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Populating data into a new prioritisation tool for National Biocontrol Collective funded work in New Zealand

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Summary

Project and client

- A draft prioritisation tool, in the form of an Excel spreadsheet that ranks prospective weed biocontrol targets and candidate biocontrol agents, was developed on behalf of the National Biocontrol Collective (NBC) and reviewed and modified by Manaaki Whenua – Landcare Research (Paynter & McGrannachan 2021). The aim of the tool is to assist councils in making biocontrol decisions nationally, and within their regions, to maximise the cost-effectiveness of weed biocontrol in New Zealand.
- Environment Southland contracted Manaaki Whenua – Landcare Research to populate the prioritisation tool with data to determine if it meets the needs of the NBC.

Objectives

- The aim of this report is to populate data into the prioritisation tool and discuss the resulting prioritised list of weed biocontrol targets with the NBC to determine if further changes should be made to enhance the selection of target weeds and candidate biocontrol agents.

Methods

A questionnaire was sent to representatives of the various councils and the Department of Conservation (DOC), asking them to list their main target weed species and answer questions developed in the prioritisation tool. These included ranking weed importance and suitability for biocontrol based on weed impacts, ease of control using conventional methods, and the magnitude of the non-target impacts of current control options.

Literature searches were conducted to determine the key traits of the nominated weed species that predict the potential impact of biocontrol (i.e. for novel targets, habitat, mode of reproduction, and whether a weed species was reported to be problematic/weedy in the native range; for repeat targets, the success of previous programmes overseas).

An online stakeholder workshop was held to discuss the results and potential refinements to the model.

Results

- A prioritised list of target weeds was developed. Many are current or previous biocontrol targets, indicating that the system is a good way to formalise the identification of the most suitable biocontrol targets in New Zealand.
- The stakeholder workshop was in general agreement that the prioritisation system is an improvement on the previous informal system.
- Some potential minor modifications were discussed, and an Excel spreadsheet was produced that ranks weeds using slightly different weightings for stakeholders to consider before the next NBC annual meeting.

Recommendations

- We recommend that this system, subject to potential minor modifications, be used as a guide to assist prioritisation of novel target weeds for the NBC.
- Due to time lags between the introduction of weed biocontrol agents and successful biocontrol, the ranking system can be misleading for current targets (i.e. a weed may be ranked a high priority for biocontrol when the suite of already released agents are likely to eventually result in successful control). We recommend that regular review of progress against existing targets be required to determine if work should proceed or be terminated.

1 Introduction

The National Biocontrol Collective (NBC) is an effective mechanism for contributing councils to collaborate on biocontrol agent development, and funding the NBC is one of the ongoing priorities for biomanagers.

To address perceived weaknesses in the selection of target weeds, councils created a draft prioritisation tool (henceforth the 'NBC Prioritisation Tool'), in the form of an Excel spreadsheet. The NBC Prioritisation Tool ranks prospective weed biocontrol targets based on information on a range of factors that contribute to their relative importance and feasibility of control. This was reviewed and refined in a previous report (Paynter & McGrannachan 2021) to develop a prototype version. The NBC Prioritisation Tool follows rationales for the prioritisation of weed control that were proposed by Hiebert (1997) by ranking weeds according to current impacts, future threat, and the cost and feasibility of control.

Here we survey NBC representatives to obtain data to use in the NBC Prioritisation Tool to determine if the resulting list of prioritised targets adequately reflects the needs of the NBC.

2 Objectives

The deliverable from this Envirolink grant is a report that summarises the results from the following activities:

- 1 a survey of NBC members to obtain lists of priority weed species from each region, together with associated data to populate the NBC Prioritisation Tool so that weed importance can be scored and ranked
- 2 a review of the status of any biocontrol programmes against these weed species, and a literature review to determine traits of these weeds that are correlated with biocontrol impact, so that the potential impact of biocontrol can be scored and ranked
- 3 an overall ranking of target weeds based on the combined scores for weed importance and the potential impact of biocontrol
- 4 a report on a workshop to discuss the final rankings with NBC delegates
- 5 recommendations regarding fine-tuning of the scoring system to reflect the needs of the NBC.

3 Survey of NBC weed priorities

On 3 May 2021 Emma Edney-Browne (Auckland Council) contacted representatives of the NBC requesting them to complete an Excel file listing regional weed lists. The file had drop-down lists enabling each person to complete information on the impacts and current control options for each nominated weed species for their region. Tables 1 to 3 list the options and associated scores for each category.

Survey responses were received from all but two councils, listing over 120 weed species, all of which are non-native. A summary of the responses is given in Appendix 4. If there was any uncertainty regarding weed species (e.g. mile-a-minute is used as a common name for at least three weed species), respondents were contacted to confirm weed identity. To ensure consistency when searching for congeneric species of the target weeds, Latin names listed in the appendices of this report are the accepted names given by the Global Biodiversity Information Facility (GBIF; <https://www.gbif.org/>). Thus, Japanese knotweed is named *Fallopia japonica* rather than *Reynoutria japonica*, and moth plant is referred to as *Araujia sericifera* rather than *A. hortorum*, which is a more commonly used name in New Zealand.

Unfortunately, a representative of DOC missed the original email request and by the time a reminder was sent it was considered too late to be able to obtain detailed responses from all DOC conservancies. Instead, a 'top 11' shortlist of DOC priorities (Appendix 5) was provided, of which all but two species (black wattle, *Acacia mearnsii*, and Himalayan fairy grass, *Miscanthus nepalensis*) were also included in the council lists. The DOC list included only potential novel biocontrol targets and excluded existing targets (Kate McAlpine, DOC, pers. comm.).

Some invasive genera (e.g. *Cortaderia*, *Cotoneaster*) were not always identified to species level, and one respondent listed 'wilding conifers', which potentially includes multiple genera (*Larix*, *Pinus*, *Pseudotsuga*). For *Cotoneaster*, most records were of *C. glaucophyllus* (weed importance score 110). Additional records of '*Cotoneaster* sp.', that were not identified to species level (weed importance score 28.43) were excluded from the rankings as there are multiple invasive cotoneaster species in New Zealand and ranking is not possible until the identity of the nominated species is confirmed.

We scored 'wilding conifers' as *Pinus contorta* Douglas, as this is the least controversial target for biocontrol because it has been declared an unwanted organism under the Biosecurity Act 1993. Consequently, provided sufficiently host-specific biocontrol agents can be identified, biocontrol of *P. contorta* should not have the potential for conflicting interests and opposition to biocontrol compared to other invasive conifers.

Weeds can have value in many ways, including as food crops, pasture plants, for forestry, as garden plants, or as a resource for honeybees or other desirable fauna. We do not think that any of the species nominated by the councils are likely to be valued highly enough to preclude the use of biological control. For example, we suspect that biological control of weeds that are valued by beekeepers (e.g. gorse) and garden ornamentals would not be prevented by the Environmental Protection Authority, because alternative pollen and nectar sources or non-weedy alternative ornamental species are usually available.

Nevertheless, biocontrol of some weed species (e.g. agapanthus, Bangalow palm) has the potential to be controversial, and *Acacia dealbata* is sometimes used as a firewood or timber crop, but we have assumed that it is not sufficiently important in New Zealand for the use of biological control to be discounted. Similarly, some weed species (e.g. *Persicaria chinensis*) are listed as herbal remedies, and Japanese walnut (*Juglans ailanthifolia*) produces edible 'heartnuts', although these nuts usually crack out very poorly (i.e. it is difficult to extract the kernel from the shell), making it unsuitable for commercial production. There are no selected common Japanese walnuts in propagation (<https://www.songonline.ca/nuts/heartnut.htm>).

Black wattle (*Acacia mearnsii*), nominated by DOC, is grown as a forestry tree in New Zealand and may not be a suitable biocontrol target. A benefit:cost analysis would be required to determine this. A restricted programme might be possible, though. For example, a seed weevil (*Melanterius maculatus*) was introduced into South Africa to reduce the ability of black wattle to invade without compromising its beneficial properties (Winston et al. 2020).

We cannot rule out the possibility that there may be objections to biocontrol for some of the other nominated weed species, so that a cost:benefit analysis may be required to determine whether a programme should proceed. This would normally be identified during a feasibility study at the onset of a biocontrol programme before significant sums of money are spent.

Table 1. Scoring system for weed impacts

Weed type	Score	Regional distribution	Score	Socio-political pressure to control per region	Score	Invasive ability	Score	Ecosystems impacts	Score
Agricultural (entirely within pasture & cropping systems)	0.95	Absent & unlikely to invade the region	0	High to control	4	Relatively slow to invade or reinvade following control	1	None	0
Environmental (mainly affecting native habitats)	1	Potential threat: absent, but has the potential to invade the region	1	Medium to control	3	Invades fairly rapidly. Infested sites require repeated control every few years	2	Low/limited degree of threat or impact observed to date	1
Cross-sector (i.e. both agricultural & environmental weed)	1	Minor: known from a few very small infestations in the region (e.g. less than 5)	2	Low to control	2	Invades/reinvades very rapidly & very difficult to contain, & infested sites require control annually or even more frequently	3	Moderate impacts (impact on specific individuals of a native species rather than to populations or ecosystems)	2
Social/cultural impacts only (impacts to human health, recreation, cultural values, aesthetic qualities etc.)	1	Low: present but not widely distributed	3	Neutral	1			High impacts (significant negative impact on populations of native species)	3
Wasteland weeds (i.e. a species primarily of wastelands, roadsides & disturbed areas)	0.5	Medium: localised impacts	5	Low to not control	0.75			Transformer species (i.e. capable of modifying the invaded ecosystem to such an extent that they alter ecosystem processes)	4
		High: widespread impacts	10	Medium to not control	0.33				
				High to not control	0.25				

Table 2. List of habitats contributing to the ecosystem impacts score

Native forest
Native scrub
Alpine/subantarctic
Aquatic
Wetland/riparian
Coastal dunes
Cliffs
Scree/boulderfield
Braided rivers
Saline
Geothermal
Agricultural/forestry

Table 3. Scoring system for current control options

Current control efficacy	Score	Current control cost	Score	Non-target impacts of current control options	Score	Restrictions to implementing control	Score
Highly effective	3	Relatively cheap	3	Minimal or temporary non-target impacts	3	None or few restrictions	3
Moderately effective	2	Moderately expensive	2	Some long-term non-target impacts to a few non-target species	2	Restricted access to a minority of infestations	2
Ineffective	1	Prohibitively expensive	1	Major long-term non-target impacts to desirable vegetation	1	Restricted access to many infestations	1

4 Status of any biocontrol programmes against the nominated weed species

The Weed Biocontrol Database (Winston et al. 2020) was consulted to obtain up-to-date information on biocontrol agents released against the nominated weeds nationwide. In addition, we consulted published literature and conducted internet searches to check if any programmes were underway against the nominated weeds that had not yet resulted in agents being released (as these programmes would not yet be included in the Weed Biocontrol Database). This information was used to estimate the cost of a weed biocontrol programme, which were scored on a scale of up to 50 points, according to relative cost according to Table 4, below.

Table 4. Scoring the potential cost of a weed biocontrol programme (where a higher score indicates a more expensive programme)

Programme type	Score
a. Novel programme	38
b. Novel shared programme: overseas exploration stage	28
c. Novel shared programme: overseas exploration has already been conducted; agents testing stage	18
d. Repeat programme (agents have already been released overseas and could be imported into NZ)	10
e. Presence of a valued congeneric plant in New Zealand	Add 12 points to the above scores if a valued congeneric plant is present in New Zealand

In future it may be possible to refine the predicted cost of biocontrol according to the native range of the weed. For example, weeds of southern African origin are likely to be relatively cheap targets because South Africa has a very active biocontrol community that is relatively economical to subcontract. Work on novel targets in Europe would usually involve contracting CABI to do the work, which is more expensive. Work on novel targets in countries where we currently have no or few contacts (e.g. central Asia, parts of South America) may also cost more.

It is not easy to predict the impact of biocontrol, although recent studies indicate that well-resourced programmes have a high success rate, with the majority of programmes resulting in complete or substantial control of the target weed. Paynter et al. (2012) investigated a range of plant traits that have been assumed to influence weed biocontrol success by calculating an 'impact index', defined as the proportional reduction in weed density due to biocontrol. For example, if biocontrol reduced a weed's density from 33 to 3.8 stems per square metre, then the reduction in stem density would be $33 - 3.8 = 29.2$, and the impact index = $29.2/33 = 0.885$.

They found that three factors were predictors of impact.

- *Ecosystem*. The average impact of biocontrol on wetland and aquatic weeds is greater than for terrestrial weeds.

- *Mode of reproduction.* The average impact of biocontrol is higher on clonal and apomict weeds compared to weeds that reproduce sexually. This factor may be a surrogate measure of genetic diversity of an invading weed (clonal weeds tend to have low genetic diversity compared to outcrossing sexual weeds).
- *Major weed in native range.* Biocontrol programmes targeting plants that are regarded as weeds in the native range tend to have lower impacts compared to programmes that target weeds that are not regarded as weedy in the native range. This factor may be a surrogate measure of relative abundance. For example, if a target plant is uncommon or a minor component of the native flora, it is unlikely to be considered a weed. Species that are not abundant in the native range that become abundant in the introduced range may do so because they benefit from the absence of specialist natural enemies in the introduced range. And species that are abundant enough to be considered weeds in the native range may be less regulated by natural enemies. For example, spatial models indicate that under certain disturbance regimes, Scotch broom (*Cytisus scoparius*) can be invasive in the native range despite the known chronic impacts of natural enemies on growth and fecundity (Rees & Paynter 1997).

