Weed Biocontrol

WHAT'S NEW?

#109

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Manaaki Whenua
Landcare Research

Contents

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COVER IMAGE:
Hibiscus bur flower

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ISBCW is Coming to NZ in 2026!

The International Symposium on Biological Control of Weeds (ISBCW) is the most important event for weed biocontrol scientists all over the world. The event provides an opportunity for participants to exchange updates on weed biocontrol research and work programmes, renew ties of friendship, develop new collaborations, and discuss the way forward for the biological control of weeds.

The next ISBCW symposium will be held in Rotorua from the 8th to the 13th of March 2026, a little over 18 months away. The symposium will present an opportunity to hear from keynote speakers and other leading experts from various countries as they share their latest work. There will be plenty of networking opportunities and a chance to participate in a local field trip to see biocontrol of weeds in action in the local area. There will also be a post-conference field trip to Rarotonga, which will offer the opportunity to learn more about the pivotal role of biocontrol as the ultimate solution for managing widespread tropical Pacific weeds.

To find out more about the event and stay up to date with the latest news, please register on the ISBCW Rotorua website (http://www.isbcw-rotorua.com/#register). We also invite you to share awareness of the symposium widely with those who may be interested.

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Scan the QR code to sign up to ISBCW updates

Still Searching for Woolly Nightshade Agents

During early summer last year our collaborators, Nic Venter and Blair Cowie from the University of the Witwatersrand (Wits) in South Africa, along with Holly Cox (Auckland Council), undertook a survey for the natural enemies of woolly nightshade (*Solanum mauritianum*) in Uruguay. Field surveys were undertaken in areas with the highest known abundance of woolly nightshade, predominantly in the southeast of Uruguay between the Punta del Este and Aiguá regions.

The surveys focused on the assessment and collection of three promising candidate biocontrol agents: a stem-galling weevil (*Collabismus notulatus*), a stem-boring weevil (*Conotrachelus squalidus*), and a flower-bud-feeding weevil (*Anthonomus morticinus*). The flower-bud-feeding weevil is already undergoing host specificity testing at Wits, but it was targeted for re-collection to boost the genetic diversity of the laboratory colony. Local *Solanum* species were also surveyed to gain better insights into the insect assemblages associated with close relatives of woolly nightshade to help identify more generalist species.

Twelve insect species were found to be associated with woolly nightshade during this survey trip, but at least three (two beetles and a bug) are known pests. Unfortunately, the stem-boring and stem-galling weevils were not encountered, despite surveying sites where they were previously collected. Although only one of the three target species was collected (the flower bud weevil), two new insect candidates – a flea beetle (*Epitrix* sp.) and an unidentified leaf-tying moth in the family Gelechiidae – were imported into the containment facility at Wits for further assessment.

The flea beetles were highly abundant on woolly nightshade in Uruguay and were very damaging to plants at some of the survey sites. Approximately 200 adults were imported into containment at Wits in December. These flea beetles are gregarious, mostly clustering on the underside of woolly nightshade leaves and causing extensive 'shothole' feeding pits. Although the beetles were not found on most local *Solanum* species surveyed, they were present and feeding, albeit to a lesser extent, on American black nightshade (*Solanum americanum*) (native to NZ), when growing in close proximity to woolly nightshade. In addition to this, as well as being difficult to rear (no eggs, larvae or new adults have been observed), adult feeding on potato (*Solanum turberosum*) in preliminary adult no-choice feeding tests ruled the flea beetle out as a candidate biocontrol agent.

The leaf-tying moth appeared to be the most abundant insect on woolly nightshade in Uruguay at this time of the year, being found at nearly all sites and on plants of varying ages. However, the level of damage was variable, with the foliage of some plants heavily tied (c. 50–70 % of the leaves) and others showing only a few ties. "Leaf ties appear very damaging, causing large sections of the leaf to desiccate and later necrose," explained Nic. "Because of the moth's high abundance and apparent damage to woolly nightshade, leaf ties containing larvae were collected for assessment of the moth's host specificity. However, unfortunately host range assessments were quickly abandoned due to extensive feeding and complete larval development on potato," he added.

This means that the flower-bud-feeding weevil remains the only candidate agent for woolly nightshade. Approximately 70 adult weevils were collected and imported into containment to supplement the colony at Wits. The field surveys of other *Solanum* spp. that did not turn up this weevil species provides good evidence of its narrow field host range. These small, black weevils are typically found nestled within the flowers and buds of woolly nightshade and are believed to be the main insect responsible for the reduced flowering, and hence fruiting, of woolly nightshade in Uruguay. Adults feed on the flower petals and anthers, as well as on the young leaves. Eggs are laid into new flower buds, and the larvae entirely destroy the bud as they develop.

Extensive host range testing with the flower bud weevil on crop plants in the Solanaceae has yielded positive results so far, indicating low non-target risks to various prominent agricultural species such as eggplant (*Solanum melongena*), potato, tomato (*Solanum lycopersicum*), and chillis/peppers (*Capsicum annuum*).

"Testing of New Zealand native poroporo species (*Solanum aviculare* and *S. laciniatum*) has been severely delayed but remains the focus of this collaborative project, in addition to conducting further surveys in the native range," said project leader Angela Bownes. "Future surveys will focus on plant pathogens as candidate biocontrol agents for woolly nightshade in New Zealand, alongside the continued search for new insects of interest," she added.

