and territories

 **NENS Releases**

All natural enemies that have been introduced into the Pacific region along with their current status, i.e. whether the natural enemy established and the level of control they are achieving in that country

 **NENS Options**

All weed species recorded in the Pacific that are also biological control targets, i.e. the weed species listed in the Weed Matrix on which natural enemies have been released, and the status of natural enemies released in each country in the Pacific. This table also lists natural enemies that are not present in the Pacific but that are available for introduction from elsewhere, and their

 **Weed Local Names**

Common names known to be used for all weed species recorded in the Pacific that are also biological control targets





Giant Sensitive Plant



A psyllid (*Heteropsylla spinulosa*) means little or no control is needed in many PICTs, but most people are unaware of it.



Prioritisation



Using tools developed in NZ to help PICTs determine their top priorities.

Koster's Curse (*Miconia crenata*)



African Tulip Tree (*Spathodea campanulata*)



Air Potato (*Dioscorea bulbifera*)



We are evaluating known agents, such as the defoliating air potato beetle (*Liliopheris cheni*) used in Florida.



Chromolaena

(Chromolaena odorata)



Also the chromolaena gall fly (*Cecidochares connexa*), widely used, including Australia and PNG. Stops flowering, kills branches & plants.



Leucaena (*Leucaena leucocephala*)



The psyllid (*Heteropsylla cubana*) which has already self-introduced to some islands but not others.



Singapore daisy (*Sphagneticola trilobata*)



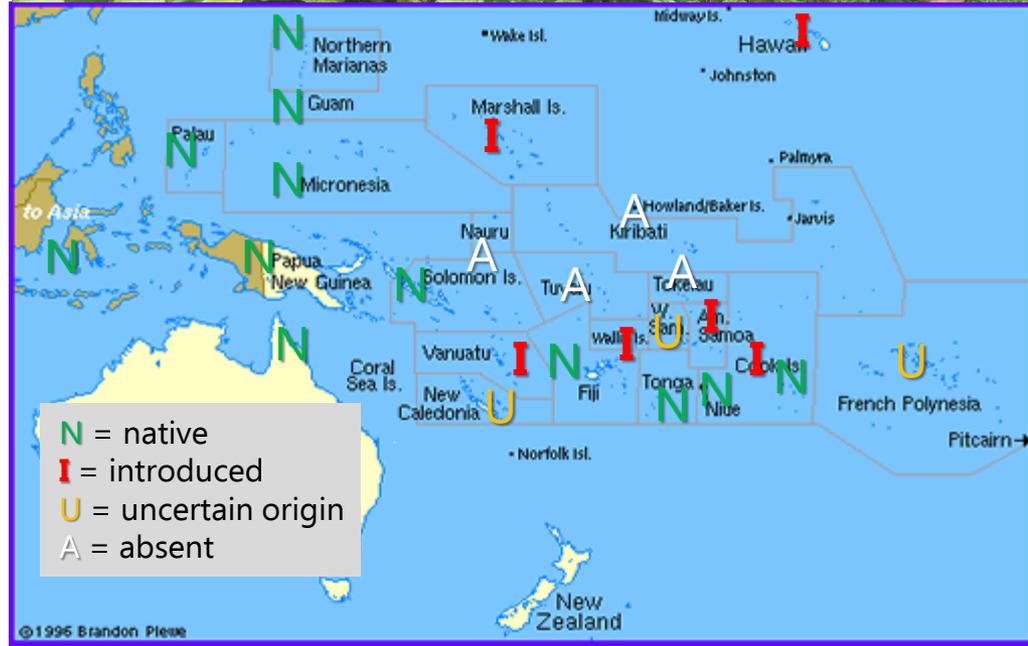
Also creating new solutions for serious emerging weed threats in the Pacific.