The average impact of biocontrol (converted to percentage reduction) for each combination of these factors is given in Table 5. Scores were reduced by 5% for weed species that have a valued congener present in New Zealand. Note that these figures are averages, and that biocontrol can succeed for all trait combinations; for example, biocontrol has been highly successful against ragwort (*Jacobaea vulgaris*), even though it has the worst combination of predictor variables (Paynter et al. 2012).

Information on the predictors of impact (ecosystem, mode of reproduction and weed in the native range) of the nominated weed species is given in Appendix 1. Mode of reproduction was determined by internet searches using the weed name and search terms, such as "breeding system" or "cross pollination" or "Apomict". If information on a species could not be found, it was assumed to reproduce sexually.

Status as a weed in the native range was determined by using the CAB Direct database, searching by weed name and examining the resulting references to determine if any described the species as a weed in its native range (i.e. excluding publications documenting native range surveys for candidate biocontrol agents).

As discussed by Paynter and McGrannachan (2021), the impact of a repeat biocontrol programme is best estimated by assuming that a repeat programme will have a similar impact to that reported in regions where biocontrol was pioneered. Information on previous overseas biocontrol programmes, as well as the status of New Zealand weed biocontrol programmes against the nominated weeds, is given in Appendix 2. The success of all South African weed biocontrol programmes has been scored by Moran et al. (2021) on a scale ranging from A+ (excellent control) to C- (no control). We converted these to numerical scores (quantitised) as follows (A+ = 100; A = 87.5; A- = 75; B+ = 62.5; B = 50; B- = 37.5; C+ = 25; C = 12.5; C- = 0). We then applied this quantitised approach to anecdotal records of success from other countries.

For target weeds where survey work has previously been performed overseas that failed to find any promising agents, the predicted percentage reduction from biocontrol (predicted biocontrol efficacy score) was reduced by half.

Table 5. Predictions of the percentage reduction achieved by biocontrol for each of the eight combinations of the predictor variables (From Paynter et al. 2012).

Major weed in native range	Reproduction	Ecosystem	Percentage reduction from biocontrol
No	Asexual	Aquatic/wetland	93
No	Sexual	Aquatic/wetland	77
No	Asexual	Terrestrial	80
No	Sexual	Terrestrial	50
Yes	Asexual	Aquatic/wetland	69
Yes	Sexual	Aquatic/wetland	36
Yes	Asexual	Terrestrial	41
Yes	Sexual	Terrestrial	15

Total biocontrol score for each weed species was calculated as follows:

$$Total\ biocontrol\ score = \frac{Efficacy\ (impact)\ of\ biocontrol\ score}{1/cost\ of\ implementing\ biocontrol\ score} \times$$

5 Weed ranking

Weed impacts were scored according to ‘weed type’, ‘regional distribution’, ‘socio-political pressure’ to control the weed, ‘invasive ability’, and ‘ecosystem impacts’ according to Tables 1 and 2, and a weed impacts score was calculated as:

$$Weed\ impacts\ score = WTS \times \left((RDS + SPS + IAS) \times \sum EIS \right)$$

where WTS = weed type score; RDS = regional distribution score; SPS = socio-political pressure score; IAS = invasive ability score; EIS = ecosystem impacts score.

Ecosystem impacts were scored and summed over all the ecosystems that a weed was reported to occur in (the ecosystem options were: native forest; native scrub; alpine/subantarctic; aquatic, wetland/riparian; coastal dunes; cliffs; scree/boulderfield; braided rivers; saline; geothermal, and agriculture/forestry.)

Control options were scores as shown in Table 3, and a control score was calculated as:

$$\text{Weed control score} = \text{CCE} + \text{CCC} + \text{NTI} + \text{RIC}$$

where, CCE = current control efficacy; CCC = current control cost; NTI = non-target impacts; RIC = restrictions to implementing control.

An overall weed importance score was then calculated as:

$$\text{Overall weed importance score} = \frac{\text{Weed impacts score}}{\text{Weed control score}}$$

The final rankings are given in Appendix 3.

5.1.1 Weed importance score

The highest-ranking weed by importance was old man's beard (*Clematis vitalba*, weed importance score = 173.83), followed by gorse (*Ulex europaeus*, 159.26), Scotch broom (*Cytisus scoparius*, 113.59) and climbing asparagus (*Asparagus scandens*, 112.93). The least important weed was saffron thistle (*Carthamus lanatus*). Notably, wilding conifers ranked quite lowly (59th) and the willows nominated (crack willow [*Salix fragilis*] and grey willow [*Salix cinerea*]) ranked 56th and 87th.

5.1.2 Total biocontrol score

The best biocontrol target, by total biocontrol score, was Madeira vine (*Anderera cordifolia*, score = 8), closely followed by Noogoora bur (*Xanthium strumarium*, 7.5), egeria (*Egeria densa*, 6.9), and Sydney golden wattle (*Acacia longifolia*, 6.88), which all have agents developed overseas that could be cheaply imported into New Zealand. The lowest-ranked biocontrol targets were Bathurst bur (*Xanthium spinosum*, score = 0.2), which was subject to native range surveys for biocontrol agents in the 1930s and 1990s that failed to find any suitable candidate agents; giant buttercup (*Ranunculus acris*), which has the worst combination of traits (terrestrial, sexually reproducing, and weed in the native range) and is a difficult target due to the presence of congeneric native plants); yellow bristle grass (*Setaria pumila*), which also has the worst combination of traits, and for which the search for adequately specific agents would be complicated by the presence of a highly valued congener, foxtail millet (*S. italica*). Note that, in addition to this, DNA work in New Zealand indicates that yellow bristle grass may be a hybrid between *Setaria pumila* and *S. sphacelata*, which would make it an even more difficult target (Lynley Hayes, pers. comm.).

5.1.3 Total score

Total scores were calculated by multiplying the weed importance score and the total biocontrol score for each weed species together; i.e.

$$\text{Total score} = \text{Weed impacts score} \times \text{Total biocontrol score}$$

There were too many weed species nominated to be able to arrange them in an easily legible matrix of weed species grouped according to their importance and the predicted impact of biocontrol, so we colour-coded weed targets as green (best), amber (medium) and red (difficult) targets by importance, biocontrol cost, predicted biocontrol efficacy and overall biocontrol scores (Appendix 3).

The highest-ranking weeds include a high proportion of species that were previously prioritised for biocontrol in New Zealand, including several current targets, such as gorse (*Ulex europaeus*, ranked first by total score), lagarosiphon (*Lagarosiphon major*, 2), Scotch broom (*Cytisus scoparius*, 3). High-ranking species that have not been targeted before, include egeria (*Egeria densa*, 4) and Madeira vine (*Anredera cordifolia*, 6), which all ranked highly by weed importance and all have agents already developed overseas. Cotoneaster (*Cotoneaster glaucophyllus* Franch.) ranked 5th despite being a novel target because it scored highly by weed importance and has traits that might make it susceptible to biocontrol (apomict, not weedy in the native range).

Low-ranking weeds tend not to have been targets in the past in New Zealand, except for ragwort (*Jacobaea vulgaris*, 82), buddleia (*Buddleja davidii*, 87), nodding thistle (*Carduus nutans*, 96), and horehound (*Marrubium vulgare*, 107). The low ranking of these targets probably reflects low importance scores, following successful past biocontrol programmes, or, in the case of horehound, because predicted impact and cost scores were calculated assuming additional agents may be required and so were much less favourable scores than for the agents already released). Moreover, horehound is predominantly an emerging agricultural weed of relatively low importance to the NBC (and was recently targeted for biocontrol through a Sustainable Farming Fund Grant rather than NBC funding).

Most (17) of the top 20 weeds by total score were high ranking by weed importance score, and 17 out of the top 20 were high ranking by total biocontrol score. All but two of the bottom 20 weeds were low ranking by weed importance score and 15 were low ranking by total biocontrol score (the remainder being medium ranking, except for giant hogweed, which had a relatively high total biocontrol score).

This suggests the NBC Prioritisation Tool does a good job of formalising the selection of the most appropriate targets and finds a good balance between selecting important weeds that are better biocontrol targets.

6 Workshop

A workshop was held with stakeholders on 14 September 2021 to describe the scoring systems and results and talk about several key discussion points:

- 1 the balance between selecting important weeds and good biocontrol targets
- 2 modifying ecosystem impacts by habitat scoring system
- 3 nominating potential targets for biocontrol and prioritisation of existing vs. new targets.

In addition to these broad points, it was noted that the scoring for regional distribution required minor modification as two categories referred to localised and widespread impacts (Table 1). It was noted that the word 'impacts' should be deleted as distribution and impacts should not be conflated (with impacts being covered by a subsequent question).

6.1 Balance between selecting important weeds and good biocontrol targets

There was consensus that the balance between selecting important weeds and good biocontrol targets was good, although there was some discussion regarding the surprisingly high ranking of weeds such as gorse, which have been long-term biocontrol targets with limited biocontrol impacts to date. This relates partly to the ecosystem impact scoring for such weeds potentially favouring some widespread terrestrial weeds, especially compared to aquatic species, and the relatively low cost of implementing biocontrol against existing targets compared to novel targets. It was also noted that, for existing (or past) targets, discussion is required on a case-by-case basis to decide whether further work is justified or should be abandoned (see section 6.3). The ranking system is designed to select the best targets, but it does not need to be followed slavishly.

It was also suggested that the relative contribution of weed impacts score versus total biocontrol score could be increased by log transformation of the total biocontrol score (to reduce the skewness of the total biocontrol score). This was done and did not greatly alter the overall weed ranking: the top 20 weed species ranked this way contained all but three of the species prioritised in the initial ranking (Appendix 3). Species that were promoted to the top 20 were important but relatively difficult biocontrol targets: pampas (*C. selloana*), old man's beard (*C. vitalba*) and climbing asparagus (*A. scandens*). Species that were demoted were less important weeds that are potentially easier biocontrol targets: Sydney golden wattle (*Acacia longifolia*); *Spartina* spp., and boneseed (*Chrysanthemoides monilifera*).

6.2 Modifying ecosystem impacts by habitat scoring system

As noted above, one potential criticism of the scoring system was that the number of terrestrial habitats that contribute to the ecosystem impacts score was much greater than the number of aquatic habitats. This tended to favour widespread weeds, such as gorse and broom, that occur in multiple terrestrial habitats. For submerged aquatic weeds, by

contrast, there was only one option to score ecosystem impacts. There was consensus that scoring could be made more equitable by amalgamating some terrestrial habitats and splitting 'aquatic'. We propose that aquatic could be split into 'static water bodies (ponds, lakes)' and 'flowing water (streams, rivers)' and that it would be logical for the terrestrial habitat 'cliffs' be combined with 'scree/boulderfield' (as 'scree/boulderfield/cliffs'). Combining additional terrestrial habitats may also be justified. However, the impacts of these modifications would require delegates to repeat their scoring so that the impact of this change could not be determined.

It was also suggested that the very worst weeds (i.e. ecosystem 'transformer species') could also be scored more highly to give higher priority to highly serious invaders that only occur in one or a few habitats (e.g. submerged aquatic weeds such as lagarosiphon). To test this, a second ranking was done scoring species with low, moderate, high and transformer ecosystem impacts, 1, 3, 5, and 10, respectively (instead of 1, 2, 3, 4; Table 1). This did not greatly alter the overall weed ranking: the top 20 weed species by total score contained the same species as the initial prioritisation, with minor changes in the order of ranking.

6.3 Nominating potential targets for biocontrol and prioritisation of existing vs. new targets

Some respondents indicated that it was hard to decide which species to nominate and it was agreed that clearer guidelines are needed. Some widely established national priorities (notably wilding conifers and willows) ranked much lower by weed importance than might be expected, indicating that some respondents may have omitted species they assumed to be difficult biocontrol targets, rather than ranking weed species by weed importance alone. Furthermore, some regions did not include current weed biocontrol targets, assuming that the prioritisation process was solely to select novel biocontrol targets.

Ranking current targets can be misleading due to inevitable lags between agents being released and successful biocontrol, which can result in weeds being ranked highly when further work on developing biocontrol agents is not necessary. For example, tradescantia (*Tradescantia fluminensis*), which is ranked 7th overall, yet we consider there is a very good chance that the current suite of agents will deliver good control nationwide. Under such circumstances it would be prudent to wait until the current suite of agents is redistributed throughout the invasive range of tradescantia in New Zealand and their impact assessed, before deciding whether additional agents are needed. However, this is not the case for all current weed biocontrol targets. Detailed consideration on whether additional agents should be sought for existing targets is beyond the scope of the current report and should be discussed regularly for all current targets. Information on current targets is given in Appendix 2.

There is little point investing in the biological control of weed that is destined for national eradication. Where national eradication is no longer feasible, even locally, biocontrol should be considered, even if a weed is an eradication target over most of its range. For example, eradication of spartina from the Kaipara harbour is no longer considered feasible, so a biological control programme restricted to the Kaipara region could benefit

other regions where spartina is an eradication weed by reducing the number of propagules dispersing to other regions.

To keep the ranking system as simple as possible, it was decided that weed species should be selected by stakeholders based on weed importance alone, regardless of current biocontrol or eradication status. It was also suggested that weed targets considered should not be restricted to those listed on a region's Regional Pest Management Plan. Issues regarding the eradication or biocontrol status of weed species of existing targets should be discussed on an individual basis upon completion of the ranking to determine each weed's suitability for control and agree on the final rankings.

Finally, it was suggested that sharing ranking scores between regions and consultation between regions may be useful before a final submission, as some regions may have missed important weeds in their ranking that they may potentially pick up on from other region's ranking lists.