This project was jointly funded by the National Biocontrol Collective and the Ministry for Primary Industries' Sustainable Food and Fibre Futures Fund (Grant #20095) on multi-weed biocontrol.

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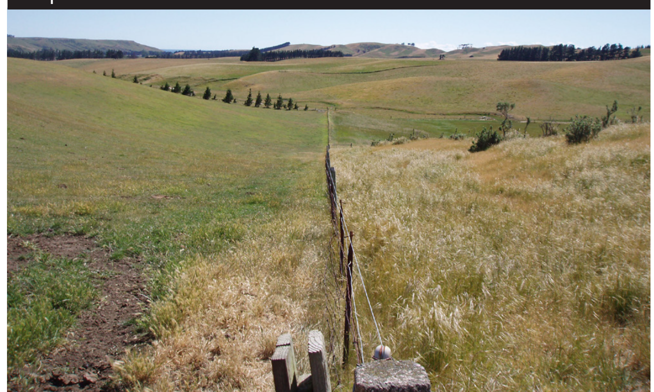
Holly Cox surveying woolly nightshade

New EPA Approvals

Exciting news! We have five new release approvals from the Environmental Protection Authority (EPA) for biocontrol agents for two target weeds, purple loosestrife (*Lythrum salicaria*) and Chilean needle grass (*Nassella neesiana*).


Purple loosestrife

Trevor James


Chilean needle grass

Purple loosestrife

In May 2024 the EPA approved an application from Horizons Regional Council to release four insects – two leaf beetles (*Galerucella calmariensis* and *Galerucella pusilla*), a stem-feeding weevil (*Hylobius transversovittatus*), and a flower-feeding weevil (*Nanophyes marmoratus*) – for the biocontrol of purple loosestrife in New Zealand. Introduced as an ornamental plant for its showy purple flowers, purple loosestrife has become a harmful invasive weed, particularly in Lake Horowhenua and surrounding areas in Manawatū on the west coast of the North Island. This tall, perennial plant outcompetes native plants in wetlands, reduces biodiversity, and can clog waterways. Current control methods such as manual removal and the use of herbicides are costly, have limited effectiveness, and can damage the delicate wetland environment.

The USA and Canada deployed these same four insect species in the early 1990s as part of their biocontrol programmes against purple loosestrife. The agents have proven to be effective there, with populations of the weed reduced by up to 90% at some sites within the first decade. This presented an opportunity for New Zealand to piggy-back on these well-established programmes using the host range testing data and evidence from the field to support a release application to the EPA for all four agents.

Horizons Regional Council, other National Biocontrol Collective members, and MWLR undertook pre-application consultation with Māori, which will continue, particularly in Horowhenua, as we start to prepare for the first releases planned for spring 2025.

Chilean needle grass

After more than 30 years of hard work and perseverance the journey of the Chilean needle grass rust (*Uromyces pencanus*) has come to an end – or rather can finally start! The rust fungus was approved for release in New Zealand, for a second time, in early July.

The story began in the 1990s when the Cooperative Research Centres in Australia launched a project to research potential biocontrol agents for Chilean needle grass and nassella tussock (*Nasella trichotoma*). Our Argentinian collaborator, Freda Anderson (CONICET), was contracted to search for potential agents in the native range of Argentina. In 2001 New Zealand joined the project by providing additional funding for Freda's work and had greater involvement as the project progressed.

The journey was far from smooth. We faced numerous challenges, including stubborn fungi that resisted cultivation for host range testing. By the time this testing was complete, and the EPA's predecessor approved the release of the rust fungus in 2011, Argentinian export regulations prevented export of the rust to New Zealand.

While we waited patiently, a revised phylogeny of the grass family (*Poaceae*) revealed that three New Zealand native grasses are more closely related to Chilean needle grass than had been initially determined. This meant additional host range testing was required, which could only be completed with an export permit from Argentina. After a decade-long wait we finally imported the rust into New Zealand and testing was completed by October 2023. Once a report was submitted to the EPA with the new host range results, a decision-making committee was convened, which approved the release of the rust without a public hearing.

Unfortunately, the strain of *U. pencanus* approved for release does not infect Hawke's Bay populations of Chilean needle grass, so future work will need to focus on finding effective strains for the North Island populations. We are currently preparing for the first release in Marlborough this spring. We hope that all the hard work and determination will pay off and the rust will flourish, contributing to management of the Chilean needle grass rust in the South Island.

The purple loosestrife project is funded by Horizons Regional Council. The Chilean needle grass project is funded by the National Biocontrol Collective and the Ministry for Primary Industries' Sustainable Food, Fibre and Futures Fund.

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Welcome to Our New Team Members

Welcome Indigo Michael

Indigo joined the Biocontrol & Molecular Ecology team at MWLR in July as a coordinator of the Pacific Natural Enemies – Natural Solutions (NENS) programme and is based at our Tāmaki site. Indigo has a background in microbial ecology, having recently completed an MSc at the University of Auckland examining the soil microbiome of kauri trees affected by kauri dieback (*Phytophthora agathidicida*) in the Waitākere Ranges in Auckland. Her thesis explored how soil bacteria can be used as biological indicators of pathogen presence, and used machine-learning models to determine whether these bacterial bioindicators can offer a quicker, more sensitive way to detect the pathogen in the environment.

