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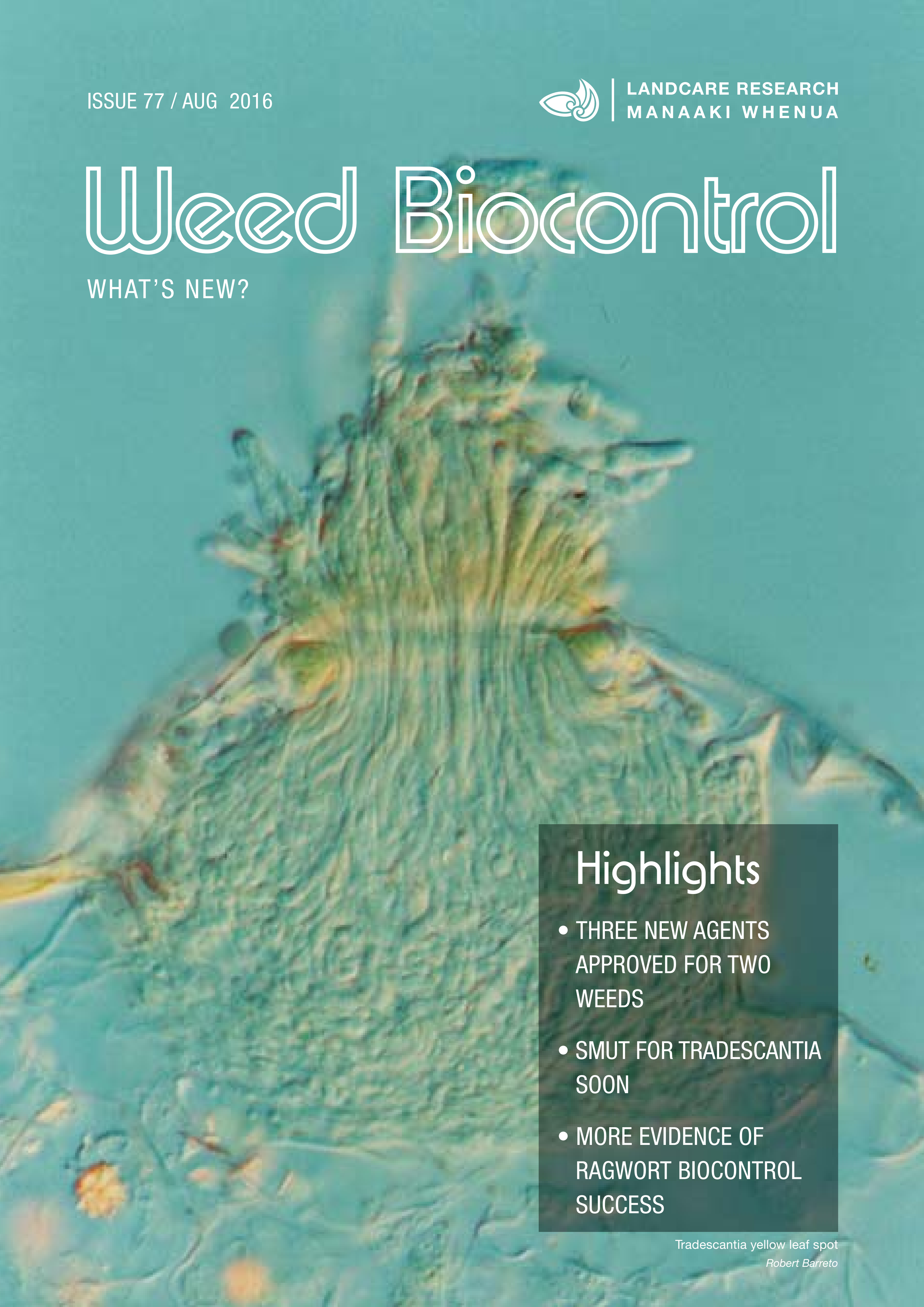
LANDCARE RESEARCH
MANAAKI WHENUA

Weed Biocontrol

WHAT'S NEW?



Highlights

- THREE NEW AGENTS APPROVED FOR TWO WEEDS
- SMUT FOR TRADESCANTIA SOON
- MORE EVIDENCE OF RAGWORT BIOCONTROL SUCCESS

Tradescantia yellow leaf spot
Robert Barreto

Contents

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Bristly Dairy Farm Dilemma

Dairy farms around the North Island are struggling to keep pastures clean as another weed, yellow bristle brass (*Setaria pumila*), is making its presence felt. Yellow bristle grass (YBG) is one of eight *Setaria* species found in New Zealand, and while not all of them are considered weeds, *S. pumila* has become a big problem, particularly in Taranaki, Waikato, South Auckland and the Bay of Plenty. Recent data suggests a possible hybrid origin for many plants commonly referred to as YBG, and it appears that this form, which may have recently arisen in New Zealand, is extremely weedy.