7 Conclusions

At the workshop, delegates noted that this ranking system is a much better system than used previously. It was considered important that information used to rank weeds should be kept up to date and as accurate as possible – the prioritisation tool is only as good as the information provided. Therefore, we recommend that the rankings be regularly reviewed. The frequency of review should be agreed by the NBC and the possible cost of such maintenance should be calculated.

It was suggested that climate change needs to be considered, but it may only be possible to factor into the potential for climate to change rankings into the post-ranking discussions. For example, where two weeds have similar scores but there are only resources to target one of them, it should be prudent to target the species that is most likely to become increasingly invasive under likely climate change scenarios.

8 Acknowledgements

We thank Emma Edney-Browne, Imogen Bassett, and Holly Cox for helpful discussions, and council staff for taking the time to respond to the prioritisation questionnaires.

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Appendix 1 – Attributes of the nominated weed species.

NC = native congeneric plant (Y/N); H = habitat (A = aquatic; T = terrestrial; W = wetland); MR = mode of reproduction (A = apomict; S = sexual; V = vegetative; note that species that produce seed are assumed to reproduce sexually if a reference describing mode of reproduction could not be found); WNR = weedy in the native range (Y/N)

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Silver wattle	<i>Acacia dealbata</i> Link	Australia	N	Acacias grown for forestry	T	S&V	(Anon 2021a)	N
Sydney golden wattle	<i>Acacia longifolia</i> (Andrews) Willd.	Australia	N	Acacias grown for forestry	T	S	(Kenrick & Knox 1982)	N
Sycamore	<i>Acer pseudoplatanus</i> L.	Central Europe	N	Ornamentals	T	S	(Belletti et al. 2007)	N
Agapanthus	<i>Agapanthus praecox</i> Willd.	South Africa	N	Ornamentals	T	S&V	(Zhuo & Sun 2009)	N
Chocolate vine	<i>Akebia quinata</i> (Houtt.) Decne.	Japan, Korea	N		T	S	(Gibbs 2014)	N
Alligator weed	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	South America	Y		T	V	(Burdon & Marshall 1981)	N
Marram grass	<i>Ammophila arenaria</i> (L.) Link	Europe and western Asia	N		T	S&V	(Hertling & Lubke 2000)	N
Portuguese angelica	<i>Angelica pachycarpa</i> Lange	NW Spain, Western Portugal	N	<i>Angelica archangelica</i> (culinary herb)	T	S	Assumed sexual	N
Madeira vine	<i>Anredera cordifolia</i>	South America	N		T	V	(Dalrymple et al. 2015)	N
Cape pondweed	<i>Aponogeton distachyos</i> L.f.	South Africa	N		A	S&V		N
Moth plant	<i>Araujia sericifera</i> Brot.	South America	N		T	S	(Coombs & Peter 2010)	N
Bangalow palm	<i>Archontophoenix cunninghamiana</i> (H.Wendl.) H.Wendl. & Drude	Australia	N	Ornamentals	T	S	Assumed sexual	N
Cape weed	<i>Arctotheca calendula</i> (L.) Levyns	South Africa	N		T	S&V	(Dunbabin & Cocks 1999)	Y
Blue Iris	<i>Aristea ecklonii</i> Baker	Southern Africa	N	Ornamentals	T	S&V	(Goldblatt & Manning 2008)	N

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Bushy asparagus	<i>Asparagus aethiopicus</i> L.	South Africa	N	Garden asparagus <i>Asparagus officinalis</i>	T	S&V	(Fukuda et al. 2005)	N
Climbing asparagus	<i>Asparagus scandens</i> Thunb.	South Africa	N	Garden asparagus <i>Asparagus officinalis</i>	T	S&V	(Fukuda et al. 2005)	N
Darwin's barberry	<i>Berberis darwinii</i> hook.	South America	N	Ornamentals	T	S	(Paun et al. 2009)	N
Great barberry	<i>Berberis glaucocarpa</i> Stapf.	West Himalayas	N	Ornamentals	T	S	(Paun et al. 2009)	N
Barberry	<i>Berberis vulgaris</i> L.	Europe, N Africa, W Asia	N	Ornamentals	T	S	(Cadic 1992)	N
Bomarea	<i>Bomarea multiflora</i> (L.f.) Mirb.	Colombia, Ecuador	N		T	S&V	(Carlson & Harms 2006)	N
Buddleia	<i>Buddleja davidii</i> Franch.	China	N	Ornamentals	T	S	(Ebeling et al. 2012)	N
Great bindweed	<i>Calystegia silvatica</i> (Kit.) Griseb.	Europe	Y		T	S	(Brown et al. 2009)	N
Nodding thistle	<i>Carduus nutans</i> L.	Europe, Asia	N		T	S	(Burdon & Marshall 1981)	Y
Divided sedge	<i>Carex divisa</i> Huds.	Europe, N Africa, Asia	Y		T	S	Assumed sexual	N
Australian sedge	<i>Carex longibrachiata</i> Boeckeler	Australia	Y		T	S	Assumed sexual	N
Saffron thistle	<i>Carthamus lanatus</i> L.	Europe, Asia	N	Ornamentals	T	S	(Ash et al. 2003)	N
Climbing Spindleberry	<i>Celastrus orbiculatus</i> Thunb.	East Asia	N	Ornamentals	T	S	(Pooler et al. 2002)	N
Feather top grass	<i>Cenchrus longisetus</i> M.C.Johnst.	Ethiopia	Y		T	A	(Gregor 2013)	N
African feather grass	<i>Cenchrus macrourus</i> (Trin.) Morrone	South Africa	Y		T	A&V	(Dujardin & Hanna 1984)	N
Hornwort	<i>Ceratophyllum demersum</i> L.	North America	N		A	V	(de Winton & Clayton 1996)	Y
Queen of the night	<i>Cestrum nocturnum</i> L.	West Indies	N	Ornamentals	T	S	Assumed sexual	N
Boneseed	<i>Chrysanthemoides monilifera</i> (L.) Norl.	South Africa	N		T	S	(Blood 2001)	N
Old man's beard	<i>Clematis vitalba</i> L.	Eurasia	Y	Ornamentals	T	S	(Knuth 1908)	Y

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Strawberry dogwood	<i>Cornus capitata</i> Wall.	Temperate Asia	N	Ornamentals	T	S	(Khanduri et al. 2019)	N
Pampas	<i>Cortaderia jubata</i> (Lemoine) Stapf	South America (Ecuador?)	N		T	A	(Costas-Lippmann 1979)	N
Pampas	<i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	South America (Chile?)	N		T	S	(Costas-Lippmann 1979)	N
Cotoneaster	<i>Cotoneaster glaucophyllus</i> Franch.	China	N	Ornamentals	T	A	(Nybom & Bartish 2007)	N
Pig's ear	<i>Cotyledon orbiculata</i> L.	South Africa	N	Ornamentals	T	S&V	(Zietsman 1998)	N
Hawthorn	<i>Crataegus monogyna</i> Jacq.	Europe, North Africa, western Asia	N	Ornamentals	T	S	(Chacoff et al. 2008)	N
Montbretia	<i>Crocasmia crocosmiiflora</i> (Lemoine) N.E.Br.	South Africa	N	Ornamentals	T	V	(Anon 2021f)	N
Scotch broom	<i>Cytisus scoparius</i> (L.) Link	Europe	N		T	S	(Paynter et al. 2010)	Y
German ivy	<i>Delairea odorata</i> Lem.	South Africa	N		T	S&V	(Robison et al. 2011)	N
Mile-a-minute	<i>Dipogon lignosus</i> (L.) Verdc.	South Africa	N		T	S	Assumed Sexual	N
Egeria	<i>Egeria densa</i> Planch.	South America	N		A	V	(de Winton & Clayton 1996)	Y
Veldt grass	<i>Ehrharta erecta</i> Lam.	Southern Africa, Yemen	Y		T	S&V	(Anon 2021e)	N
Elaeagnus	<i>Elaeagnus ×reflexa</i> É.Morren & Decne.	East Asia, Japan	N	Ornamentals	T	S(?)&V	(Anon 2021d)	N
African love grass	<i>Eragrostis curvula</i> (Schrad.) Nees	South Africa	N		T	A	(Cardone et al. 2006)	N
Spanish heath	<i>Erica lusitanica</i> Rudolphi	Europe	N	Ornamentals	T	S	Assumed sexual	N
Mexican daisy	<i>Erigeron karvinskianus</i> DC.	Central America	N		T	A	(Noyes 2000)	N
Japanese knotweed	<i>Fallopia japonica</i> (Houtt.) Ronse Decr.	Japan, China, Korea	N		T	S&V	(Bailey et al. 2009)	N

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Giant knotweed	<i>Fallopia sachalinensis</i> (F.Schmidt) Ronse Decr.	northeastern Asia in northern Japan	N		T	S&V	(Bailey et al. 2009)	N
Reed sweet grass	<i>Glyceria maxima</i> (Hartm.) Holmb.	Europe, Asia	N		W/A	S&V	(Lambert 1947)	N
Gunnera	<i>Gunnera tinctoria</i> (Molina) Mirb.	Chile, Argentina	Y		T	S&V	(Fennell et al.)	N
Willow leaved hakea	<i>Hakea salicifolia</i> (Vent.) B.L.Burt	Australia	N	Ornamentals	T	S	(Goldingay & Carthew 1998)	N
Prickly Hakea	<i>Hakea sericea</i> Schrad. & J.C.Wendl.	Australia	N	Ornamentals	T	S	(Goldingay & Carthew 1998)	N
English ivy	<i>Hedera helix</i> L.	Europe, west Asia	N	Ornamentals	T	S	(Metcalf 2005)	Y
Wild ginger	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	Asia	N	Ornamentals	T	S&V	(Wang et al. 2004)	N
Water celery	<i>Helosciadium nodiflorum</i> (L.) Koch	Western Europe	N		W	S&V	(Desjardins et al. 2015)	N
Giant hogweed	<i>Heracleum mantegazzianum</i> Sommier & Levier	Western Caucasus region of Eurasia	N		T	S	(Stewart & Grace 1984)	N
Holly	<i>Ilex aquifolium</i> L.	Europe, north Africa, west Asia	N	Ornamentals	T	S	(Obeso et al. 1998)	N
Himalayan balsam	<i>Impatiens glandulifera</i> royle	Himalayan mountains	N	Ornamentals	T	S	(Nienhuis & Stout 2009)	N
Blue morning glory	<i>Ipomoea indica</i> (Burm.) Merr.	South America	Y	Ornamentals, sweet potato <i>Ipomoea batatas</i>	T	V	(Anon 2021b)	N
Yellow flag Iris	<i>Iris pseudacorus</i> L.	Europe, north Africa, west Asia	N	Ornamentals	T/W	S	(Gaskin et al. 2016)	Y
Ragwort	<i>Jacobaea vulgaris</i> Gaertn.	Europe	N		T	S&V	(Burdon & Marshall 1981)	Y
Jasmine	<i>Jasminum polyanthum</i> Franch.	China	N	Ornamentals,	T	S	(Zhang et al. 2003)	N
Japanese walnut	<i>Juglans ailanthifolia</i> Carrière	Japan	N	Crop: English Walnut <i>J. regia</i>	T	S	(Kimura et al. 2003)	N

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Sharp rush	<i>Juncus acutus</i> L. subsp. <i>acutus</i>	Western Europe to Iraq & the Persian Gulf	Y	Ornamentals	W	S	(Jones & Richards 1954)	N
Lagarosiphon	<i>Lagarosiphon major</i> (Ridl.) Moss	South Africa	N		A	V	(de Winton & Clayton 1996)	N
Himalayan honeysuckle	<i>Leycesteria formosa</i> Wall.	Himalayas	N		T	S	Assumed sexual	N
Tree privet	<i>Ligustrum lucidum</i> W.T.Aiton	China	N	Ornamentals	T	S	(Starr et al. 2003)	N
Chinese privet	<i>Ligustrum sinense</i> Lour.	China	N	Ornamentals	T	S	(Starr et al. 2003)	N
Japanese honeysuckle	<i>Lonicera japonica</i> Thunb.	Japan, Korea, China	N	Ornamentals	T	S	(Larson et al. 2002)	N
Creeping gloxinia	<i>Lophospermum erubescens</i> D.Don ex Sweet	Mexico	N		T	S	Assumed sexual	N
Tree lupin	<i>Lupinus arboreus</i> Sims	North America	N	Green crops; ornamentals	T	S	(Kittelson & Maron 2000)	N
Russell lupin	<i>Lupinus polyphyllus</i> Lindl.	North America	N	Green crops; ornamentals	T	S	(Anon 2021c)	N
Boxthorn	<i>Lycium ferocissimum</i> Mers	South Africa	N	<i>L. barbatum</i> sold in NZ	T	S	(Miller et al. 2008)	N
Horehound	<i>Marrubium vulgare</i> L.	Europe, North Africa, Asia	N		T	S	Assumed sexual	N
Cape honeyflower	<i>Melianthus major</i> L.	South Africa	N		T	S&V	Assumed sexual	N
Parrot's feather	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	South America	Y		A	V	(Cilliers 1999)	N
Chilean needle grass	<i>Nassella neesiana</i> (Trin. & Rupr.) Barkworth	South America	N		T	S&V	(Bourdote & Hurrell 1992)	N
Nassella tussock	<i>Nassella trichotoma</i> (Nees) Hack. & Arechav.	South America	N		T	S&V	(Hussaini et al. 2000)	N
Royal fern	<i>Osmunda regalis</i> L.	Europe, Africa, Asia, North & South America	N		T	S&V	(Li & Haufler 1994)	N
Brush wattle	<i>Paraserianthes lophantha</i> (Vent.) I.C.Nielsen	Australia	N		T	S	(Brown et al. 2020)	N