After finishing her MSc, Indigo worked at Auckland University of Technology (AUT), where she used her molecular-based experience to look at the effects of different agricultural and horticultural practices on the fungal and bacterial communities in soil. She also worked on developing less destructive and quicker protocols for sampling mycorrhizal fungi from the roots of native trees.

Alongside her scientific work, Indigo has always had a passion for science education and mentoring. She taught in undergraduate labs at the University of Auckland and worked as both a mentor and a coordinator of the Tuākana programme, an inclusive learning environment for Māori and Pasifika science students. Indigo is excited to contribute to the meaningful work the NENS team carries out in the Pacific and is especially excited to meet new people and explore the diversity and knowledge the Pacific holds.

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Indigo Michael

Annette Mwayawa

Welcome Annette Mwayawa

Annette also joined the team in early July this year, as a second coordinator for the Pacific NENS programme, and is based at our Lincoln site. Annette has a background in crop agronomy and recently completed a PhD in plant science. It was her interest in enhancing crop production that brought her to Lincoln University and New Zealand from Papua New Guinea. Her PhD focused on plant physiology and understanding the important aspects of canopy development that contribute to variability in maize grain yield.

Annette has spent most of her career at Papua New Guinea University of Natural Resources and Environment, teaching, engaging with industry-based research projects, and working with farmer groups to improve husbandry practices and farm-gate production. Her agronomy work has led to her involvement with invasive weeds and crop/plant health management in plantation crops and pasture forages.

With an enthusiasm for plants and a background in agriculture, Annette is relishing the chance to delve into and share the complexities of weed biocontrol, highlighting its benefits for both conservation and land productivity. Her new role at MWLR will involve assessing the establishment of biocontrol agents, introducing new ones where needed, and continuing the collaborative efforts with key partners and communities in the Pacific. She will take on the responsibilities of leading coordination activities in designated Pacific Island countries (Vanuatu, Samoa, Tonga, and the Marshall Islands), assist with media content and other science communication materials, get involved with database content improvements, and participate in insect rearing at Lincoln. She looks forward to contributing her skills and perspectives to make the programme a success.

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A Literature Review to Narrow the Search

A central principle of weed biocontrol programmes is that host-specific natural enemies will have co-evolved with their host plant within their native range. It follows that if there is uncertainty about the native range of a weed, then biocontrol practitioners may fail to prospect for candidate biocontrol agents in the most appropriate region. This can result in failure to identify suitable candidate agents and waste precious resources.

"This was an issue we encountered when we started investigating the potential for biocontrol of hibiscus bur (*Urena lobata*) in Vanuatu," said senior researcher Quentin Paynter. Hibiscus bur is a small shrub with pink, hibiscus-like flowers. It is invasive in Vanuatu, where it outcompetes pasture grasses, affecting the local beef industry. The New Zealand Ministry of Foreign Affairs and Trade (MFAT) funded a biocontrol programme in 2018 to target this species in Vanuatu. It had never previously been targeted for biocontrol.

"Hibiscus bur is found throughout the tropics, and we weren't even sure which continent to survey for natural enemies, let alone which country or region!" said Quentin. "Some authors suggest it is native to Africa, some Asia, but *Plants of the World Online*, published by the Royal Botanic Gardens, Kew, indicates that it is native to the Caribbean Islands, Central and South America, Africa, and Asia west of the Wallace Line. Comparing genotypes can potentially match native and exotic populations, but at the start of the programme plant samples weren't available for analysis and we couldn't wait for a genetic study to be conducted," he added. Quentin then suspected that literature searches could help identify regions with the highest diversity of specialist natural enemies and therefore indicate where to survey for candidate biocontrol agents.

Lace bug release demonstration

Plant pathogen host records were sourced from the US National Fungus Collections Fungal Database. This database enables the name of a host plant to be entered, and the output produces a list of fungus species that have been recorded using that plant as a host, plus the location (e.g. country) where each observation took place. To assess the potential host specificity of the pathogens identified, the database was further interrogated. The names of each pathogen recorded attacking hibiscus bur were entered to obtain a full list of host records for each pathogen. Fungal pathogens were defined as specialist (host records confined to the genus *Urena*), oligophagous (records from several genera in the plant family Malvaceae, to which *Urena* belongs), or polyphagous (host records include plants belonging to other plant families). A similar approach was taken for arthropods, although there is no single source of host record data for phytophagous invertebrates. Records were located using online databases, where available (e.g. for Lepidoptera), and by using online searches using the terms "*Urena lobata*" and "host plant".

Quentin noted that comparing the numbers of potentially host-specific natural enemy species in different regions can be misleading due to observational bias (the fauna of some regions is likely to have been more thoroughly investigated than others). "I assumed that even if the number of species recorded in different regions might be subject to observational bias, the proportion of potentially host-specific species within different regions should be independent of the number of records. Consequently, the analysis tested whether the proportion of potentially host-specific species varied between regions," he explained.

The geographical resolution of host records was often low (e.g. to country level only), and there weren't a lot of records. Consequently, to analyse the distribution of species that attack hibiscus bur, the resolution had to be broad. Records were allocated to the three biogeographical realms where *Plants of the World Online* indicates that hibiscus bur is native: the Neotropical, Afrotropical, and Indomalayan realms.