Originally from southern Asia, YBG has spread throughout Europe, Africa, North America and Australia. It was most likely brought accidentally to New Zealand as a contaminant in grass seed. As the name suggests, YBG has a bristly seed head which attaches easily to the hair of animals and can be moved between farms in feed such as hay. The loss of grass production on dairy farms due to the presence of YBG has been estimated at around 20%, which lowers farm productivity considerably. The cost of buying in supplementary feed to keep milk production at an acceptable level has become a big burden for some dairy farmers, and in some cases has resulted in more YBG seed arriving on the property.

Although palatable to stock during the spring, cattle won't graze YBG once it starts forming a seed head (January – May). Outside of this period heavy grazing can reduce the prevalence of the plant, but the flip side of this is that pugging of the ground can enhance YBG seed germination. Instead, farmers are mostly relying on costly chemical control, which has the added burden of a withholding period of 28 days where stock cannot graze the pasture. Manual removal is used for small infestations, but careful pasture management is required, such as topping paddocks prior to seed set and harrowing paddocks to reduce seed germination from dung pats. Despite best efforts, the grass is continuing to spread.

So what are the biocontrol options for this plant? "A collaborative effort between AgResearch and Landcare Research has recently produced a feasibility study to try to answer this question," said Trevor James from AgResearch, who led the study. One goal was to determine the genetic variation in populations of YBG in New Zealand. To achieve this,

K. Tozer

Yellow bristle grass is an increasing problem on dairy farms.

we collected YBG samples from 20 different sites (mainly from the North Island and the top of the South Island) and knot root bristle grass (*S. gracilis*) from one site. Molecular biologist Gary Houliston was surprised with the results from the initial molecular work. "We sequenced phylogenetic regions from both the nucleus and chloroplast and were surprised at what we found. While the nuclear region was a very good match for *S. pumila,* the chloroplast result appeared more like *S. sphacelata*," said Gary. *S. sphacelata* was available for comparison from an agricultural trial of the species near Kaikohe. This species of grass was also planted on Whatawhata Research Station in the western Waikato region, and the seed was sourced from Australia, Kenya and South Africa. Suspiciously, the invasive type of YBG is common in the regions where *S. sphacelata* has been trialled, adding weight to the hypothesis that the reason for YBG suddenly becoming problematic after many years of being present in New Zealand is the formation of an aggressive hybrid. However, further studies would be needed to be sure that the invasive type is a local hybrid rather than an introduced genotype.

"We also found that morphological features that have been used to identify YBG and related species do not line up well with genetic variability detected and therefore cannot be reliably used for identification purposes," warned Gary. "We also don't know how widespread the weedy form of YBG is yet," added Trevor. Further molecular work is needed to compare material found in New Zealand with material from overseas in order to attempt to narrow down where the plants originated from, and indicate where best to search for potential biocontrol agents.

A literature search has suggested that it might be better to go down the track of looking for pathogens to control this weed rather than insects. Few insects are known to feed on YBG, none appear to be suitable for biocontrol purposes, and pathogens appear to offer more options. However, because of the taxonomic uncertainties around *Setaria* and the issues identified in using morphological features to assign names in this group, it is possible that literature referring to YBG, or related species, may be inaccurate, including the host range of pathogens reported. If similar genetic forms can be found overseas it would enable those populations to be surveyed for possible biocontrol agents. If they cannot be found, the next best option would be to survey the parent plants or the most similar material that can be identified. "Any future work will also need to carefully consider which *Setaria* species should be targeted for biocontrol in New Zealand, because there is a danger that focusing on just the weedy hybrid YBG form could result in it just being replaced by other *Setaria* entities," concluded Trevor.

This study was funded by the Ministry for Primary Industries Sustainable Farming Fund.

T. James

Yellow bristle grass spreading along roadside.

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BIOCONTROL AGENTS RELEASED IN 2015/16

Species	Releases made
Broom gall mite *(Aceria genistae)*	100
Darwin's barberry seed weevil *(Berberidicola exeratus)*	7
Lantana blister rust *(Puccinia lantanae)*	1
Privet lace bug *(Leptoypha hospita)*	11
Tradescantia leaf beetle *(Neolema oglobini)*	20
Tradescantia stem beetle *(Lema basicostata)*	22
Tradescantia tip beetle *(Neolema abbreviata)*	21
Total	182

Comparing Ragwort Then with Now: Part One

In a world where accountability and measurable outcomes are becoming the norm, there seems to be more need than ever to demonstrate whether a project has been successful or not. "We have the techniques to monitor the impact of weed biocontrol agents in detail, but such work tends to be very expensive and therefore unable to be undertaken very often," said Simon Fowler, who leads the Beating Weeds research programme. "Since this has proven to be a barrier to following up on the success of weed biocontrol programmes, we have been developing more cost efficient methodologies that can use to achieve the same endpoint."