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Saltwater paspalum	<i>Paspalum vaginatum</i> Sw.	Africa and the Americas	Y		W	S&V	(Duncan 1999)	N
Banana passionfruit	<i>Passiflora 'Tacsonia' subgroup:</i> <i>Passiflora pinnatistipula</i> Cav.; <i>Passiflora tarminiana</i> Coppens & V.E.Barney; <i>Passiflora tripartita</i> (A.Juss.) Poir.	South America	Y	Food crops	T	S	(Beavon 2007)	N
Blue passionflower	<i>Passiflora caerulea</i> L.	South America	Y	Food crops	T	S	(Beavon 2007)	N
Chinese knotweed	<i>Persicaria chinensis</i> (L.) Nakai	Asia	Y		T	V	(Galloway & Lepper 2010)	N
Phragmites	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	S Asia to Australia	N		A	S&V	(Nayak et al. 2020)	N
Inkweed	<i>Phytolacca octandra</i> L.	Tropical South and Central America	N		T	S	Assumed sexual	N
Lodgepole (Wilding) pine	<i>Pinus contorta</i> Douglas ex Loudon	USA	N	Forestry spp. esp. <i>P. radiata</i>	T	S	(Sorensen 2001)	N
Taiwan cherry	<i>Prunus campanulata</i> Maxim.	Japan, Taiwan, southern and eastern China	N	Multiple crops, ornamentals	T	S	(Ma et al. 2009)	N
Cherry laurel	<i>Prunus laurocerasus</i> L.	SE Europe, Asia Minor	N	Multiple crops, ornamentals	T	S	(Ma et al. 2009)	N
Japanese hill cherry	<i>Prunus sargentii</i> Rehder	Japan, Korea, Sakhalin (Russia)	N	Multiple crops, ornamentals	T	S	(Ma et al. 2009)	N
Giant buttercup	<i>Ranunculus acris</i> L.	Europe, temperate Asia	Y		T	S&V	(Lundqvist et al. 1973)	Y
Evergreen buckthorn	<i>Rhamnus alaternus</i> L.	Mediterranean	N	Ornamentals	T	S	(Rottenberg 2000)	N
Blackberry	<i>Rubus fruticosus</i> L.	Europe	Y		T	A&V	(Burdon & Marshall 1981)	Y
Climbing dock	<i>Rumex sagittatus</i> Thunb.	Southern Africa	Y		T	S&V	(Navajas-Perez et al. 2005)	N
Grey willow	<i>Salix cinerea</i> L.	Eurasia	N	Ornamentals	T	S	(Adair et al. 2006)	N
Crack willow	<i>Salix fragilis</i> L.	Eurasia	N	Ornamentals	T	S	(Adair et al. 2006)	N

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Lily of the valley vine	<i>Salpichroa origanifolia</i> Lam.) Baill.	South America	N		T	S	(Morales & Galetto 2003)	N
Brazilian pepper	<i>Schinus terebinthifolia</i> Raddi	South America	N		T	S	(Lenzi & Orth 2004)	N
African club moss	<i>Selaginella kraussiana</i> (Kunze) A.Braun	Madeira, the Azores, Canary Islands and much of Africa	N		T	S&V	(Anon 2021g)	N
Cape ivy	<i>Senecio angulatus</i> L.fil.	South Africa	Y	Ornamentals	T	S	Assumed sexual	N
Purple/pink ragwort	<i>Senecio glastifolius</i> L.fil.	South Africa	Y	Ornamentals	T	S	Assumed sexual	N
Gravel groundsel	<i>Senecio skirrodon</i> DC. (<i>S. madagascariensis</i> x <i>inaequidans</i> ?)	South Afrca, Madagascare	Y	Ornamentals	T	S	Assumed sexual	N
Yellow bristle grass	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Europe	N	Foxtail millet <i>S. italica</i>	T	S	Assumed sexual	Y
Variegated thistle	<i>Silybum marianum</i> (L.) Gaertn.	Europe	N		T	S	(Hetz et al. 1995)	Y
Woolly nightshade	<i>Solanum mauritianum</i> Scop.	South America	Y	Crops: Potatoes; eggplant, tomatoes etc.	T	S	(Rambuda & Johnson 2004)	N
Spartina	<i>Spartina alterniflora</i> Liosel.	Eastern N America	N		A	S	(Davis et al. 2004)	N
Spartina	<i>Spartina anglica</i> C.E.Hubb.	Europe	N		A	S	(Davis et al. 2004)	N
Monkey apple	<i>Syzygium australe</i> (J.C.Wendl. ex Link) B.Hyland	Australia	Y	Ornamentals	T	S	Assumed sexual	N
Tradescantia	<i>Tradescantia fluminensis</i> Vell.	South America	N	Ornamentals	T	V	(Standish 2004)	N
Chilean flame creeper	<i>Tropaeolum speciosum</i> Poepp. & Endl.	South America	N	Ornamentals	T	S(?)&V	Assumed sexual	N
Gorse	<i>Ulex europaeus</i> L.	Europe	N		T	S	(Burdon & Marshall 1981)	Y
Perennial nettle	<i>Urtica dioica</i> L.	Northern temperate regions	Y		T	S&V	(Cox & Allen 2008)	N
Eel grass	<i>Vallisneria australis</i> S.W.L.Jacobs & Les	Australia	N		A	V	(New Zealand Plant Conservation Network 2021)	Y

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Periwinkle	<i>Vinca major</i> L.	Europe	N	Ornamentals	T	S&V	(Fryxell 1957)	N
Bulbil watsonia	<i>Watsonia bulbifera</i> J.W.Mathews & L.Bolus	South Africa	N	Ornamentals	T	S&V	(Wilson & Conran 1994)	N
Bathurst bur	<i>Xanthium spinosum</i> L.	South America	N		T	S	(Hicks 1975)	Y
Noogoora bur	<i>Xanthium strumarium</i> L.	North America	N		T	S	(Hicks 1975)	Y
Arum lily	<i>Zantedeschia aethiopica</i> (L.) Spreng.	South Africa	N	Ornamentals	T	S&V	(Singh et al. 1996)	N

Appendix 2 – Status of biocontrol research on the nominated weed species:

AR = Biocontrol agents already released in New Zealand (Y/N); BD = Biocontrol agents developed overseas that could potentially be released in New Zealand. Biocontrol impact information is from the catalogue (Winston et al. 2020), unless otherwise stated.

Common name	Latin name	AR	BD	Notes
Silver wattle	<i>Acacia dealbata</i> Link	N	Y	South African programme restricted to seed-feeders to reduce spread: A flower gall fly <i>Dasineura pilifera</i> that was introduced to control <i>A. baileyana</i> in S. Africa also attacks silver wattle, but its impacts are unknown; <i>Melanterius</i> sp. nr <i>maculatus</i> . Seed damage has ranged from 64-93% (mean 79%) at the few sites where establishment is confirmed. Overall impact is nevertheless considered to be low in South Africa (Moran et al. 2021). Biocontrol cost and efficacy were scored as novel programme, assuming candidate agents capable of inflicting greater damage are required.
Sydney golden wattle	<i>Acacia longifolia</i> (Andrews) Willd.	N	Y	Current NZ target. In South Africa a gall wasp <i>Trichilogaster acaciaelongifoliae</i> provides excellent control in dryer areas and has 'stabilized' populations in riverine areas (Category A and B, respectively, according to Moran et al. 2021). An EPA application to release the gall wasp in NZ is being prepared. As biocontrol ranges from Category A to B in South Africa, it was given a Biocontrol Efficacy score of score of 68.75 and cost score of 10.
Alligator weed	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Y	N	Past NZ target. Good control of aquatic weed on still water bodies. No control of terrestrial weed, so release of additional agents is desirable. However, prospects of finding suitable agents seems poor. A flea beetle, <i>Disonycha argentinensis</i> did not establish on terrestrial weed in NZ despite large numbers being released; <i>Amylothrips andersoni</i> , which was released in the USA, is not sufficiently host-specific for release in NZ (assuming <i>Alternanthera denticulata</i> / <i>A. nahui</i> are native, which is debatable.) Work on a gall-forming fly <i>Ophiomyia marelli</i> was abandoned in NZ after it was found to rear through on both <i>Alternanthera denticulata</i> and <i>A. nahui</i> and did not appear to be very damaging. Biocontrol cost was scored for a novel target (as surveys for novel agents are required). Efficacy was reduced by half to 40, reflecting the low likelihood of finding damaging agents on an already well surveyed species.
Madeira vine	<i>Anredera cordifolia</i>	N	Y	A defoliating beetle <i>Plectonycha correntina</i> was released in Australia in 2011 and South Africa in 2016. In Australia, it reportedly occasionally causes conspicuous damage, but a lack of monitoring means that the long-term impacts are unknown and were therefore scored according to Table 5.
Moth plant	<i>Araujia sericifera</i> Brot.	Y	Y	Current NZ target. A root-feeding beetle <i>Freudeita cupripennis</i> is established and releases are ongoing; specificity testing of a fruit fly <i>Anastrepha</i> sp., is complete and a rust fungus <i>Puccinia araujiae</i> is approved for release (delayed due to regulatory issues obtaining export approval from Argentina). Ideally, a programme should continue until all three are released to maximise the chance of success.

Common name	Latin name	AR	BD	Notes
Cape weed	<i>Arctotheca calendula</i> (L.) Levyns	N	N	Preliminary survey work was done in South Africa during 1986-1988 (Scott & Way 1990) and found five potential biocontrol agents. The curculionid weevil <i>Stenotypus indignus</i> was possibly the most suitable as it is known only from <i>A. calendula</i> and is damaging to the plant. Two leaf-feeding chrysomelid beetles, <i>Chrysolina fasciata</i> and <i>Cassida sphaerula</i> , and a root-feeding curculionid weevil <i>Rhytirrhinus sordidus</i> fed on several species from the tribe Arctoteae including <i>A. calendula</i> and may not be sufficiently specific. The gall-forming nematode <i>Subanguina mobilis</i> also has potential for biological control.
Climbing asparagus	<i>Asparagus scandens</i> Thunb.	N	N	Past NZ target. Native range surveys were done, but few candidate agents were identified (Kleinjan 2007). A seed-feeder that also attacks cultivated asparagus may have potential (but its release would likely be opposed by the commercial asparagus industry so a rigorous cost-benefit analysis would be required). Work on this target has been suspended. Work could resume, but it is by no means certain that any suitable agents will be found. Biocontrol efficacy score was reduced by half to reflect the low likelihood of discovering a damaging agent.
Darwin's barberry	<i>Berberis darwinii</i> hook.	Y	Y	Current NZ target. A seed-weevil <i>Berberidicola exeratus</i> has been released in NZ and recovered from some release sites. A flowerbud feeding weevil <i>Anthonomus kuscheli</i> is also approved for release here (we are waiting to see if it is needed, or if the weevil alone will be sufficient to reduce seed production to trivial levels). Work on a rust fungus <i>Puccinia berberidis-darwinii</i> is ongoing. Work should continue at least until the specificity of the rust fungus has been determined.
Buddleia	<i>Buddleja davidii</i> Franch.	Y	N	Past NZ target. A leaf-feeding weevil <i>Cleopus japonicus</i> has heavy impacts; one other promising candidate agent was identified (a stem borer <i>Mecyclobus erro</i>) but may not be needed.
Nodding thistle	<i>Carduus nutans</i> L.	Y	Y	Past NZ target. Control is good in most parts of NZ. Other agents, e.g., <i>Cheilosia grossa</i> , <i>Psylliodes chalconera</i> could potentially be released, but do not appear to be particularly damaging and may not be needed. Redistribution of green thistle beetles and crown weevils could also be attempted.
Saffron thistle	<i>Carthamus lanatus</i> L.	N	N	No agents have been used anywhere. Many candidate agents were considered likely to attack safflower <i>C. tinctorius</i> . <i>Botanophila turcica</i> may be sufficiently host-specific but perhaps not very damaging (Grace et al. 2004).
Boneseed	<i>Chrysanthemoides monilifera</i> (L.) Norl.	Y	Y	Past NZ target. The boneseed leafroller <i>Tortrix</i> s.l. sp. " <i>chrysanthemoides</i> " is established in NZ with minimal impacts; other agents that were released in Australia could potentially be released in NZ but they either failed to establish or have a low efficacy in Australia. A rust fungus <i>Endophyllum osteospermi</i> is much more promising but it has proven very hard to work with (Wood 2006). Work on this target has been suspended as it was likely to require significant funding. It could be resumed if it is considered that work on the rust could be successful.
Old man's beard	<i>Clematis vitalba</i> L.	Y	Y	Current NZ target: a novel agent <i>Aceria vitalbae</i> is currently being mass-reared and released and a sawfly <i>Monophadnus spinolae</i> , which only established in the Nelson region, is being redistributed. Surveys for pathogens in Europe are underway. Efficacy and cost scores were calculated according to Table 4

Common name	Latin name	AR	BD	Notes
Pampas	<i>Cortaderia jubata</i> (Lemoine) Stapf	N	N	Current NZ target. Some survey work has been done overseas, and a smut fungus <i>Ustilago quitensis</i> is under investigation in containment but proving difficult to work with. Scored as a novel target, according to Table 4s and 5.
Pampas	<i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	N	N	Past NZ target. Some survey work and testing done: a planthopper <i>Saccharosydne</i> proved unsuitable (reared through on native toetoe) and work on this target has been suspended. This is a difficult target because plants which are a good genetic match to invasive plants in NZ are rarely found in the native range, implying that the true native range of <i>C. selloana</i> that is invasive in NZ has not yet been found. Scored as if it were a novel target. It is possible that <i>Ustilago quitensis</i> , collected from <i>C. jubata</i> (see above) will be effective against <i>C. selloana</i> .
Scotch broom	<i>Cytisus scoparius</i> (L.) Link	Y	Y	Past NZ target. Biocontrol is starting to have a major impact, but not in all regions. Additional candidates, (e.g., the root nodule-feeder <i>Andrion regensteinensis</i>) are available for further investigation should redistribution of existing agents fail to result in sufficient control. It may also be worth investigating reimporting <i>Agonopterix assimillella</i> , which is highly damaging in parts of the native range but does not appear to have established (although a thorough survey of release sites should be conducted to confirm this). Efficacy scored for a novel target (Table 5), cost scored as "agent testing stage" (18) as no further survey work to identify candidate agents is required.
Egeria	<i>Egeria densa</i> Planch.	N	Y	A leaf-mining fly <i>Hydrellia egeriae</i> was released in South Africa in 2018. It established but it is too early to determine its impact there.
Japanese knotweed	<i>Fallopia japonica</i> (Houtt.) Ronse Decr.	N	Y	A psyllid <i>Aphalara itadori</i> has been released in the UK, but did not establish, so current track record is of failure. Scored as a novel target for efficacy and cost.
Prickly Hakea	<i>Hakea sericea</i> Schrad. & J.C.Wendl.	N	Y	Several spp. released in South Africa, namely the Hakea seed moth <i>Carposina autologa</i> ; Hakea fruit weevil <i>Erytenna consputa</i> ; a shoot boring weevil <i>Cydmaea binotata</i> ; a stem-boring beetle <i>Aphanasium australe</i> and bud weevil <i>Dicomada rufa</i> have reportedly resulted in Hakea being 'less problematic than previously' (B-; Moran et al. 2021). Biocontrol impact was given a score of 37.5.
Wild ginger	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	N	N	Current NZ target. CABI have been working on several candidate agents, of which a weevil <i>Metaprodiocetes trilineata</i> appears to be the most promising, but low rearing success in containment and bureaucratic issues have delayed progress. The current priority is to import agents into containment in NZ to see if rearing success can be improved so that specificity testing can be completed, in conjunction with additional field testing in India.