The analysis indicated that the proportion of potentially host-specific natural enemy species present varied significantly between realms: three (c. 14%) natural enemy species recorded feeding on *U. lobata* in the Afrotropical realm are potentially specific to the genus *Urena*, compared to 13 species (c. 22%) in the Indomalayan realm and none in the Neotropical realm. The absence of specialist natural enemies throughout the Neotropical distribution of hibiscus bur indicates that it is not native there. Although the diversity of apparently specialist natural enemies was highest in the Indomalayan realm, the data do not exclude the possibility that hibiscus bur is also native to Africa. Nevertheless, the relative abundance of records of potentially host-specific agents from the Indomalayan realm suggested that this is the more promising region to begin surveys.

Where to survey was further refined by very simple climatic matching: The Köppen climate classification divides climates into five main climate groups, with each group further divided based on patterns of seasonal precipitation and temperature. Vanuatu is classified as having an Af Tropical Rainforest Climate. Within the Indomalayan realm, Indonesia, Malaysia, and the Philippines (and small parts of Thailand and Sri Lanka) have the same Af climate classification as Vanuatu

Based on the results of this study, it was recommended that:

- surveys for natural enemies of hibiscus bur commence within the Indomalayan realm, focusing on countries that have the same Af climate classification as Vanuatu
- concurrent collection of plant samples should be made in Vanuatu and in surveyed regions, and additional herbarium samples sourced, if required, to conduct genetic matching to ensure candidate agents are sourced from plants that belong to the same biotype as those that occur in Vanuatu, where biocontrol is required.

Subsequent work was severely disrupted by Covid-19, but surveys were conducted in Malaysia in 2019, before the pandemic, and a tingid bug (*Haedus vicarious*) was prioritised

Inspecting hibscus bur lacebugs

Lace bugs on hibiscus bur leaves

for further investigation because there are reports of this species inflicting severe damage to hibiscus bur in Southeast Asia. A shipment of the tingid bug was couriered from Malaysia to containment in Auckland in February 2021, and subsequent testing confirmed that it is sufficiently host specific to release in Vanuatu. Permission to release it there was granted in April 2024 and the first releases took place in late July 2024.

Molecular work conducted by Caroline Mitchell subsequently indicated that hibiscus bur growing in Vanuatu is a good genetic match to plants in Malaysia, validating the literature review findings. "At the start of the programme I thought finding an agent of hibiscus bur might be mission impossible," Quentin said. "I can't quite believe how well the approach worked, and examining host records in the literature is likely to become easier as more host records become available online and as taxonomic uncertainties (e.g. surrounding cryptic species) are resolved. Who knows, maybe we could even use AI to do this for us in future!" he added.

This work was funded by the Ministry of Foreign Affairs and Trade (Activity PF 10-582), and the writing of this manuscript was supported by core funding to Manaaki Whenua – Landcare Research from the Ministry of Business, Innovation and Employment.

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Spring Activities

Most biocontrol agents become active during spring, making it a busy time of year to check release sites and move agents around.

Broom shoot moth ***(Agonopterix assimilella)***

- We are unsure if this moth has managed to successfully establish in New Zealand, so we will be interested to hear if anyone can find any sign of them. Late spring is the best time to check release sites, so look for the caterpillars' feeding shelters made by webbing twigs together. Small caterpillars are dark reddish-brown and turn dark green as they get older.

Darwin's barberry weevil ***(Berberidicola exaratus)***

- Establishment has been confirmed in Southland and the Greater Wellington region. High densities were found only in Southland where the weevils are currently being redistributed to new sites.
- Beat plants at release sites later in the spring to see if any of the small (3–4 mm long), blackish adults can be found. Also examine the fruits for signs of puncturing. Please let us know what you find.

Giant reed gall wasp ***(Tetramesa romana)***

- We don't know if the gall wasp is successfully establishing in New Zealand, so we will be interested to hear about updates from release sites. Look for swellings on the stems caused by the gall wasps. These look like small corn cobs on large, vigorous stems, or like broadened, deformed shoot tips when side shoots are attacked. The galls often have small, circular exit holes made by emerging wasps.
- It will probably be too soon to consider harvesting and redistribution if you do see evidence of the gall wasp establishing.

Honshu white admiral ***(Limenitis glorifica)***

- Look for the adult butterflies at release sites from late spring. Look also for pale yellow eggs laid singly on the upper and lower surfaces of the leaves, and for the caterpillars. When small, the caterpillars are brown and found at the tips of leaves, where they construct pontoon-like extensions to the mid-rib. As they grow, they turn green, with spiky, brown, horn-like protrusions.
- Unless you find lots of caterpillars, don't consider harvesting and redistribution activities. You will need to aim to shift at least 1,000 caterpillars to start new sites. The butterflies are strong fliers and are likely to disperse quite rapidly without any assistance.

Lantana leaf rust ***(Prospodium tuberculatum)***

- Check sites where the leaf rust has been released, especially after a period of warm, wet weather. Look for yellowing on the leaves, with corresponding brown pustules and spores, rather like small coffee granules. A hand lens may be needed to see the symptoms during early stages of infection. If the rust is well established, then extensive defoliation may be obvious.
- Once established, this rust is likely to be readily dispersed by the wind. If redistribution efforts are needed, the best method is to harvest infected leaves, wash them in water to make a spore solution, and then apply this to plants.