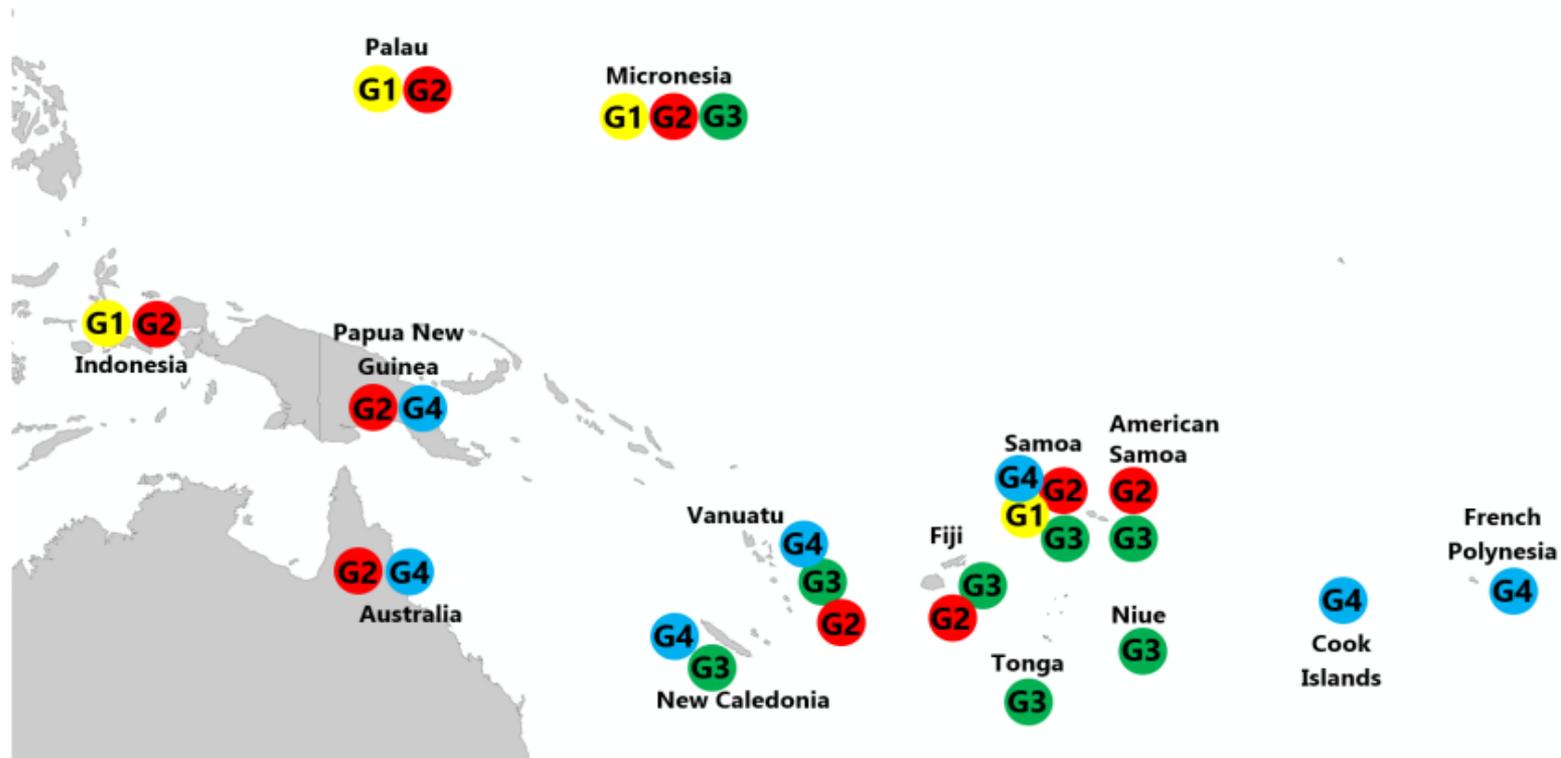


Merremia (*Decalobanthus peltatus*)



- Smothering vine ranked as one of the most important CI weeds.
- BUT present on many Pacific islands when European botanists first documented regional floras.
- Is it native or was it an early Polynesian introduction or both?
- Do we have a problem with native plants becoming weedy?
- What can DNA tell us?





Presumed origin is the Indo-Malaysia region. Molecular study found 4 genotypes, and a strong pattern of increasing genetic distance with geographic distance. This supports colonisation of *D. peltatus* throughout the Pacific from older natural sources and/or by Polynesian means. Also found some recent human-assisted spread of material from the original native range to a number of locations. So native and introduced genotypes.

Taro vine/Devil's ivy (*Epipremnum pinnatum* cv *aureum*)







Albizia (*Falcataria moluccana*)



Collaborating with Hawai'i to find suitable natural enemies.



New Project Trialling Aerial Tools at Different Scales



Testing their utility for detecting weeds, assessing extent of infestations, establishment of biocontrol agents and changes to weed infestations over time.



50 cm



10 cm



≤ 4 cm

Key Lessons



- Build a team of in-country experts/champions & wide support base for biocontrol activities.
- Regular visits to keep up momentum.
- Adapt to local conditions & customs (big learning curve).
- Plan for setbacks.
- Closely monitor new agents - successful ones can work quickly in the tropics!
- We can make a difference!





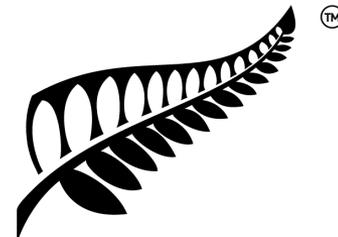
PPID



- A NZ group recently formed to strengthen assistance, enhance impact, prevent duplication, and streamline resources: **Plant Protection in International Development.**
- Interim committee formed: Sulav Paudel (Convener), Lynley Hayes, Monica Gruber, Trevor Jackson, David Teulon, and Disna Gunawardana.
- Public announcement soon to invite anyone interested in being involved (including those not currently working in the Pacific) via the NZ Plant Protection Society and other avenues.