Common name	Latin name	AR	BD	Notes
Giant Hogweed	<i>Heracleum mantegazzianum</i> Sommier & Levier	N	N	CABI performed native range surveys (to look for candidate agents that could be released in the UK). No specialists were recognised (Hansen et al. 2006) but the recent description of a new species of <i>Agonopterix</i> (<i>A. caucasiella</i>) that attacks <i>H. mantegazzianum</i> (Karsholt et al. 2006), indicates that prospects may be better than first thought. Moreover, higher specificity is required for biocontrol in UK, which has native congeners, compared to in NZ. Cost scored as 18 (agent testing stage, as there is only one promising agent identified that would be a priority for importation and testing).
Himalayan balsam	<i>Impatiens glandulifera</i> Royle	N	Y	<i>Puccinia komarovii</i> var. <i>glanduliferae</i> has been introduced into the UK. Too early to assess impact but there have been issues matching rust strain with susceptible weed populations. Cost scored as 10 (repeat programme), efficacy scored based on traits, as per Table 5.
Yellow flag Iris	<i>Iris pseudacorus</i> L.	N	N	Current NZ target - two candidate agents including a flea beetle <i>Aphthona nonstriata</i> are under investigation in South Africa (Minuti et al. 2021). Efficacy scored according to plant traits. Cost scored as 18 (agent testing stage).
Ragwort	<i>Jacobaea vulgaris</i> Gaertn.	Y	Y	Past NZ target under good control in many regions. Release of additional agents is unlikely to lead to greatly improved control. Efficacy scored according to plant traits. Cost scored as 10 (repeat programme, assuming that priority agents would be tested species already released overseas e.g., <i>Longitarsus flavicornis</i>).
Lagarosiphon	<i>Lagarosiphon major</i> (Ridl.) Moss	N	Y	Current NZ target. A leaf miner <i>Hydrellia lagarosiphon</i> is sufficiently host-specific to be released in NZ. A stem miner <i>Polypedilum tuburcinatum</i> has potential for used as a biocontrol agent but more host-specificity testing is required and is currently underway in South Africa.
Chinese privet	<i>Ligustrum sinense</i> Lour.	Y	N	Past NZ target. A tingid <i>Leptoypha hospita</i> is already established in NZ. There has been little formal assessment of its impacts, but they appear to be limited so far; no other agents are currently available although USDA testing on a beetle <i>Argopistes tsekooni</i> was well advanced so little additional testing would be required for NZ (so cost scored 18: "agent testing stage").
Japanese honeysuckle	<i>Lonicera japonica</i> Thunb.	Y	Y	Current NZ target. The butterfly <i>Limenitis glorifica</i> is well established and spreading, but seemingly has had little impact to date. A stem-boring beetle <i>Oberea shirahatai</i> is being mass-reared and is considered to have great potential to damage Japanese honeysuckle. Additional candidate agents have been identified, if required, but we recommend waiting to see how well <i>O. shirahatai</i> performs before investing in additional agents.
Horehound	<i>Marrubium vulgare</i> L.	Y	Y	Current NZ target using the same agents as Australia. As the two selected agents are already established at release sites in NZ, this species was scored assuming additional survey work for additional agents is required (cost = 28) and the potential impact of additional agents was scored according to plant traits. Anecdotal evidence indicates that the plume moth performs well in Australian regions with rainfall > 450 mm and where summer maximum temperatures rarely exceed 35°C, and the clearwing moth can kill plants, so additional agents may not be required.

Common name	Latin name	AR	BD	Notes
Parrot's feather	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	N	Y	Anecdotally, excellent control in S Africa (Category A, according to Moran et al. 2021). Impact scored as 87.5.
Chilean needlegrass	<i>Nassella neesiana</i> (Trin. & Rupr.) Barkworth	N	Y	Current NZ target. Testing of a rust fungus was complete and EPA approval obtained, but recent host-specificity testing work for Australia indicates that it would be prudent to test additional native NZ test plants; this work is planned but have been problems exporting the rust from Argentina.
Nassella tussock	<i>Nassella trichotoma</i> (Nees) Hack. & Arechav.	N	N	Past NZ target. Some survey work and host-range testing done for Australia and NZ. The fungi were either not sufficiently host-specific (<i>Puccinia nassellae</i>), or sufficiently damaging (<i>P. nassellae</i> , <i>Tranzscheliella</i> sp.) or their life cycles could not be determined (<i>P. nassellae</i> , <i>Tranzscheliella</i> sp., <i>Corticiceae</i> sp.) (McLaren et al. 2012). Prospects for successful biocontrol seem poor.
Brush wattle	<i>Paraserianthes lophantha</i> (Vent.) I.C.Nielsen	N	Y	A seed-feeding beetle <i>Melanterius servulus</i> and a <i>Uromycladium</i> rust fungus have been released in South Africa (too early to assess impact, but another <i>Uromycladium</i> performed well against related <i>Acacia saligna</i> in South Africa).
Banana passionfruit	<i>Passiflora</i> 'Tacsonia' subgroup: <i>Passiflora pinnatistipula</i> Cav.; <i>Passiflora tarminiana</i> Coppens & V.E.Barney; <i>Passiflora tripartita</i> (A.Juss.) Poir.	N	Y	Current NZ target. Progress has been slow due to agents failing specificity tests (<i>Septoria passiflorae</i>), low rearing success and being considered insufficiently damaging (<i>Pyrausta perelegans</i>). Work on a stem-mining moth <i>Odonna passiflorae</i> , which kills banana passionfruit plants in Colombia is underway, including a long-term field specificity test in Colombia. A seed fly <i>Dasiops caustonae</i> is also under investigation.
Blackberry	<i>Rubus fruticosus</i> L.	Y	Y	Past NZ target. Other strains of the blackberry rust have been released in Australia that may have potential for biocontrol of susceptible forms in NZ. However, there is insufficient published information to estimate the potential impacts on strains present in NZ. Work in Australia has indicated that a stem-boring sawfly <i>Phylloecus faunus</i> may have some potential to control <i>Rubus ulmifolius</i> , which belongs to <i>R. fruticosus</i> agg.
Brazilian Pepper	<i>Schinus terebinthifolia</i> Raddi	N	Y	Several spp. released in the USA with generally 'slight' impacts although fears of impacts on non-target species due to the toxicity of promising candidate biocontrol agents has prevented some host-specific and potentially highly damaging agents being released to date (Boevé et al. 2018).
Variegated thistle	<i>Silybum marianum</i> (L.) Gaertn.	Y	N	No agents have been specifically developed for <i>S. marianum</i> , although <i>R. conicus</i> will attack it, but with limited impacts.

Common name	Latin name	AR	BD	Notes
Woolly nightshade	<i>Solanum mauritianum</i> Scop.	Y	Y	Current NZ target. <i>Gargaphia decoris</i> can be highly damaging to plants growing in sheltered shaded sites but has minimal impacts on plants growing in full sun. A flower-feeder <i>Anthonomus morticinus</i> is being investigated in South Africa; other promising candidate agents have been prioritised for further study once overseas travel becomes possible.
Spartina	<i>Spartina alterniflora</i> Liosel. <i>Spartina anglica</i> C.E.Hubb.	N	Y	A sapsucking bug <i>Prokelisia marginata</i> was introduced into western North America, where spartina is introduced, resulting in an approximately 50% reduction in growth and biomass (Grevstad et al. 2003). Scored as 50.
Tradescantia	<i>Tradescantia fluminensis</i> Vell.	Y	Y	Current NZ target and very promising signs of success; redistribution of agents is the main priority (then to assess if more are needed, e.g., in cooler regions).
Chilean flame creeper	<i>Tropaeolum speciosum</i> Poepp. & Endl.	N	N	Current NZ target. Preliminary survey work done. Promising chrysomelid beetle <i>Blaptea elguetai</i> found.
Gorse	<i>Ulex europaeus</i> L.	Y	Y	Current NZ target. Redistribution of existing agents is a current priority, but SFFF work could see more agents imported and released provided they are sufficiently host-specific, (e.g., <i>Sitona</i> and <i>Andrion</i> root-weevils). <i>Andrion regensteiniensis</i> has the potential to damage both gorse and Scotch broom.
Bathurst bur	<i>Xanthium spinosum</i> L.		N	Surveys for agents were done in the Americas in the 1930s and 1990s and did not find anything promising (Julien et al. 2012).
Noogoora bur	<i>Xanthium strumarium</i> L.		Y	A moth, <i>Epiblema strenuata</i> and an accidentally introduced fungus (<i>Puccinia xanthii</i>) have had major impacts in humid regions of Australia. The rust caused excellent control across much of Australia, except in more arid regions and wet-dry tropics. Potential biocontrol impacts in NZ scored as 75.
Arum lily	<i>Zantedeschia aethiopica</i> (L.) Spreng.		N	Only seed-feeders have been investigated for Australia (due to conflicting interests as flowers valued). Fruits were surveyed in South Africa, but only polyphagous seed-feeders found.

Appendix 3 – Final rankings of the nominated weed species

For Weed importance score, green shading indicates most important targets (score > 27.5); amber = medium importance (score 8.5 – 27.5) and red = least important (score < 8.5. Biocontrol efficacy score: green = highest predicted impacts (>50); amber = medium impacts predicted (41-50); red = lower impacts predicted (≤ 40). Cost score: green = cheapest targets (score = 10); amber = medium cost targets (score 18-30); red = most expensive targets (score > 30). Total biocontrol score: green = better targets (score > 2); amber = medium targets (score 1-2); red = more difficult targets (score < 1). Total score = weed importance score \times total biocontrol score. Weed importance score (Tr = 10) is a revised score based on scoring species with 'low', 'moderate', 'high' and 'transformer' ecosystem impacts, 1, 3, 5, and 10, respectively (instead of 1, 2, 3, 4; Table 1). Total Score (Tr = 10) = Weed importance score (Tr = 10) \times Total Biocontrol score. Total Score (Log(tot biocontrol score)) = Weed Importance score \times log(Total Biocontrol scor)+1).