Moth plant beetle ***(Freudeita cupripennis)***

- This beetle has established in the Bay of Plenty and Waikato. Look for adult beetles on the foliage and stems of moth plant. The adults are about 10 mm long with metallic orangey-red elytra (wings cases) and a black head, thorax, and legs. The larvae feed on the roots of moth plant so you won't find them easily.
- The beetles can be harvested if you find them in good numbers. Aim to shift at least 100 beetles to sites that are not yet infested with the beetle.

Privet lace bug ***(Leptoypha hospita)***

- Examine the undersides of leaves for the adults and nymphs, especially leaves showing signs of bleaching.
- If large numbers are found, cut infested leaf material and put it in chilly bin or large paper rubbish bag, and tie or wedge this material into Chinese privet at new sites. Aim to shift at least 1,000 individuals to each new site.

Ragwort plume moth ***(Platyptilia isodactyla)***

- October is the best time to check release sites for caterpillars, so look for plants with wilted, blackened or blemished shoots with holes, and an accumulation of debris, frass or silken webbing. Pull back the leaves at the crown of damaged plants to look for large, hairy, green larvae and pupae. Also check where the leaves join bolting stems for holes and frass. Don't get confused by larvae of the blue stem borer (*Patagoniodes farinaria*), which look similar to plume moth larvae until they develop their distinctive bluish coloration.
- If the moth is present in good numbers, the best time to shift it around is in late spring. Dig up damaged plants, roots and all. Pupae may be in the surrounding soil so retain as much as possible. Shift at least 50–100 plants, but the more the better. Place one or two infested plants beside a healthy ragwort plant so that any caterpillars can crawl across.

Tradescantia leaf, stem and tip beetles
(Neolema ogloblini, Lema basicostata, N. abbreviata)

- Look for the distinctive feeding damage of the adult beetles and larvae on the stems and leaves of tradescantia.

For the leaf and tip beetles, look for the external-feeding larvae which have a distinctive faecal shield on their backs.

- If you find them in good numbers, aim to collect and shift at least 100–200 beetles using a suction device or a small net. For stem beetles it might be easier to harvest infested material and wedge this into tradescantia at new sites (but make sure you have an exemption from MPI that allows you to do this).

Tradescantia yellow leaf spot *(Kordyana brasiliensis)*

- The smut fungus is now well established in many parts of the North Island. Look for the distinctive yellow spots on the upper surface of the leaves with corresponding white spots underneath, especially after wet, humid weather. Feel free to take a photo to send to us for confirmation if you are unsure, as occasionally other pathogens do damage tradescantia leaves.
- The fungus is likely to disperse readily via spores on air currents. If human-assisted distribution is needed in the future, again you will need permission from MPI to propagate and transport tradescantia plants. These plants can then be put out at sites where the fungus is present until they show signs of infection, and then planted out at new sites.

Tutsan beetle *(Chrysolina abchasica)*

- It is early days for most tutsan beetle release sites, but the best time to look for this agent is spring through to mid-summer. Look for leaves with notched edges or whole leaves that have been eaten away. The iridescent purple adults are around 10–15 mm in size, but they spend most of the day hiding away so the damage may be easier to spot. Look also for the creamy-coloured larvae, which are often on the underside of the leaves. They turn bright green just before they pupate.

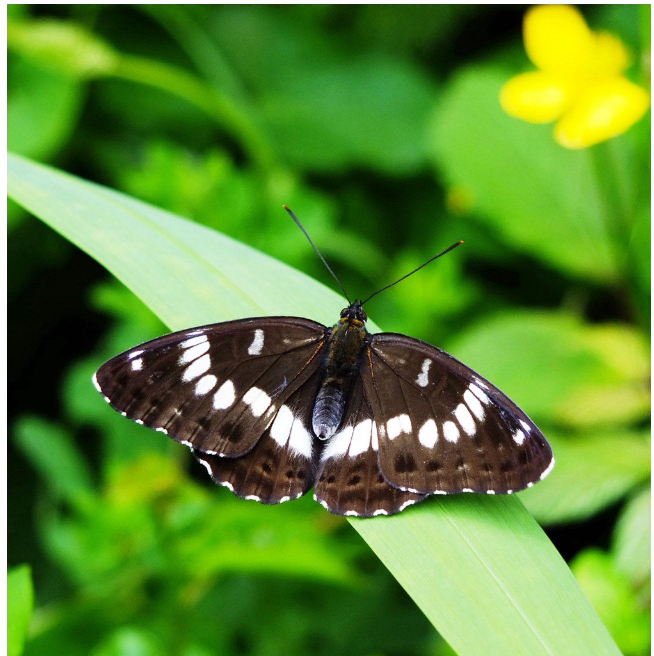
Tutsan moth *(Lathronympha strigana)*

- We don't yet know if the tutsan moth has established so are keen to hear if anyone can find them. Look for the small, orange adults flying about flowering tutsan plants. They have a similar look and corkscrew flight pattern to the gorse pod moth (*Cydia succedana*). Look also for fruits infested with the larvae.

Other agents

You might also need to check or distribute the following this spring:

- boneseed leafroller (*Tortrix* s.l. sp. *chrysanthemoides*)
- broom gall mites (*Aceria genistae*)
- broom leaf beetle (*Gonioctena olivacea*)
- gorse soft shoot moth (*Agonopterix ulicetella*)
- gorse thrips (*Sericothrips staphylinus*)



Honshu white admiral

- gorse colonial hard shoot moth (*Pempelia genistella*)
- green thistle beetle (*Cassida rubiginosa*).