An approach trialled recently has been to revisit ragwort flea beetle (*Longitarsus jacobaeae*) release sites nationwide, 20–30 years after the beetles were released, and collect some simple information about the status of ragwort (*Jacobaea vulgaris*) on these properties now. The ragwort flea beetles were released at sites with significant ragwort problems, often 10–20 large plants/ m^2. "We know that the flea beetle has had a big impact on the ragwort, because it is clearly nowhere near as prevalent as it used to be, but hard data is needed to support our observations," explained Simon. The strength of this assessment approach is the potentially large number of sites (>100) that data can be gathered from nationwide. While this data only provides a correlation (suggestion of a cause-and-effect relationship), it contributes to the overall story, supporting the cause-and-effect data that has been collected at a few sites through insecticide exclusion studies (where some ragwort plants were protected through the use of insecticide). It also enables people to compare results in their region with nationwide trends.

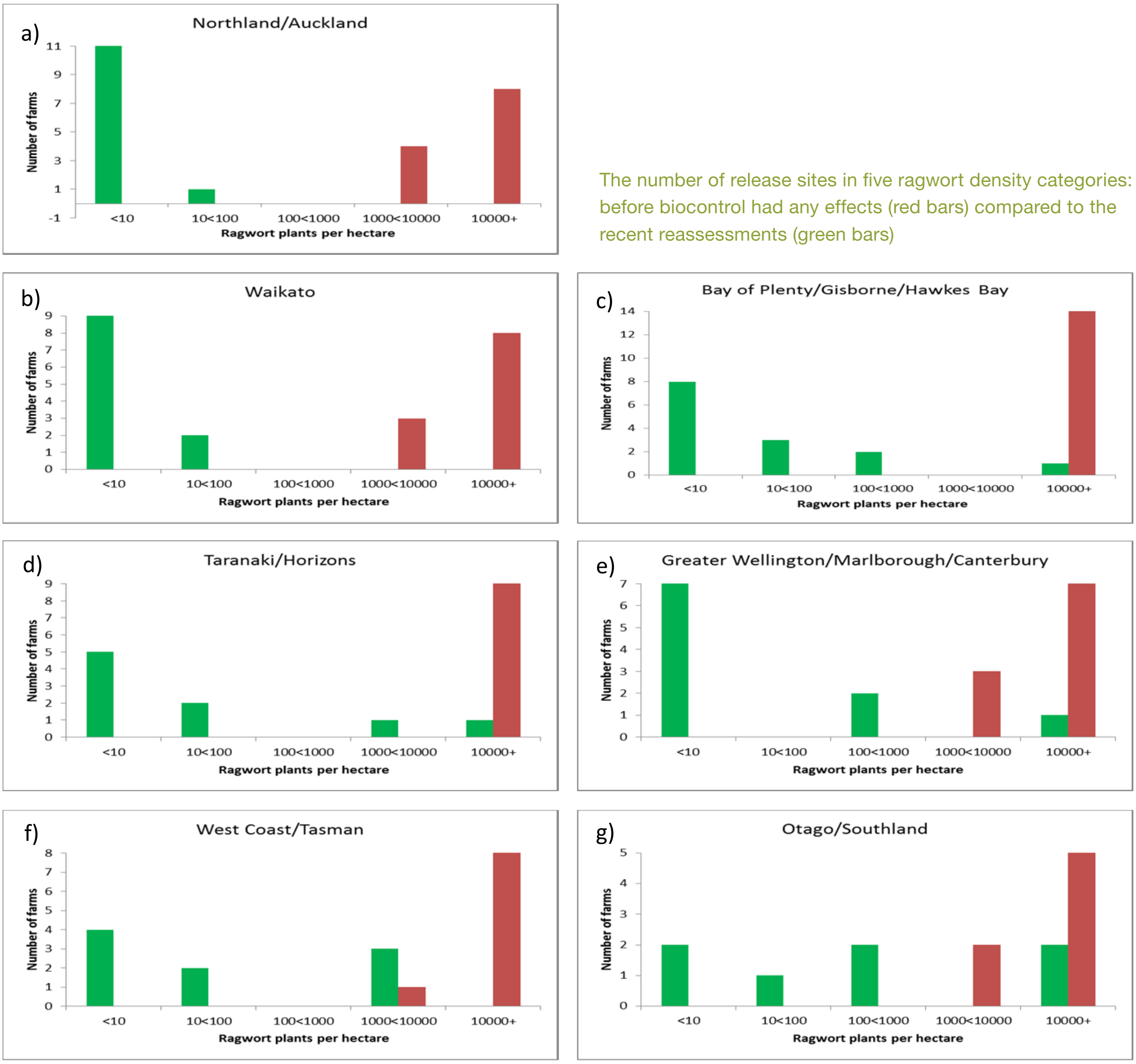
Landcare Research has an extensive database that summarises all known information about where biocontrol agents they provided have been released and their fate. From the >100 ragwort flea beetle release sites a list was drawn up of those that regional council staff would be asked to attempt to revisit. Sites that were known to have been destroyed were excluded, as were those for which there was no estimate of ragwort density around release time to use as a comparison. Although ragwort density was not always recorded when the flea beetles were released, density was estimated each time sites were subsequently revisited, so for many sites this data was available 1–3 years after the beetles were released and before they would have begun to make a serious dent in the ragwort.