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Gorse <i>Ulex europaeus</i> L.	159.26	294.12	50	18	2.78	442.4	1	817.0	2	91.9	1
Lagarosiphon <i>Lagarosiphon major</i> (Ridl.) Moss	75.89	207.72	93	18	5.17	392.1	2	1073.2	1	60.0	3
Scotch broom <i>Cytisus scoparius</i> (L.) Link	113.59	208.54	50	18	2.78	315.5	3	579.3	4	65.6	2
Egeria <i>Egeria densa</i> Planch.	38.00	86.50	69	10	6.90	262.2	4	596.9	3	34.1	10
Cotoneaster <i>Cotoneaster glaucophyllus</i> Franch.	110.00	224.75	80	38	2.11	231.6	5	473.2	5	54.1	4
Madeira vine <i>Anredera cordifolia</i> (Ten.) Steenis	28.33	44.55	80	10	8.00	226.6	6	356.4	6	27.0	12
Tradescantia <i>Tradescantia fluminensis</i> Vell.	48.00	77.33	80	18	4.44	213.3	7	343.7	7	35.3	9
Chinese privet <i>Ligustrum sinense</i> Lour.	69.20	121.60	50	18	2.78	192.2	8	337.8	8	39.9	5
Pampas <i>Cortaderia jubata</i> (Lemoine) Stapf	76.79	126.33	80	38	2.11	161.7	9	266.0	10	37.8	7
Tree privet <i>Ligustrum lucidum</i> W.T.Aiton	108.29	184.46	50	38	1.32	142.5	10	242.7	11	39.5	6

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Banana passionfruit <i>Passiflora 'Tacsonia' subgroup: Passiflora pinnatistipula Cav.; Passiflora tarminiana Coppins & V.E.Barney; Passiflora tripartita (A.Juss.) Poir.</i>	87.63	167.92	45	28	1.61	140.8	11	269.9	9	36.5	8
Wild ginger <i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	45.71	72.86	50	18	2.78	127.0	12	202.4	13	26.4	13
Woolly nightshade <i>Solanum mauritianum</i> Scop.	68.14	112.55	45	28	1.61	109.5	13	180.9	16	28.4	11
Brazilian pepper <i>Schinus terebinthifolia</i> Raddi	21.60	36.00	50	10	5.00	108.0	14	180.0	17	16.8	20
Sydney golden wattle <i>Acacia longifolia</i> (Andrews) Willd.	14.88	31.88	68.75	10	6.88	102.3	15	219.1	12	13.3	30
Moth plant <i>Araujia sericifera</i> Brot.	34.80	67.41	50	18	2.78	96.7	16	187.3	15	20.1	16
Darwin's barberry <i>Berberis darwinii</i> hook.	31.86	50.71	50	18	2.78	88.5	17	140.9	18	18.4	18
Reed sweet grass <i>Glyceria maxima</i> (Hartm.) Holmb.	40.83	62.38	77	38	2.03	82.7	18	126.4	20	19.6	17
Spartina <i>Spartina alterniflora</i> Liosel and <i>Spartina anglica</i> C.E.Hubb.	15.43	38.57	50	10	5.00	77.1	19	192.9	14	12.0	35
Boneseed <i>Chrysanthemoides monilifera</i> (L.) Norl.	27.63	46.13	50	18	2.78	76.7	20	128.1	19	15.9	23
Brush wattle <i>Paraserianthes lophantha</i> (Vent.) I.C.Nielsen	14.64	18.82	50	10	5.00	73.2	21	94.1	32	11.4	39
Pampas <i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	55.46	90.78	50	38	1.32	73.0	22	119.4	22	20.2	15

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Japanese honeysuckle <i>Lonicera japonica</i> Thunb.	25.00	40.00	50	18	2.78	69.4	23	111.1	24	14.4	28
Old man's beard <i>Clematis vitalba</i> L.	173.83	335.83	10	28	0.36	62.1	24	119.9	21	23.1	14
Chilean flame creeper <i>Tropaeolum speciosum</i> Poepp. & Endl.	34.36	49.77	50	28	1.79	61.4	25	88.9	36	15.3	25
Phragmites <i>Phragmites karka</i> (Retz.) Trin. ex Steud.	30.00	52.50	77	38	2.03	60.8	26	106.4	27	14.4	29
Nassella tussock <i>Nassella trichotoma</i> (Nees) Hack. & Arechav.	21.57	34.15	50	18	2.78	59.9	27	94.9	31	12.4	34
Himalayan honeysuckle <i>Leycesteria formosa</i> Wall.	42.36	69.28	50	38	1.32	55.7	28	91.2	34	15.5	24
Periwinkle <i>Vinca major</i> L.	41.00	74.25	50	38	1.32	53.9	29	97.7	29	15.0	26
Barberry <i>Berberis vulgaris</i> L.	41.00	73.00	50	38	1.32	53.9	30	96.1	30	15.0	27
Greater bindweed <i>Calystegia silvatica</i> (Kit.) Griseb.	58.37	103.25	45	50	0.90	52.5	31	92.9	33	16.3	22
Hornwort <i>Ceratophyllum demersum</i> L.	28.80	61.45	69	38	1.82	52.3	32	111.6	23	12.9	31
Alligator weed <i>Alternanthera philoxeroides</i> (Mart.) Griseb.	64.00	125.45	40	50	0.80	51.2	33	100.4	28	16.3	21
Climbing asparagus <i>Asparagus scandens</i> Thunb.	112.93	242.86	22.5	50	0.45	50.8	34	109.3	26	18.2	19
Water celery <i>Helosciadium nodiflorum</i> (L.) Koch	24.80	54.00	77	38	2.03	50.3	35	109.4	25	11.9	36
Blue morning glory <i>Ipomoea indica</i> (Burm.) Merr.	31.50	56.50	75	50	1.50	47.3	36	84.8	37	12.5	33
Spanish heath <i>Erica lusitanica</i> Rudolphi	35.33	57.11	50	38	1.32	46.5	37	75.1	42	12.9	32

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Prickly hakea <i>Hakea sericea</i> Schrad. & J.C.Wendl.	12.00	22.00	37.5	10	3.75	45.0	38	82.5	38	8.1	55
Climbing spindleberry <i>Celastrus orbiculatus</i> Thunb.	31.67	60.00	50	38	1.32	41.7	39	78.9	41	11.5	37
Jasmine <i>Jasminum polyanthum</i> Franch.	31.36	62.67	50	38	1.32	41.3	40	82.5	39	11.4	38
Noogoora bur <i>Xanthium strumarium</i> L.	5.50	12.10	75	10	7.50	41.3	41	90.8	35	5.1	67
Arum lily <i>Zantedeschia aethiopica</i> (L.) Spreng.	29.31	53.75	50	38	1.32	38.6	42	70.7	44	10.7	42
Holly <i>Ilex aquifolium</i> L.	28.21	41.33	50	38	1.32	37.1	43	54.4	52	10.3	45
Gunnera <i>Gunnera tinctoria</i> (Molina) Mirb.	40.20	70.53	45	50	0.90	36.2	44	63.5	45	11.2	40
Mile-a-minute <i>Dipogon lignosus</i> (L.) Verdc.	27.50	38.50	50	38	1.32	36.2	45	50.7	55	10.0	46
Chilean needlegrass <i>Nassella neesiana</i> (Trin. & Rupr.) Barkworth	12.92	19.38	50	18	2.78	35.9	46	53.8	53	7.5	57
Sycamore <i>Acer pseudoplatanus</i> L.	27.04	42.67	50	38	1.32	35.6	47	56.1	49	9.9	47
Great barberry <i>Berberis glaucocarpa</i> Stapf.	26.92	61.91	50	38	1.32	35.4	48	81.5	40	9.8	48
Chocolate vine <i>Akebia quinata</i> (Houtt.) Decne.	26.00	56.50	50	38	1.32	34.2	49	74.3	43	9.5	50
Saltwater paspalum <i>Paspalum vaginatum</i> Sw.	37.14	65.00	45	50	0.90	33.4	50	58.5	48	10.4	43
Lily of the valley vine <i>Salpichroa organifolia</i> Lam.) Baill.	25.00	41.67	50	38	1.32	32.9	51	54.8	51	9.1	51
Agapanthus <i>Agapanthus praecox</i> Willd.	24.89	35.11	50	38	1.32	32.7	52	46.2	61	9.1	52

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Blackberry <i>Rubus fruticosus</i> L.	43.91	68.88	36	50	0.72	31.6	53	49.6	57	10.3	44
Yellow flag iris <i>Iris pseudacorus</i> l.	36.71	70.71	15	18	0.83	30.6	54	58.9	47	9.7	49
English ivy <i>Hedera helix</i> l.	75.79	157.10	15	38	0.39	29.9	55	62.0	46	11.0	41
Giant knotweed <i>Fallopia sachalinensis</i> (F.Schmidt) Ronse Decr.	22.56	33.05	50	38	1.32	29.7	56	43.5	63	8.2	53
Evergreen buckthorn <i>Rhamnus alaternus</i> L.	20.76	35.33	50	38	1.32	27.3	57	46.5	59	7.6	56
Taiwan cherry <i>Prunus campanulata</i> Maxim.	29.41	52.80	45	50	0.90	26.5	58	47.5	58	8.2	54
Crack willow <i>Salix fragilis</i> L.	19.13	40.50	50	38	1.32	25.2	59	53.3	54	7.0	58
Japanese knotweed <i>Fallopia japonica</i> (Houtt.) Ronse Decr.	18.11	27.18	50	38	1.32	23.8	60	35.8	65	6.6	60
Marram grass <i>Ammophila arenaria</i> (L.) Link	17.97	35.17	50	38	1.32	23.6	61	46.3	60	6.6	61
Tree lupin <i>Lupinus arboreus</i> Sims	24.50	61.25	45	50	0.90	22.1	62	55.1	50	6.8	59
Himalayan balsam <i>Impatiens glandulifera</i> royle	4.40	8.80	50	10	5.00	22.0	63	44.0	62	3.4	76
African clubmoss <i>Selaginella kraussiana</i> (Kunze) A.Braun	15.79	21.94	50	38	1.32	20.8	64	28.9	69	5.8	63
Hawthorn <i>Crataegus monogyna</i> Jacq.	15.71	25.71	50	38	1.32	20.7	65	33.8	67	5.7	64
African feather grass <i>Cenchrus macrourus</i> (Trin.) Morrone	13.44	22.00	75	50	1.50	20.2	66	33.0	68	5.4	66
Cape ivy <i>Senecio angulatus</i> L.fil.	21.25	31.88	45	50	0.90	19.1	67	28.7	70	5.9	62
Russell lupin <i>Lupinus polyphyllus</i> Lindl.	19.93	55.74	45	50	0.90	17.9	68	50.2	56	5.6	65

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Bomarea <i>Bomarea multiflora</i> (L.f.) Mirb.	13.13	16.88	50	38	1.32	17.3	69	22.2	76	4.8	68
Inkweed <i>Phytolacca octandra</i> L.	12.38	28.13	50	38	1.32	16.3	70	37.0	64	4.5	70
Royal fern <i>Osmunda regalis</i> L.	12.33	26.33	50	38	1.32	16.2	71	34.6	66	4.5	71
Wilding pines <i>Pinus contorta</i> Douglas ex Loudon	17.00	25.00	45	50	0.90	15.3	72	22.5	74	4.7	69
Mexican daisy <i>Erigeron karvinskianus</i> DC.	6.75	10.13	80	38	2.11	14.2	73	21.3	77	3.3	78
Strawberry dogwood <i>Cornus capitata</i> Wall.	10.50	15.75	50	38	1.32	13.8	74	20.7	78	3.8	74
Gravel groundsel <i>Senecio skirrodon</i> DC. (<i>S. madagascariensis</i> x <i>inaequidans</i> ?)	14.00	28.00	45	50	0.90	12.6	75	25.2	71	3.9	72
Japanese hilly cherry <i>Prunus sargentii</i> Rehder	14.00	21.00	45	50	0.90	12.6	76	18.9	79	3.9	73
African love grass <i>Eragrostis curvula</i> (Schrad.) Nees	5.78	8.67	80	38	2.11	12.2	77	18.2	82	2.8	82
Eleagnus <i>Elaeagnus xreflexa</i> É.Morren & Decne.	9.00	14.00	50	38	1.32	11.8	78	18.4	80	3.3	79
Queen of the night <i>Cestrum nocturnum</i> L.	9.00	12.00	50	38	1.32	11.8	79	15.8	88	3.3	80
Climbing dock <i>Rumex sagittatus</i> Thunb.	13.00	16.38	45	50	0.90	11.7	80	14.7	89	3.6	75
Purple/pink ragwort <i>Senecio glastifolius</i> L.fil.	12.00	20.36	45	50	0.90	10.8	81	18.3	81	3.3	77
Ragwort <i>Jacobaea vulgaris</i> Gaertn.	7.12	9.45	15	10	1.50	10.7	82	14.2	92	2.8	83
Veldt grass <i>Ehrharta erecta</i> Lam.	11.00	17.60	45	50	0.90	9.9	83	15.8	87	3.1	81

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Eel grass <i>Vallisneria australis</i> S.W.L.Jacobs & Les	5.33	13.33	69	38	1.82	9.7	84	24.2	72	2.4	87
Grey willow <i>Salix cinerea</i> L.	7.11	17.78	50	38	1.32	9.4	85	23.4	73	2.6	85
Creeping gloxinia <i>Lophospermum erubescens</i> D.Don ex Sweet	7.00	11.00	50	38	1.32	9.2	86	14.5	90	2.6	86
Buddleia <i>Buddleja davidii</i> Franch.	3.29	5.16	50	18	2.78	9.1	87	14.3	91	1.9	93
Montbretia <i>Crococsmia crocosmiiflora</i> (Lemoine) N.E.Br.	8.43	15.69	41	38	1.08	9.1	88	16.9	84	2.7	84
Chinese knotweed <i>Persicaria chinensis</i> (L.) Nakai	6.00	12.00	75	50	1.50	9.0	89	18.0	83	2.4	88
Bulbil watsonia <i>Watsonia bulbillifera</i> J.W.Mathews & L.Bolus	5.89	12.77	50	38	1.32	7.8	90	16.8	85	2.1	91
Sharp rush <i>Juncus acutus</i> L. <i>subsp. acutus</i>	8.33	13.33	45	50	0.90	7.5	91	12.0	94	2.3	89
Portuguese angelica <i>Angelica pachycarpa</i> Lange	8.25	10.50	45	50	0.90	7.4	92	9.5	96	2.3	90
Cape pondweed <i>Aponogeton distachyos</i> L.f.	3.57	7.86	77	38	2.03	7.2	93	15.9	86	1.7	96
Pig's ear <i>Cotyledon orbiculata</i> L.	5.25	7.00	50	38	1.32	6.9	94	9.2	98	1.9	92
Boxthorn <i>Lycium ferocissimum</i> Mers	4.90	7.00	50	38	1.32	6.4	95	9.2	99	1.8	95
Nodding thistle <i>Carduus nutans</i> L.	7.18	9.23	15	18	0.83	6.0	96	7.7	102	1.9	94
Willow-leaved hakea <i>Hakea salicifolia</i> (Vent.) B.L.Burtt	4.00	10.00	50	38	1.32	5.3	97	13.2	93	1.5	100
Parrot's feather <i>Myriophyllum aquaticum</i> (Vell.) Verdc.	3.00	6.60	87.5	50	1.75	5.3	98	11.6	95	1.3	103