National Assessment Protocol

For those taking part in the National Assessment Protocol, spring is the appropriate time to check for establishment and/or to assess population damage levels for the species listed in the table below. You can find out more information about the protocol and instructions for each agent at: www.landcareresearch.co.nz/assets/Discover-Our-Research/Biosecurity/Biocontrol-ecology-of-weeds/2022/guidelines-and-techniques/National-assessment-protocol-specific-guidelines.pdf

Target	When	Agents
Broom	Oct–Nov Oct–Nov Sept–Oct Aug–Sept	Leaf beetle (*Gonioctena olivacea*) Psyllid (*Arytainilla spartiophila*) Shootmoth (*Agonopterix assimilella*) Twig miner (*Leucoptera spartifoliella*)
Lantana	Oct–Nov (or March–May)	Blister rust (*Puccinia lantanae*) Leaf rust (*Prospodium tuberculatum*)
Tradescantia	Nov–April Anytime	Leaf beetle (*Neolema ogloblini*) Stem beetle (*Lema basicostata*) Tip beetle (*Neolema abbreviata*) Yellow leaf spot fungus (*Kordyana brasiliensis*)

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Who's Who in Biological Control of Weeds?

Alligator weed beetle (*Agasicles hygrophila*)	Foliage feeder, common, often provides excellent control on static water bodies.
Alligator weed beetle (*Disonycha argentinensis*)	Foliage feeder, released widely in the early 1980s, failed to establish.
Alligator weed moth (*Macrorrhinia endonephele*)	Stem borer, common in some areas, can provide excellent control on static water bodies.
Blackberry rust (*Phragmidium violaceum*)	Leaf rust fungus, self-introduced, common in areas where susceptible plants occur, can be damaging but many plants are resistant.
Boneseed leaf roller (*Tortrix* s.l. sp. "*chrysanthemoides*")	Foliage feeder, established and quite common at some North Island (NI) sites but no significant damage yet, limited by predation and parasitism.
Bridal creeper rust (*Puccinia myrsiphylli*)	Rust fungus, self-introduced, first noticed in 2005, widespread and providing good control.
Broom gall mite (*Aceria genistae*)	Gall former, becoming widespread in some regions, beginning to cause extensive damage to broom at many sites, especially in the South Island (SI).
Broom leaf beetle (*Gonioctena olivacea*)	Foliage feeder, establishment confirmed at sites in both islands but not yet common, impact unknown.
Broom psyllid (*Arytainilla spartiophila*)	Sap sucker, becoming common, some damaging outbreaks seen, but may be limited by predation, impact unknown.
Broom seed beetle (*Bruchidius villosus*)	Seed feeder, common in many areas, now destroying up to 84% of seeds at older release sites.
Broom shoot moth (*Agonopterix assimilella*)	Foliage feeder, recently released at limited sites as difficult to rear, appears to be established in low numbers at perhaps 3 sites.
Broom twig miner (*Leucoptera spartifoliella*)	Stem miner, self-introduced, common, often causes obvious damage.
Stripy broom psyllid (*Arytaina genistae*)	Accidentally introduced, common in Canterbury and spreading north and south. Similar to broom psyllid, but adults and nymphs can be present all year on broom. Impact unknown.
Californian thistle flea beetle (*Altica carduorum*)	Foliage feeder, released widely during the early 1990s, failed to establish.
Californian thistle gall fly (*Urophora cardui*)	Gall former, extremely rare as galls tend to be eaten by sheep, impact unknown.
Californian thistle leaf beetle (*Lema cyanella*)	Foliage feeder, only established at one site near Auckland, where it causes obvious damage and from which it is dispersing, also recently reported in Hawke's Bay.
Californian thistle rust (*Puccinia punctiformis*)	Systemic rust fungus, self-introduced, common, damage usually not widespread.
Californian thistle stem miner (*Ceratapion onopordi*)	Stem miner, attacks a range of thistles, released at limited sites as difficult to rear, establishment success unknown.
Green thistle beetle (*Cassida rubiginosa*)	Foliage feeder, attacks a range of thistles, released widely and some damaging outbreaks beginning to occur.
Chilean needle grass rust (*Uromyces pencanus*)	Rust fungus, approved for release in 2011 but not released yet, additional testing is underway with 3 native grass species, only SI populations likely to be susceptible.
Darwin's barberry flower bud weevil (*Anthonomus kuscheli*)	Flower bud feeder, approved for release in 2012, reapplication required
Darwin's barberry seed weevil (*Berberidicola exaratus*)	Seed feeder, releases began in 2015, difficult to rear so widespread releases will begin once harvesting from field is possible, establishment confirmed in Southland.
Field horsetail weevil (*Grypus equiseti*)	Foliage and rhizome feeder, field releases began in 2017, establishment is looking likely, further releases ongoing.
Giant reed gall wasp (*Tetramesa romana*)	Stem galler, field releases began in late 2017, establishment confirmed at one release site near Auckland.
Giant reed scale (*Rhizaspidiotus donacis*)	Sap sucker, approved for release in 2017, first field releases made early in 2021, establishment likely at one site in Auckland, further releases planned.
Gorse colonial hard shoot moth (*Pempelia genistella*)	Foliage feeder, from limited releases widely established only in Canterbury, impact unknown, but obvious damage seen at several sites.
Gorse hard shoot moth (*Scythris grandipennis*)	Foliage feeder, failed to establish from a small number released at one site, no further releases planned due to rearing difficulties.
Gorse pod moth (*Cydia succedana*)	Seed feeder, common in many areas, can destroy many seeds in spring but not as effective in autumn, not well synchronised with gorse flowering in some areas.
Gorse seed weevil (*Exapion ulicis*)	Seed feeder, common, destroys many seeds in spring.
Gorse soft shoot moth (*Agonopterix umbellana*)	Foliage feeder, common in parts of the SI with some impressive outbreaks seen, and well established and spreading at a site in Northland, impact unknown.
Gorse spider mite (*Tetranychus lintearius*)	Sap sucker, common, often causes obvious damage, but ability to persist is limited by predation.
Gorse stem miner (*Anisoplaca pytoptera*)	Stem miner, native, common in the SI, often causes obvious damage, lemon tree borer has similar impact in the NI.
Gorse thrips (*Sericothrips staphylinus*)	Sap sucker, common in many areas, impact unknown.
Heather beetle (*Lochmaea suturalis*)	Foliage feeder, has damaged/killed 40,000+ ha heather at Tongariro National Park and Rotorua since 1996, spreading rapidly, uncertain if new strains more suited to high altitude released recently have established.
Hemlock moth (*Agonopterix alstromeriana*)	Foliage feeder, self-introduced, common, often causes severe damage.
Hieracium crown hover fly (*Cheilosia psilophthalma*)	Crown feeder, released at limited sites as difficult to rear, thought unlikely to have established.
Hieracium gall midge (*Macrolabis pilosellae*)	Gall former, established but spreading slowly in the SI, common near Waiouru, where it has reduced host by 18% over 6 years, very damaging in laboratory trials.
Hieracium gall wasp (*Aulacidea subterminalis*)	Gall former, established and spreading well in the SI but more slowly in the NI, appears to be having minimal impact although it reduced stolon length in laboratory trials.
Hieracium plume moth (*Oxyptilus pilosellae*)	Foliage feeder, only released at one site due to rearing difficulties, did not establish.