Initially the approach was trialled as a pilot in three regions during 2011 and 2012: Wellington, Manawatu–Wanganui and Waikato. Site were visited at least twice in autumn (consistent with other monitoring), and in different calendar years to reduce the impact of any unusual annual variation that can occur with this plant. After the pilot trial the survey methodology was fine-tuned and then rolled out nationwide. "It proved more difficult than expected for regional council staff to fit in the site checks, which meant it took 4 years instead of 2 to collect this more extensive survey data," said Lynley Hayes, who helped to organise the survey. All up just over 70 sites nationwide were able to be resurveyed. Given the time elapsed since the releases, it was unusual for the same people who made the original releases to be involved in this survey, once again emphasising the need for good record keeping. A considerable number of the properties visited had also changed hands, with many landowners unaware of the flea beetles and their contribution to ragwort control.

The survey asked landowners questions about the management of the land, such as the farming type (e.g. dairy cows, beef stock, sheep, deer or horses) to see if that made any difference to the results, and any ongoing ragwort control efforts. They were also asked to describe the biocontrol programme in three words. We will report on these aspects of the survey results in the November issue of this newsletter. As well as questioning the landowners, the regional council staff visually estimated the density of ragwort remaining at the sites as well as checking for the presence of the beetle and other ragwort biocontrol agents. Photos of release sites were requested, but it proved difficult to take 'after' shots that lined up well with 'before' shots, due to a lack of data about where the original photos were taken or changes to landmarks (such as trees), in the interim. But the numerous photos of clean pasture still contribute to the overall story.

The data show that ragwort density has declined enormously since the release of the ragwort flea beetle (see graphs). At 42% of the sites there was no ragwort evident at the time the sites were checked, and at 51% of sites ragwort had declined by 90–99%. However, in 7% of the sites there had either been less than a 50% reduction in ragwort density or even an increase in density. Reductions in ragwort density occurred all over New Zealand, but the effect was strongest in the northern regions, which is consistent with previous information suggesting that ragwort declines were less dramatic in cooler or very wet regions, such as the West Coast and Southland.

The survey also showed that high numbers of the ragwort flea beetle were found at sites with mean annual rainfall up to 2000 mm. This is consistent with previous data that suggests the flea beetle larvae don't like getting too wet. However, the threshold of around 2000 mm/yr is encouragingly higher than that shown previously (1670 mm/yr), indicating that the flea beetle is able to do well in somewhat wetter regions than was previously thought.



The number of release sites in five ragwort density categories: before biocontrol had any effects (red bars) compared to the recent reassessments (green bars)

Cinnabar moth (*Tyria jacobaeae*) was encountered at 68% of ragwort flea beetle release sites at some stage over the course of the study and is well spread throughout New Zealand. However, its occurrence at damaging levels was only ever noted sporadically, and earlier studies have shown it to be limited by natural enemies.

The study also found the ragwort plume moth (*Platyptilia isodactyla*) present at seven sites. On the West Coast the plume moth has self-colonised at least three of the ragwort flea beetle release sites, including the wettest site in the study (Whataroa, with a mean annual rainfall of 5305 mm). The fact that the plume moth is dispersing to new sites on the West Coast means that, as intended, it is doing well in these areas that are too wet for the flea beetle. The data also suggests that the plume moth may already be causing some declines in ragwort at these wet sites, again supporting other observations of the impact of this agent.

To summarise, the objective of this project is to develop simple, yet powerful, methods that can be used to demonstrate whether a biocontrol programme has been successful or not. This project has achieved that aim, capturing vital information from a wide geographic range and showing regional differences in agent performance. "By involving many people we have been able to share the load and collect meaningful data in a highly cost-effective manner without imposing a huge burden on any one party," concluded Simon. A similar resurvey project is underway to study the impact of nodding thistle (*Carduus nutans*) agents. A pilot study for this has been completed and the project will be rolled out nationwide this spring.

This project was funded and data for it was collected by the National Biocontrol Collective. A huge thanks to everyone who contributed to this survey!

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Three New Agents Approved for Two Weeds

The release of agents to biologically control two serious weeds, tutsan (*Hypericum androsaemum*) and field horsetail (*Equisetum arvense*), is a step closer after we received approvals from the Environmental Protection Authority (EPA) in May this year. The new agents for tutsan, which we developed for the Tutsan Action Group (a farmer-led group supported by Horizons Regional Council), include a leaf-tying moth (*Lathronympha strigana*) and a leaf beetle (*Chrysolina abchasica*). The moth attacks the stem, shoot-tips and seed-pods of the plant, and the beetle feeds on the foliage. Tutsan has become a significant pest of pasture and conservation land, particularly in the central North Island.