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
Feather top grass <i>Cenchrus longisetus</i> M.C.Johnst.	3.33	3.99	75	50	1.50	5.0	99	6.0	108	1.3	102
Bangalow palm <i>Archontophoenix cunninghamiana</i> (H.Wendl.) H.Wendl. & Drude	3.73	5.59	50	38	1.32	4.9	100	7.4	103	1.4	101
Monkey apple <i>Syzygium australe</i> (J.C.Wendl. ex Link) B.Hyland	5.40	9.00	45	50	0.90	4.9	101	8.1	100	1.5	98
Japanese walnut <i>Juglans ailanthifolia</i> Carrière	5.33	8.00	45	50	0.90	4.8	102	7.2	104	1.5	99
Giant hogweed <i>Heracleum mantegazzianum</i> Sommier & Levier	1.67	2.78	50	18	2.78	4.6	103	7.7	101	1.0	111
Variegated thistle <i>Silybum marianum</i> (L.) Gaertn.	10.86	23.89	15	38	0.39	4.3	104	9.4	97	1.6	97
Cherry laurel <i>Prunus laurocerasus</i> L.	4.67	7.00	45	50	0.90	4.2	105	6.3	106	1.3	104
Silver wattle <i>Acacia dealbata</i> Link	4.20	6.30	45	50	0.90	3.8	106	5.7	110	1.2	107
Horehound <i>Marrubium vulgare</i> L.	2.83	17.00	50	38	1.32	3.7	107	22.4	75	1.0	110
Cape weed <i>Arctotheca calendula</i> (L.) Levyns	6.88	11.00	15	28	0.54	3.7	108	5.9	109	1.3	105
Divided sedge <i>Carex divisa</i> Huds.	4.00	6.67	45	50	0.90	3.6	109	6.0	107	1.1	108
Blue passionflower <i>Passiflora caerulea</i> L.	3.89	4.67	45	50	0.90	3.5	110	4.2	112	1.1	109
Yellow bristle grass <i>Setaria pumila</i> (Poir.) Roem. & Schult.	16.04	34.52	10	50	0.20	3.2	111	6.9	105	1.3	106
Bushy asparagus <i>Asparagus aethiopicus</i> L.	3.11	5.44	45	50	0.90	2.8	112	4.9	111	0.9	112
Blue iris <i>Aristea ecklonii</i> Baker	1.95	1.95	50	38	1.32	2.6	113	2.6	117	0.7	113

Weed species	Weed importance score	Weed importance score (Tr = 10)	Biocontrol efficacy score	Biocontrol cost score	Total Biocontrol score	Total Score	Rank	Total Score (Tr = 10)	Rank	Total Score (Log(tot biocontrol score))	Rank
German ivy <i>Delairea odorata</i> Lem.	1.80	2.70	50	38	1.32	2.4	114	3.6	114	0.7	115
Australian sedge <i>Carex longibrachiata</i> Boeckeler	2.53	4.22	45	50	0.90	2.3	115	3.8	113	0.7	114
Cape honeyflower <i>Melianthus major</i> L.	1.56	2.33	50	38	1.32	2.0	116	3.1	116	0.6	117
Giant buttercup <i>Ranunculus acris</i> L.	8.13	17.42	10	50	0.20	1.6	117	3.5	115	0.6	116
Perennial nettle <i>Urtica dioica</i> L.	1.45	1.82	45	50	0.90	1.3	118	1.6	118	0.4	118
Saffron thistle <i>Carthamus lanatus</i> L.	0.35	0.35	45	50	0.90	0.3	119	0.3	119	0.1	119
Bathurst bur <i>Xanthium spinosum</i> L.	0.67	0.67	7.5	38	0.20	0.1	120	0.1	120	0.1	120

Appendix 4 – Scores for the nominated weed species by council

Type of weed: A = Agricultural (entirely within pasture & cropping systems); E = Environmental (mainly affecting native habitats); S = Social/cultural impacts only: e.g. impacts to human health, reduced recreational use, loss of cultural value, aesthetic qualities etc.; CS = Cross-sector (i.e. Agricultural and Environmental weed); W = Wasteland weeds (e.g. neither important agricultural nor environmental weeds, being a species primarily of wastelands, roadsides and disturbed areas) **Regional distribution/threat = RDT:** HI = High: widespread impacts in the region; M = Medium: localised impacts; L = Low: present but not widely distributed; MI = Minor: known from a few very small infestations in the region (e.g. <5); PT = Potential threat (absent from region); **Socio-political pressure = SPP:** HTC = High to control; MTC = Medium to control; LTC = Low to control; N = Neutral; LTN = Low to not control; MTN = Medium to not control; P = Polarised (scored according to estimated average); **Invasive ability:** VR = Invades/reinvades very rapidly and is very difficult to contain/and infested sites require control annually or even more frequently; FR = Invades fairly rapidly and infested sites require repeated control every few years; RS = Relatively slow to invade or reinvade following control; **Ecosystem Impacts Score = EIS;** **Current control efficacy = CCE:** HE = Highly Effective; ME = Moderately Effective; I = Ineffective; **Current control cost = CCC:** PE = Prohibitively expensive; ME = Moderately expensive; RC = Relatively cheap; **Non-target impacts of current control options = NTI:** MT = Minimal or temporary non-target impacts; S = Some long-term non-target impacts to a few non-target species; M = Major long-term non-target impacts to desirable vegetation; **Restrictions to implementing control (physical, socio-cultural, legislative etc.) = RIC:** NF = None or few restrictions; = RAMin = Restricted access to a minority of infestations; RAM = Restricted access to many infestations

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
Marlborough	Silver wattle	<i>Acacia dealbata</i>	E	1	PT	1	HTC	4	FR	2	6	HE	3	ME	2	MT	3	RAMin	2
Marlborough	Sydney golden wattle	<i>Acacia longifolia</i>	S	1	HI	10	HTC	4	VR	3	7	HE	3	PE	1	MT	3	RAM	1
GWRC	Sycamore	<i>Acer pseudoplatanus</i>	E	1	M	5	N	1	RS	1	2	HE	3	RC	3	MT	3	NF	3
Southland	Sycamore	<i>Acer pseudoplatanus</i>	E	1	L	3	LTC	2	FR	2	9	ME	2	ME	2	MT	3	RAM	1
Taranaki	Sycamore	<i>Acer pseudoplatanus</i>	E	1	HI	10	MTC	3	FR	2	6	ME	2	ME	2	MT	3	RAMin	2
Tasman	Sycamore	<i>Acer pseudoplatanus</i>	E	1	M	5	N	1	FR	2	10	ME	2	ME	2	MT	3	NF	3
Auckland	Agapanthus	<i>Agapanthus praecox</i>	E	1	M	5	N	1	FR	2	8	ME	2	ME	2	MT	3	RAM	1
GWRC	Agapanthus	<i>Agapanthus praecox</i>	S	1	M	5	MTC	3	FR	2	8	ME	2	ME	2	MT	3	RAMin	2
Northland	Agapanthus	<i>Agapanthus praecox</i>	E	1	M	5	N	1	FR	2	8	ME	2	ME	2	MT	3	RAM	1
GWRC	Akebia/chocolate vine	<i>Akebia quinata</i>	E	1	L	3	N	1	RS	1	7	ME	2	RC	2	MT	3	NF	3

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
Tasman	Akebia/chocolate vine	<i>Akebia quinata</i>	E	1	M	5	LTC	2	FR	2	15	ME	2	ME	2	M	1	RAM	1
Bay of Plenty	Alligator weed	<i>Alternanthera philoxeroides</i>	CS	1	M	5	MTC	3	VR	3	9	ME	2	ME	2	M	1	RAM	1
Northland	Alligator weed	<i>Alternanthera philoxeroides</i>	CS	1	HI	10	MTC	3	VR	3	7	ME	2	PE	1	S	2	RAMin	2
Waikato	Alligator weed	<i>Alternanthera philoxeroides</i>	CS	1	M	5	HTC	4	VR	3	21	ME	2	ME	2	S	2	RAMin	2
GWRC	Marram grass	<i>Ammophila arenaria</i>	E	1	M	5	N	1	RS	1	4	ME	2	ME	2	MT	3	NF	3
Taranaki	Marram grass	<i>Ammophila arenaria</i>	E	1	HI	10	N	1	FR	2	7	I	1	PE	1	S	2	RAMin	2
Southland	Angelica	<i>Angelica pachycarpa</i>	E	1	L	3	LTC	2	RS	1	11	ME	2	ME	2	S	2	RAMin	2
Auckland	Madeira/Mignonette vine	<i>Anredera cordifolia</i>	E	1	M	5	N	1	RS	1	8	ME	2	ME	2	MT	3	RAMin	2
GWRC	Madeira/Mignonette vine	<i>Anredera cordifolia</i>	E	1	M	5	LTN	0.8	RS	1	6	I	1	ME	2	S	2	NF	3
Hawke's Bay	Madeira/Mignonette vine	<i>Anredera cordifolia</i>	E	1	M	5	N	1	RS	1	6	ME	2	ME	2	MT	3	RAMin	2
Waikato	Madeira/Mignonette vine	<i>Anredera cordifolia</i>	E	1	M	5	MTC	3	VR	3	9	I	1	ME	2	MT	3	RAMin	2
GWRC	Cape pondweed	<i>Aponogeton distachyos</i>	E	1	L	3	N	1	RS	1	5	I	1	PE	1	MT	3	RAMin	2
Bay of Plenty	Moth plant	<i>Araujia sericifera</i>	CS	1	M	5	MTC	3	FR	2	8	ME	2	ME	2	S	2	RAM	1
Northland	Moth plant	<i>Araujia sericifera</i>	E	1	HI	10	HTC	4	VR	3	11	ME	2	PE	1	S	2	NF	3
Auckland	Bangalow palm	<i>Archontophoenix cunninghamiana</i>	E	1	L	3	P	0.8	RS	1	4	HE	3	RC	3	S	2	NF	3
Northland	Bangalow palm	<i>Archontophoenix cunninghamiana</i>	E	1	L	3	P	1	RS	1	4	HE	3	RC	3	S	2	RAMin	2
Hawke's Bay	Cape weed	<i>Arctotheca calendula</i>	CS	1	M	5	MTC	3	VR	3	5	ME	2	ME	2	S	2	RAMin	2
Northland	Aristea	<i>Aristea ecklonii</i>	W	0.5	HI	10	N	1	FR	2	3	ME	2	ME	2	MT	3	NF	3
Auckland	Bushy asparagus	<i>Asparagus aethiopicus</i>	E	1	L	3	LTC	2	FR	2	4	HE	3	ME	2	S	2	RAMin	2
Marlborough	Climbing asparagus	<i>Asparagus scandens</i>	E	1	M	5	LTC	2	VR	3	9	ME	2	ME	2	S	2	RAM	1
Northland	Climbing asparagus	<i>Asparagus scandens</i>	E	1	HI	10	HTC	4	VR	3	16	ME	2	PE	1	S	2	NF	3
Taranaki	Climbing Asparagus	<i>Asparagus scandens</i>	E	1	M	5	LTC	2	VR	3	9	ME	2	ME	2	MT	3	RAMin	2

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
Tasman	Climbing asparagus	<i>Asparagus scandens</i>	E	1	HI	10	HTC	4	VR	3	15	ME	2	PE	1	S	2	NF	3
Waikato	Climbing asparagus	<i>Asparagus scandens</i>	E	1	M	5	MTC	3	VR	3	11	I	1	PE	1	S	2	RAM	1
Otago	Darwin's Barberry	<i>Berberis darwinii</i>	CS	1	M	5	N	1	RS	1	10	I	1	PE	1	S	2	NF	3
Southland	Darwin's barberry	<i>Berberis darwinii</i>	E	1	M	5	LTC	2	FR	2	17	ME	2	PE	1	MT	3	RAM	1
Marlborough	Great barberry	<i>Berberis glaucocarpa</i>	A	0.95	HI	10	HTC	4	VR	3	10	ME	2	PE	1	S	2	RAM	1
Hawke's Bay	Common barberry	<i>Berberis vulgaris</i>	CS	1	HI	10	LTC	2	FR	2	15	ME	2	ME	2	S	2	RAM	1
Horizons	Common Barberry	<i>Berberis vulgaris</i>	CS	1	M	5	LTC	2	FR	2	11	ME	2	ME	2	S	2	NF	3
Otago	Bomarea	<i>Bomarea multiflora</i>	E	1	HI	10	MTC	3	FR	2	7	ME	2	ME	2	M	1	NF	3
Otago	Buddleia	<i>Buddleja davidii</i>	W	0.5	HI	10	LTN	0.8	RS	1	2	ME	2	RC	3	MT	3	NF	3
Tasman	Buddleia	<i>Buddleja davidii</i>	W	0.5	M	5	N	1	FR	2	5	ME	2	ME	2	MT	3	RAMin	2
Auckland	Greater bindweed	<i>Calystegia silvatica</i>	CS	1	M	5	MTC	3	FR	2	7	I	1	PE	1	M	1	RAMin	2
Hawke's Bay	Greater bindweed	<i>Calystegia silvatica</i>	E	1	HI	10	HTC	4	VR	3	3	I	1	ME	2	M	1	RAM	1
Horizons	Greater bindweed	<i>Calystegia silvatica</i>	W	0.5	M	5	LTC	2	VR	3	12	ME	2	ME	2	S	2	RAMin	2
Tasman	Greater bindweed	<i>Calystegia silvatica</i>	E	1	HI	10	MTC	3	VR	3	10	ME	2	PE	1	M	1	RAMin	2
Otago	Nodding thistle	<i>Carduus nutans</i>	CS	1	M	5	MTC	3	FR	2	3	ME	2	ME	2	MT	3	NF	3
Tasman	Nodding thistle	<i>Carduus nutans</i>	A	0.95	M	5	MTC	3	VR	3	4	ME	2	ME	2	MT	3	NF	3
Auckland	Divided sedge	<i>Carex divisa</i>	E	1	M	5	N	1	FR	2	3	ME	2	ME	2	M	1	RAM	1
Northland	Australian sedge	<i>Carex longibrachiata</i>	A	0.95	M	5	N	1	FR	2	3	ME	2	ME	2	S	2	NF	3
GWRC	Saffron thistle	<i>Carthamus lanatus</i>	A	0.95	L	2	N	1	RS	1	1	ME	2	RC	3	MT	3	NF	3
Bay of Plenty	Climbing Spindleberry	<i>Celastrus orbiculatus</i>	CS	1	M	5	MTC	3	FR	2	19	ME	2	PE	1	S	2	RAM	1
Hawke's Bay	Feather top grass	<i>Cenchrus longisetus</i>	CS	1	M	5	MTC	3	VR	3	11	ME	2	ME	2	S	2	NF	3
GWRC	African feather grass	<i>Cenchrus macrourus</i>	A	0.95	L	3	LTC	2	FR	2	5	ME	2	ME	2	MT	3	NF	3
Auckland	Hornwort	<i>Ceratophyllum demersum</i>	CS	1	L	3	LTN	2	VR	3	5	ME	2	PE	1	S	2	RAMin	2
Bay of Plenty	Hornwort	<i>Ceratophyllum demersum</i>	S	1	M	5	HTC	4	VR	3	4	ME	2	ME	2	MT	3	RAMin	2
GWRC	Hornwort	<i>Ceratophyllum demersum</i>	CS	1	MI	2	LTC	2	FR	2	8	I	1	PE	1	S	2	NF	3