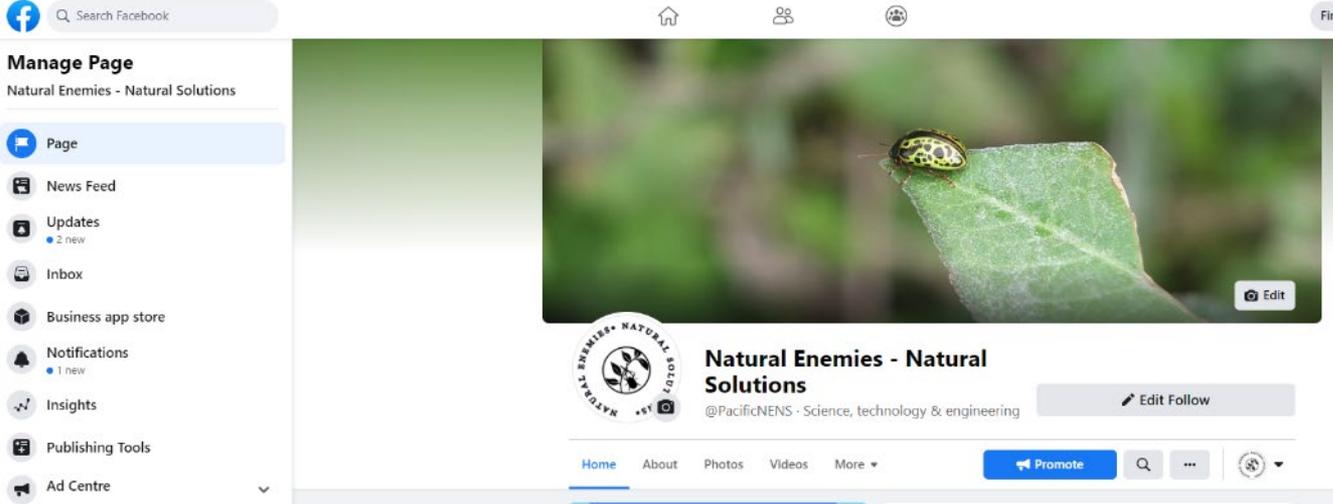


**Faafetai lava
Fakaue
Fakafetai
Kommool tata
Malo
Meitaki Ma'ata
Tank Yu Tumas
Thank You
Vinaka**



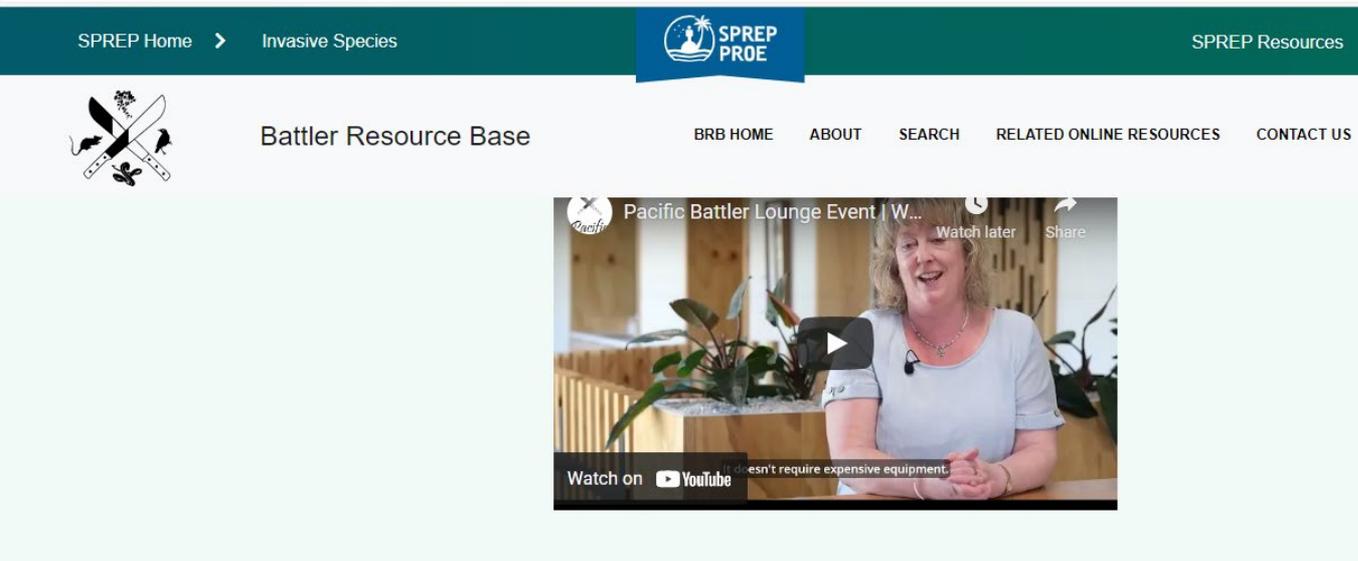
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Questions