Hugh Gourlay, who is leading the work with the tutsan agents, has recently received confirmation that the leaf beetles are disease free and have been correctly identified, enabling him to apply to the Ministry for Primary Industries (MPI) to take them out of containment. However, the beetles have not been breeding as quickly as anticipated. "This is possibly due to changes in food quality and/or because they undergo a lengthy hibernation during the winter and we are still trying to understand what conditions are optimal for their survival in captivity," said Hugh. "Once we can take the beetles out of containment, we are hoping they will be happier and breed more readily, so we can start to seriously mass rear them for release," added Hugh. All going well, Hugh is hoping to make the first releases of both new agents simultaneously near Taumarunui in late spring this year.

Lindsay Smith has been leading the project to find agents to biologically control field horsetail (*Equisetum arvense*) for another farmer-led group, the Lower Rangitikei Horsetail Control Group. Field horsetail is particularly problematic in the lower North Island. Potential agents sourced from the UK were host-range tested at the Lincoln containment facility during 2013–15. These included a flea beetle (*Hippuriphila modeeri*), a weevil (*Grypus equiseti*), and two sawfly species (*Dolerus germanicus* and *D. eversmanni*). "After studying all four insects we decided the weevil offered the most potential to control the plant," said Lindsay. Now that EPA approval to release the horsetail weevil has been granted, the challenge for this project is also to rear sufficient numbers to allow field releases to begin.

Field horsetail weevil

The great thing about the horsetail weevil is that both adults and larvae feed on the plant. Young weevil larvae munch their way down the stem and into the large underground root system, reducing its ability to produce new shoots and lowering the plant's ability to invade new habitats. "This is a significant advantage because it will help minimise the extent to which the plant is shifted unintentionally from site to site in soil," said Craig Davey from Horizons Regional Council, which has also supported the group behind this project. "Biocontrol will add another tool to the toolbox putting us in a better position to provide best practice advice to land managers who are struggling to keep the plant under control," explained Craig. "What is required is long-term persistent control that will minimise the need for chemical input and reduce the risk of spread region-wide," he added.

"We only have small numbers of larvae at this stage, but once they have pupated and new adults emerge in spring we will apply to MPI for approval to remove them from containment and make the first field release in the Rangitikei region," said Lindsay. Some additional adult weevils were recently shipped from the UK to help boost the population. "These adults are currently producing plenty of eggs in containment, but their offspring will need to be rephased to our southern hemisphere seasons before they can be released," said Lindsay. It is not difficult to grow field horsetail in containment, but in winter plants die back, making it difficult to maintain a breeding population of weevils shipped in from the northern hemisphere summer needing fresh horsetail growth. However, it is hoped that from these small beginnings a lot of farmers are ultimately going to be very happy.

Both the field horsetail and tutsan projects are funded by the Ministry for Primary Industries' Sustainable Farming Fund, with co-funding provided by a range of other organisations, including the National Biocontrol Collective.

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Smut for Tradescantia Soon

The three beetles released for the biological control of tradescantia (*Tradescantia fluminensis*) continue to go from strength to strength in New Zealand. However, there has been an instance already of beetles released in a riparian area in Northland, thought to be high enough up to be well out of harm's way, being affected by an extreme flood. As well as these infrequent catastrophic events, there are plenty of tradescantia-infested areas that are regularly flooded in which it will be difficult for the beetles to be effective, and so we are still considering introducing a yellow leaf spot fungus that may be better suited to such soggy situations. Tradescantia typically bounces back from remaining fragments quickly after a flood, but beetle populations take much longer to recover. However, fungi tend to thrive in damp conditions and infection may build and spread in only weeks or months.

We have referred to this smut-like fungus previously as *Kordyana* sp., but recently it was officially named as *Kordyana brasiliensis*. Spores germinate on the upper surface of tradescantia leaves, as long as some moisture is present, and about 10 days later yellow leaf spots appear on the upper leaf surface and these develop, expand and turn brown as the infected leaves die. In another 15 days the spot centres turn white underneath, and if humidity is high enough, new basidiospores form there. Basidiospores are very small, and are easily spread through air turbulence, and the whole cycle starts again as soon as they land on a new tradescantia plant.

We obtained permission to release the yellow leaf spot fungus in New Zealand in 2013. However, because of funding constraints, we have been releasing and monitoring the beetles first. The jury is still out on whether we need the fungus but, because of the flooding issues, there is a good chance it will be needed here. "In Brazil we most commonly saw the yellow leaf spot fungus close to waterways where the beetles were less common, probably because of flooding," said Simon Fowler, who has led the project. Meanwhile, the Australians have been investigating the potential of the yellow leaf spot to control tradescantia there.

In Australia a weed needs to be declared a biocontrol target by the Invasive Plants and Animals Committee (IPAC) before applications to release agents against it can be submitted. Tradescantia was approved as a target by IPAC in December 2015. The smut fungus had already been applied to a range of plants closely related to the target weed in Brazil and found to be highly host specific. "However, those tests were performed for New Zealand so some plants of significance in Australia were not included," explained Louise Morin (CSIRO), "and so further tests were required by our authorities".

Robert Barreto

Tradescantia infected with the yellow leaf spot fungus.