Hieracium root hover fly [*Cheilosia urbana*] **Hieracium rust** [*Puccinia hieracii* var. *piloselloidarum*]	Root feeder, released at limited sites as difficult to rear, thought unlikely to have established. Leaf rust fungus, self-introduced?, common, causes slight damage to some mouse-ear hawkweed, plants vary in susceptibility.
Horehound clearwing moth [*Chamaesphecia mysinformis*] **Horehound plume moth** [*Wheerleria spilodactylus*]	Root feeder, released at limited sites in late 2018, may have established at low levels at one site in the Mackenzie District. Densities too low to confirm establishment. Foliage feeder, released at limited sites in late 2018, initially thought to have established at sites in North Canterbury and Marlborough, causing obvious damage. Later disappeared from these sites, reintroduction planned in late 2023.
Honshu white admiral [*Limenitis glorifica*] **Japanese honeysuckle stem beetle** [*Oberea shirahatai*]	Foliage feeder, field releases began in 2014, already well established and dispersing from site in the Waikato. Stem miner, field releases began in 2017, rearing ongoing in preparation for more field releases, establishment confirmed at one site in Canterbury.
Lantana blister rust [*Puccinia lantanae*] **Lantana leaf rust** [*Prospodium tuberculatum*] **Lantana plume moth** [*Lantanophaga pusillidactyla*]	Leaf and stem rust fungus, releases began autumn 2015, does not appear to have established to date. Leaf rust fungus, releases began autumn 2015, established well and causing severe defoliation already at several sites in Northland. Flower feeder, self-introduced, host range, distribution and impact unknown.
Mexican devil weed gall fly [*Procecidochares utilis*] **Mexican devil weed leaf fungus** [*Passalora ageratinae*]	Gall former, common, initially high impact but now reduced considerably by Australian parasitic wasp. Leaf fungus, probably accidentally introduced with gall fly in 1958, common and almost certainly having an impact.
Mist flower fungus [*Entyloma ageratinae*] **Mist flower gall fly** [*Procecidochares alani*]	Leaf smut, common and often causes severe damage. Gall former, common now at many sites, in conjunction with the leaf smut provides excellent control of mist flower.
Moth plant beetle [*Freudeita cupripennis*] **Moth plant rust** [*Puccinia araujiae*]	Root and foliage feeder, field releases began in late 2019 and will be on-going, some promising early signs that establishment is likely. Rust fungus, approved for release in 2015 but not released yet as waiting for export permit to be granted.
Nodding thistle crown weevil [*Trichosirocalus horridus*] **Nodding thistle gall fly** [*Urophora solstitialis*] **Nodding thistle receptacle weevil** [*Rhinocyllus conicus*]	Root and crown feeder, becoming common on several thistles, often provides excellent control in conjunction with other thistle agents. Seed feeder, becoming common, can help to provide control in conjunction with other thistle agents. Seed feeder, common on several thistles, can help to provide control of nodding thistle in conjunction with other thistle agents.
Old man's beard bud-galling mite [*Aceria vitalbae*] **Old man's beard leaf fungus** [*Phoma clematidina*] **Old man's beard leaf miner** [*Phytomyza vitalbae*] **Old man's beard sawfly** [*Monophadnus spinolae*]	Gall former, stunts new growth, approved for release in 2019, first field releases took place in 2021, establishment confirmed in several regions of the country. Leaf fungus, initially caused noticeable damage but has become rare or died out. Leaf miner, common, damaging outbreaks occasionally seen, but appears to be limited by parasitism. Foliage feeder, limited releases as difficult to rear and only established in low numbers at a site in Nelson, more released in North Canterbury in 2018, establishment confirmed at this site.
Privet lace bug [*Leptoypha hospita*]	Sap sucker, releases began spring 2015, establishment confirmed in Auckland and Waikato, some promising early damage seen already in shaded sites.
Cinnabar moth [*Tyria jacobaeae*] **Ragwort crown-boring moth** [*Cochylis atricapitana*] **Ragwort flea beetle** [*Longitarsus jacobaeae*] **Ragwort plume moth** [*Platyptilia isodactyla*] **Ragwort seed fly** [*Botanophila jacobaeae*]	Foliage feeder, common in some areas, often causes obvious damage. Stem miner and crown borer, released widely, but probably failed to establish. Root and crown feeder, common, provides excellent control in many areas. Stem, crown and root borer, recently released widely, well established and quickly reducing ragwort noticeably at many sites. Seed feeder, established in the central NI, no significant impact.
Greater St John's wort beetle [*Chrysolina quadrigemina*] **Lesser St John's wort beetle** [*Chrysolina hyperici*] **St John's wort gall midge** [*Zeuxidiplosis giardi*]	Foliage feeder, common in some areas, not believed to be as significant as the lesser St John's wort beetle. Foliage feeder, common, nearly always provides excellent control. Gall former, established in the northern SI, often causes severe stunting.
Scotch thistle gall fly [*Urophora stylata*]	Seed feeder, released at limited sites but becoming common, fewer thistles observed at some sites, recent study suggests it can have a significant impact on seed production.
Sydney golden wattle gall wasp [*Trichilogaster acaciaelongifoliae*]	Gall former, released at limited sites in 2022 in Manawatū-Whanganui, establishment not yet confirmed.
Tradescantia leaf beetle [*Neolema ogloblini*] **Tradescantia stem beetle** [*Lema basicostata*] **Tradescantia tip beetle** [*Neolema abbreviata*] **Tradescantia yellow leaf spot** [*Kordyana brasiliensis*]	Foliage feeder, released widely since 2011, established well and causing major damage at many sites already. Stem borer, releases began in 2012, establishing well with major damage seen at several sites already. Tip feeder, releases began in 2013, appears to be establishing readily, no significant impact observed yet. Leaf fungus, field releases began in 2018 and are continuing, establishment confirmed at several sites and promising damage seen at several sites in the NI.
Tutsan beetle [*Chrysolina abchasica*] **Tutsan moth** [*Lathronympha strigana*]	Foliage feeder, difficult to mass rear in captivity so limited field releases made since 2017, establishment success unknown but some promising signs seen. Foliage and seed pod feeder, field releases began in 2017 with good numbers released widely, establishment success unknown.
Woolly nightshade lace bug Gargaphia decoris]	Sap sucker, established at many sites but only reaches high and damaging densities at shaded sites.