The tradescantia yellow leaf spot was imported into the CSIRO containment facility at Black Mountain, Canberra, in July 2014, and a culture established on Australian tradescantia plants. Plant species to be included in host range testing were chosen according to recent molecular phylogenies of the family Commelinaceae, to which tradescantia belongs. The fungus was applied to seven species that had previously been tested in Brazil (including the target weed) and 22 additional species or cultivars of relevance to Australia (ornamental plants, weeds and native taxa). "Results confirmed that the yellow leaf spot fungus is highly host specific and able to damage all of the tradescantia accessions we tested," revealed Louise. She is now working on an application to release this fungus in Australia. "We hope to submit it by the end of August this year."

It is reassuring the Australian tests confirmed that tradescantia leaf spot is highly host specific, and handy that we can now obtain it from just 'over the ditch'. This will potentially be easier than getting it from South America, especially since this smut fungus does not do well in artificial culture and needs to be transported quickly inside living plant tissues. All in all, the tradescantia yellow leaf spot looks like a very promising biocontrol agent for both Australia and New Zealand.

The tradescantia project in New Zealand has been funded by the National Biocontrol Collective and in Australia by the Department of the Environment. We acknowledge the assistance of Robert Barreto and Davi Macedo, at the University of Viçosa, Brazil, who have helped to find, test and supply the yellow leaf spot fungus.

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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.

Boneseed leafroller *(Tortrix s.l. sp. "chrysanthemoides")*

- Check release sites for feeding shelters made by caterpillars webbing together leaves at the tips of stems. Also look for 'windows' in the leaves and sprinkles of black frass. Small caterpillars are olive green in colour and become darker, with two parallel rows of white spots as they mature.
- Caterpillars can be harvested if you find them in good numbers. Cut off infested boneseed tips and wedge them into plants at new sites. Aim to shift at least 500 caterpillars to sites where scale insects and invasive ants are not known to be present.

Broom gall mites *(Aceria genistae)*

- Check release sites for galls, which look like deformed lumps and range in size from 5 to 30 mm across. Very heavy galling, leading to the death of bushes, has already been observed at some sites.
- Harvesting of galls is best undertaken from late spring to early summer when predatory mites are less abundant. If galls are present in good numbers, aim to shift at least 50 to each site and tie them on to plants so the tiny mites can shift across.

Broom leaf beetles *(Gonioctena olivacea)*

- Check release sites by beating plants over a tray. Look for the adults, which are 2–5 mm long and goldish-brown (females) through to orangey-red (males), with stripes on their backs. Look also for greyish-brown larvae, which may also be seen feeding on leaves and shoot tips.
- It is probably still a bit soon to begin harvesting and redistribution.

Broom shoot moth *(Agonopterix assimilella)*

- Late spring is the best time to check release sites. 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. We are unsure if this moth has managed to successfully establish in New Zealand, so we will be interested to hear if you find any sign of the caterpillars.
- We would not expect you to be able to begin harvesting and redistribution just yet.

Green thistle beetles *(Cassida rubiginosa)*

- Check release sites for adult beetles, which emerge on warm days towards the end of winter and feed on new thistle leaves, making round window holes. The adults are 6–7.5 mm long and green, but are quite well camouflaged against the leaf. The larvae also make windows in the leaves. They have a protective covering of old moulted skins and excrement. You may also see brownish clusters of eggs on the undersides of leaves.
- It should be possible to harvest beetles at many of the older sites. Use a garden-leaf vacuum machine and aim to shift at least 50 adults from spring throughout summer and into autumn. Be careful to separate the beetles from other material collected, which may include pasture pests.

Lantana blister rust

Lantana blister rust *(Puccinia lantanae)*

- Check sites where lantana plants infected with blister rust have been planted out, especially after a period of warm, wet weather. Signs of infection include leaf and stem chlorosis (yellowing) accompanied by large, dark pustules on the undersides of leaves and on the stems. Stunting, defoliation and die-back may also be apparent.
- Once established, this rust is likely to be readily dispersed by the wind. If redistribution efforts are needed, the best method is likely to involve placing small potted lantana plants beneath infected ones and then planting these out at new sites once they have become infected. However, to propagate and distribute lantana in this manner an exemption from MPI will be required.

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.
- Once established, this rust is likely to be readily dispersed by the wind. If redistribution efforts are needed, the best method will likely involve harvesting infected leaves, washing them in water to make a spore solution and then applying this to plants.

Privet lace bug *(Leptoypha hospita)*

- Although it is early days for privet lace bug releases it might be worth checking release sites to look for any signs post winter. Examine the undersides of leaves for the adults and nymphs, especially leaves showing signs of bleaching.
- It is likely to be too soon for any harvesting to begin.

Ragwort plume moth *(Platyptilia isodactyla)*

- October is the best time to check release sites for caterpillars. Look for plants with wilted or 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 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 colouration.
- 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 beetle (*Neolema ogloblini*)

- Check release sites for the shiny metallic bronze adults sitting on the foliage, or the larvae, which have a distinctive protective covering over their backs. Also look for notches in the edges of leaves caused by adult feeding, or leaves that have been skeletonised by larvae grazing off the green tissue. The white, star-shaped pupal cocoons may also be visible on damaged foliage.
- If you can find plenty of beetles then harvesting can begin. Aim to collect and shift 50–100 beetles. Collect the beetles either using a suction device or a small net.

Tradescantia stem beetle (*Lema basicostata*)

- Check release sites for the black knobbly adults, which tend to drop when disturbed and can be difficult to see. Look also for their feeding damage, which consists of elongated windows in the upper surfaces of leaves, or sometimes whole leaves consumed. The larvae inside the stems will also be difficult to spot. Look for stems showing signs of necrosis or collapse and brown frass.
- If you can find widespread damage at the site then you may be able to begin harvesting. We still need to identify the best possible method to do this. If it proves to be too difficult to collect 50–100 adults with a suction device, then another approach to try would be to remove a quantity of the damaged material and put it in a wool pack or on a tarpaulin and wedge this into tradescantia at new sites. However, to distribute tradescantia in this manner an exemption from MPI will be required.

Tradescantia tip beetle (*Neolema abbreviata*)

- Check the release site for the adults, which are mostly black with yellow wing cases, sitting about on the foliage. Look also for their feeding damage, which looks like elongated windows in the leaves, similar to those made by the stem beetle. Larvae will also be difficult to see when they are feeding inside the tips, but brown frass may be visible. When tips are in short supply, the slug-like larvae feed externally on the leaves.
- If you can find plenty of beetles then harvesting can begin. Aim to collect and shift 50–100 beetles. Collect the beetles using either a suction device or a small net.

Other agents

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

- gorse soft shoot moth (*Agonopterix ulicetella*)
- gorse thrips (*Sericothrips staphylinus*)
- gorse colonial hard shoot moth (*Pempelia genistella*).

National Assessment Protocol

For those taking part in the National Assessment Protocol, spring is the appropriate time to check for establishment and/or 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/publications/books/biocontrol-of-weeds-book

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

Send any reports of interesting, new or unusual sightings to Lynley Hayes (hayesl@landcareresearch.co.nz, Ph 03 321 9694).

Who's Who in Biological Control of Weeds?

Alligator weed beetle (*Agasicles hygrophila*) Alligator weed beetle (*Disonycha argentinensis*) Alligator weed moth (*Arcola malloi*)	Foliage feeder, common, often provides excellent control on static water bodies. Foliage feeder, released widely in the early 1980s, failed to establish. 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*) Broom leaf beetle (*Gonioctena olivacea*) Broom psyllid (*Arytainilla spartiophila*) Broom seed beetle (*Bruchidius villosus*) Broom shoot moth (*Agonopterix assimilella*) Broom twig miner (*Leucoptera spartifoliella*)	Gall former, recently released widely, establishing well and already severely damaging plants at some sites. Foliage feeder, recently released widely, established at a few sites but not yet abundant anywhere. Sap sucker, becoming common, some damaging outbreaks seen, but may be limited by predation, impact unknown. Seed feeder, common in many areas, now destroying up to 84% of seeds at older release sites. Foliage feeder, recently released at limited sites as difficult to rear, establishment success is uncertain. Stem miner, self-introduced, common, often causes obvious damage.
Californian thistle flea beetle (*Altica carduorum*) Californian thistle gall fly (*Urophora cardui*) Californian thistle leaf beetle (*Lema cyanella*) Californian thistle rust (*Puccinia punctiformis*) Californian thistle stem miner (*Ceratapion onopordi*) Green thistle beetle (*Cassida rubiginosa*)	Foliage feeder, released widely during the early 1990s, failed to establish. Gall former, extremely rare as galls tend to be eaten by sheep, impact unknown. Foliage feeder, only established at one site near Auckland where it causes obvious damage. Systemic rust fungus, self-introduced, common, damage usually not widespread. Stem miner, attacks a range of thistles, recently released at limited sites as difficult to rear, establishment success unknown. Foliage feeder, attacks a range of thistles, recently released widely, establishing well and some damaging outbreaks beginning to occur.
Chilean needle grass rust (*Uromyces pencanus*)	Rust fungus, approved for release in 2011 but no releases made yet as waiting for export permit to be granted, only South Island (SI) populations likely to be susceptible.
Darwin's barberry flower bud weevil (*Anthonomus kuscheli*) Darwin's barberry seed weevil (*Berberidicola exaratus*)	Flower bud feeder, approved for release in 2012, releases will be made after the seed weevil is established if still needed. Seed feeder, approved for release in 2012, first release made in early 2015, and releases are continuing.
Field horsetail weevil (*Grypus equiseti*)	Foliage and rhizome feeder, approved for release in 2016, first field release planned for spring 2016.
Gorse colonial hard shoot moth (*Pempelia genistella*) Gorse hard shoot moth (*Scythris grandipennis*) Gorse pod moth (*Cydia succedana*) Gorse seed weevil (*Exapion ulicis*) Gorse soft shoot moth (*Agonopterix umbellana*) Gorse spider mite (*Tetranychus lintearius*) Gorse stem miner (*Anisoplaca pytoptera*) Gorse thrips (*Sericothrips staphylinus*)	Foliage feeder, from limited releases established only in Canterbury, impact unknown, but obvious damage seen at several sites. Foliage feeder, failed to establish from small number released at one site, no further releases planned due to rearing difficulties. 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. Seed feeder, common, destroys many seeds in spring. Foliage feeder, established poorly in the NI but well established and common in parts of the SI, some impressive outbreaks seen, impact unknown. Sap sucker, common, often causes obvious damage, but ability to persist is limited by predation. Stem miner, native, common in the SI, often causes obvious damage, lemon tree borer has similar impact in the NI. Sap sucker, common in many areas, impact unknown.
Heather beetle (*Lochmaea suturalis*)	Foliage feeder, established in and around Tongariro National Park (TNP), also Rotorua, 1500 ha heather damaged/killed at TNP since 1996, new strains more suited to high altitude released recently.
Hemlock moth (*Agonopterix alstromeriana*)	Foliage feeder, self-introduced, common, often causes severe damage.
Hieracium crown hover fly (*Cheilosia psilophthalma*) Hieracium gall midge (*Macrolabis pilosellae*) Hieracium gall wasp (*Aulacidea subterminalis*)	Crown feeder, released at limited sites as difficult to rear, establishment success unknown. Gall former, established in both islands, common near Waiouru, where it has reduced host by 18% over 6 years, also very damaging in laboratory trials. Gall former, established but not yet common in the SI and not established yet in the NI, impact unknown but reduces stolon length in laboratory trials.