Further Reading

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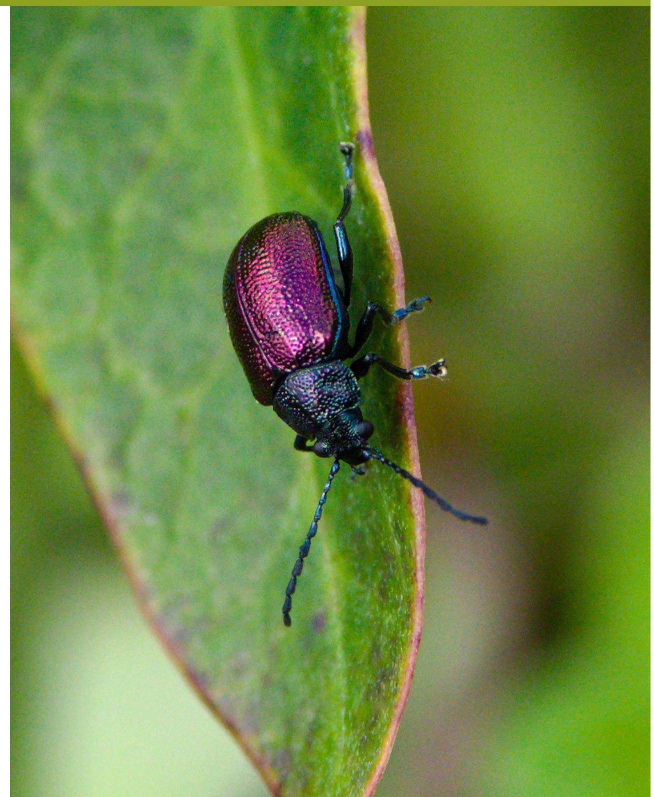
Moth plant beetle

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Biocontrol Agents Released in 2023/2024

Species	Releases made
Moth plant beetle *(Freudeita cupripennis)*	5
Tradescantia yellow leaf spot fungus *(Kordyana brasiliensis)*	6
Old man's beard mite *(Aceria vitalbae)*	8
Old man's beard sawfly *(Monophadnus spinolae)*	7
Total	26