Hieracium plume moth (*Oxyptilus pilosellae*) Hieracium root hover fly (*Cheilosia urbana*) Hieracium rust (*Puccinia hieracii* var. *piloselloidarum*)	Foliage feeder, only released at one site due to rearing difficulties, did not establish. Root feeder, released at limited sites as difficult to rear, establishment success unknown. Leaf rust fungus, self-introduced?, common, causes slight damage to some mouse-ear hawkweed, plants vary in susceptibility.
Japanese honeysuckle white admiral (*Limenitis glorifica*) Japanese honeysuckle stem beetle (*Oberea shirahati*)	Foliage feeder, approved for release in 2013, cannot be reared in captivity, released at 2 field sites in 2014, establishment confirmed at one and will begin harvesting from this site in 2016/17. Stem miner, approved for release in 2015, difficult to rear in captivity, plan to make first field release before end of 2016.
Lantana blister rust (*Puccinia lantanae*) Lantana leaf rust (*Prospodium tuberculatum*) Lantana plume moth (*Lantanophaga pusillidactyla*)	Leaf and stem rust fungus, approved for release in 2012, releases began autumn 2015, establishment success unknown. Leaf rust fungus, approved for release in 2012, releases began autumn 2015, believed to have established 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 (*Colaspis argentinensis*) Moth plant rust (*Puccinia araujiae*)	Root feeder, approved for release in 2011 but no releases made yet as waiting for export permit to be granted by Argentinian authorities. Rust fungus, approved for release in 2015 but no releases made yet as waiting for export permit to be granted by Argentinian authorities.
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 leaf fungus (*Phoma clematidina*) Old man's beard leaf miner (*Phytomyza vitalbae*) Old man's beard sawfly (*Monophadnus spinolae*)	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, released at limited sites as difficult to rear, has only established at one site in Nelson where still appears to be rare and having no obvious impact.
Privet lacebug (*Leptoypha hospita*)	Sap sucker, releases began spring 2015, establishment success not yet known, but some promising early damage seen already.
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, has 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, establishing and spreading readily, fewer thistles observed at some sites, impact unknown.
Tradescantia leaf beetle (*Neolema ogloblini*) Tradescantia stem beetle (*Lema basicostata*) Tradescantia tip beetle (*Neolema abbreviata*) Tradescantia yellow leaf spot *Kordyana brasiliense*	Foliage feeder, released widely since 2011, establishing well and beginning to cause noticeable damage. 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. Leaf fungus, approved for released in 2013 but no releases as yet, plan to import fungus into containment in 2017 so releases can begin.
Tutsan beetle (*Chrysolina abchasica*) Tutsan moth (*Lathronympha strigana*)	Foliage feeder, approved for release in 2016, first field release planned for spring 2016. Foliage and seed pod feeder, approved for release in 2016, first field release planned for spring 2016.
Woolly nightshade lace bug (*Gargaphia decoris*)	Sap sucker, recently released widely, establishing readily at many sites, some damaging outbreaks are beginning to occur.

Further Reading

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Changes to Pages

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- Index
- Darwin's barberry seed weevil
- Field horsetail weevil
- Japanese honeysuckle
- Honshu white admiral
- Japanese honeysuckle stem beetle
- Old man's beard sawfly
- Privet lace bug
- Ragwort flea beetle
- Tradescantia
- Tradescantia beetle comparison
- Tradescantia leaf beetle
- Tradescantia stem beetle
- Tradescantia tip beetle