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
Northland	Hornwort	<i>Ceratophyllum demersum</i>	CS	1	M	5	P	1	VR	3	6	HE	3	PE	1	S	2	RAMin	2
Waikato	Hornwort	<i>Ceratophyllum demersum</i>	E	1	MI	2	HTC	4	FR	2	5	ME	2	ME	2	S	2	RAMin	2
Auckland	Queen of the night	<i>Cestrum nocturnum</i>	E	1	M	5	N	1	FR	2	4	ME	2	ME	2	S	2	RAMin	2
Northland	Queen of the night	<i>Cestrum nocturnum</i>	E	1	M	5	N	1	FR	2	5	ME	2	ME	2	S	2	RAMin	2
Bay of Plenty	Boneseed	<i>Chrysanthemoides monilifera</i>	CS	1	M	5	LTC	2	FR	2	12	ME	2	ME	2	MT	3	RAM	1
Marlborough	Boneseed	<i>Chrysanthemoides monilifera</i>	E	1	M	5	LTC	2	VR	3	5	ME	2	ME	2	MT	3	RAM	1
Otago	Boneseed	<i>Chrysanthemoides monilifera</i>	E	1	L	3	LTC	2	VR	2	9	ME	2	ME	2	MT	3	RAM	1
Bay of Plenty	Old man's Beard	<i>Clematis vitalba</i>	CS	1	M	5	MTC	3	FR	2	23	ME	2	PE	1	S	2	RAM	1
Marlborough	Old man's beard	<i>Clematis vitalba</i>	E	1	HI	10	HTC	4	VR	3	12	HE	3	PE	1	M	1	RAM	1
Otago	Old man's beard	<i>Clematis vitalba</i>	E	1	HI	10	LTC	2	VR	3	10	ME	2	ME	2	M	1	RAM	1
Tasman	Old man's beard	<i>Clematis vitalba</i>	E	1	HI	10	HTC	4	VR	3	27	ME	2	PE	1	M	1	RAMin	2
Taranaki	Strawberry dogwood	<i>Cornus capitata</i>	E	1	HI	10	LTC	2	FR	2	6	ME	2	ME	2	S	2	RAMin	2
GWRC	Pampas	<i>Cortaderia jubata</i>	CS	1	HI	10	LTC	2	FR	2	13	ME	2	ME	2	S	2	NF	3
Taranaki	Pampas	<i>Cortaderia jubata</i>	E	1	HI	10	MTC	3	FR	2	10	ME	2	RC	3	S	2	RAMin	2
Tasman	Pampas	<i>Cortaderia jubata</i>	E	1	HI	10	MTC	3	VR	3	12	ME	2	PE	1	MT	3	NF	3
Waikato	Pampas	<i>Cortaderia jubata</i>	CS	1	M	5	MTC	3	FR	2	13	ME	2	PE	1	S	2	RAMin	2
GWRC	Pampas	<i>Cortaderia selloana</i>	CS	1	HI	10	LTC	2	FR	2	13	ME	2	ME	2	S	2	NF	3
Taranaki	Pampas	<i>Cortaderia selloana</i>	E	1	HI	10	MTC	3	FR	2	10	ME	2	RC	3	S	2	RAMin	2
Waikato	Pampas	<i>Cortaderia selloana</i>	CS	1	M	5	MTC	3	FR	2	13	ME	2	PE	1	S	2	RAMin	2
Hawke's Bay	Cotoneaster	<i>Cotoneaster glaucophyllus</i>	E	1	HI	10	MTC	3	VR	3	21	I	1	ME	2	S	2	RAM	1
Northland	Cotoneaster	<i>Cotoneaster glaucophyllus</i>	E	1	HI	10	LTC	2	RS	1	4	ME	2	ME	2	S	2	RAMin	2
Tasman	Cotoneaster	<i>Cotoneaster glaucophyllus</i>	E	1	HI	10	LTC	2	VR	3	19	ME	2	PE	1	S	2	RAM	1
Horizons	Cotoneaster	<i>Cotoneaster</i> spp.	CS	1	M	5	LTC	2	FR	2	11	HE	3	ME	2	S	2	RAMin	2
Southland	Cotoneaster	<i>Cotoneaster</i> spp.	CS	1	M	5	LTC	2	RS	1	10	ME	2	PE	1	MT	3	RAM	1
Taranaki	Cotonoeaster spp.	<i>Cotoneaster</i> spp.	E	1	M	5	LTC	2	RS	1	6	ME	2	ME	2	S	2	RAMin	2

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
GWRC	Pigs ear	<i>Cotyledon orbiculata</i>	E	1	M	5	N	1	RS	1	6	ME	2	ME	2	MT	3	RAM	1
Hawkes Bay	Hawthorn	<i>Crataegus monogyna</i>	CS	1	M	5	HTC	3	FR	2	11	ME	2	ME	2	S	2	RAM	1
GWRC	Montbretia	<i>Crocasmia x crocosmiiflora</i>	E	1	M	5	N	1	RS	1	4	ME	2	ME	2	MT	3	NF	3
Northland	Montbretia	<i>Crocasmia x crocosmiiflora</i>	W	0.5	HI	10	LTC	2	VR	3	6	ME	2	ME	2	S	2	RAMin	2
Marlborough	Scotch broom	<i>Cytisus scoparius</i>	A	0.95	HI	10	HTC	4	VR	3	5	ME	2	ME	2	MT	3	RAM	1
Southland	Scotch broom	<i>Cytisus scoparius</i>	CS	1	HI	10	HTC	4	RS	1	23	ME	2	ME	2	S	2	NF	3
Tasman	Scotch broom	<i>Cytisus scoparius</i>	CS	1	HI	10	HTC	4	VR	3	23	I	1	PE	1	S	2	RAMin	2
Northland	German ivy	<i>Delairea odorata</i>	W	0.5	M	5	N	1	VR	3	4	HE	3	RC	3	S	2	RAMin	2
Auckland	Mile a minute	<i>Dipogon lignosus</i>	E	1	M	5	MTC	3	VR	3	6	ME	2	ME	2	M	1	RAM	1
Northland	Mile a minute	<i>Dipogon lignosus</i>	E	1	M	5	MTC	3	VR	3	9	ME	2	ME	2	M	1	RAM	1
Auckland	Egeria	<i>Egeria densa</i>	E	1	HI	10	LTN	0.8	VR	3	4	HE	3	RC	3	S	2	RAMin	2
Marlborough	Egeria	<i>Egeria densa</i>	CS	1	HI	10	MTC	3	VR	3	11	I	1	ME	2	MT	3	RAMin	2
Northland	Egeria	<i>Egeria densa</i>	CS	1	HI	10	P	1	VR	3	6	HE	3	PE	1	S	2	RAMin	2
Auckland	Veldt grass	<i>Ehrharta erecta</i>	E	1	M	5	MTC	3	VR	3	5	ME	2	PE	1	M	1	RAM	1
Northland	Elaeagnus	<i>Elaeagnus x reflexa</i>	E	1	M	5	LTC	2	FR	2	9	ME	2	ME	2	MT	3	RAMin	2
Otago	African love grass	<i>Eragrostis curvula</i>	CS	1	HI	10	N	1	FR	2	4	ME	2	ME	2	S	2	NF	3
Otago	Spanish heath	<i>Erica lusitanica</i>	CS	1	L	3	LTC	2	FR	2	8	ME	2	ME	2	S	2	NF	3
Tasman	Spanish heath	<i>Erica lusitanica</i>	CS	1	HI	10	LTC	2	VR	3	14	ME	2	ME	2	MT	3	RAMin	2
Auckland	Mexican daisy	<i>Erigeron karvinskianus</i>	E	1	M	5	N	1	VR	3	6	HE	3	ME	2	S	2	RAM	1
GWRC	Japanese/ Asiatic knotweed	<i>Fallopia japonica</i>	E	1	L	3	MTC	3	VR	3	4	I	1	ME	2	S	2	NF	3
Otago	Japanese/ Asiatic knotweed	<i>Fallopia japonica</i>	E	1	MI	2	N	1	RS	1	12	I	1	RC	3	M	1	RAMin	2
GWRC	Giant knotweed	<i>Fallopia sachalinensis</i>	E	1	L	3	MTC	3	VR	3	4	I	1	ME	2	S	2	NF	3
Taranaki	Giant Knotweed	<i>Fallopia sachalinensis</i>	E	1	L	3	LTC	2	VR	3	7	I	1	PE	1	M	1	RAMin	2

Region	Weed	Latin name	Type of weed	Score	RDT	Score	SPP	Score	Invasive ability	Score	EIS	CCE	Score	CCC	Score	NTI	Score	RIC	Score
Hawke's Bay	Reed sweet grass	<i>Glyceria maxima</i>	E	1	M	5	LTC	2	VR	3	9	I	1	ME	2	S	2	RAM	1
Southland	Reed sweet grass	<i>Glyceria maxima</i>	E	1	M	5	LTC	2	FR	2	13	ME	2	ME	2	MT	3	RAM	1
GWRC	Gunnera	<i>Gunnera tinctoria</i>	E	1	L	3	N	1	RS	1	3	ME	2	RC	3	MT	3	NF	3
Otago	Gunnera	<i>Gunnera tinctoria</i>	S	1	M	5	N	1	RS	1	7	I	1	ME	2	MT	3	NF	3
Southland	Gunnera	<i>Gunnera tinctoria</i>	E	1	L	3	LTC	2	RS	1	12	ME	2	ME	2	S	2	RAM	1
Taranaki	Gunnera	<i>Gunnera tinctoria</i>	E	1	HI	10	HTC	4	FR	2	13	ME	2	ME	2	MT	3	RAMin	2
Northland	Willow leaved hakea	<i>Hakea salicifolia</i>	E	1	M	5	N	1	FR	2	4	ME	2	ME	2	S	2	RAMin	2
Northland	Prickly hakea	<i>Hakea sericea</i>	E	1	M	5	N	1	FR	2	4	ME	2	ME	2	S	2	RAMin	2
Tasman	Prickly hakea	<i>Hakea sericea</i>	E	1	M	5	N	1	FR	2	10	ME	2	ME	2	MT	3	NF	3
Auckland	English ivy	<i>Hedera helix</i>	E	1	M	5	LTC	2	RS	1	8	ME	2	ME	2	S	2	RAMin	2
GWRC	English ivy	<i>Hedera helix</i>	E	1	M	5	LTC	2	FR	2	5	ME	2	ME	2	MT	3	NF	3
Hawke's Bay	English ivy	<i>Hedera helix</i>	CS	1	M	5	HTC	4	VR	3	16	I	1	ME	2	M	1	RAM	1
Horizons	Ivy spp	<i>Hedera helix</i>	E	1	M	5	N	1	FR	2	7	ME	2	ME	2	MT	3	RAMin	2
Northland	English ivy	<i>Hedera helix</i>	E	1	M	5	LTC	2	RS	1	7	ME	2	ME	2	S	2	RAMin	2
Taranaki	English Ivy	<i>Hedera helix</i>	E	1	M	5	LTC	2	VR	3	7	I	1	PE	1	S	2	RAMin	2
Bay of Plenty	Wild ginger	<i>Hedychium gardnerianum</i>	E	1	HI	10	MTC	3	FR	2	14	HE	3	PE	1	S	2	RAM	1
Waikato	Wild ginger	<i>Hedychium gardnerianum</i>	E	1	M	5	MTC	3	FR	2	11	ME	2	PE	1	S	2	RAMin	2
Auckland	Water celery	<i>Helosciadium nodiflorum</i>	E	1	M	5	N	1	FR	2	3	ME	2	PE	1	M	1	RAM	1
Hawkes Bay	Water Celery	<i>Helosciadium nodiflorum</i>	CS	1	M	5	MTC	3	FR	2	10	ME	2	PE	1	M	1	RAM	1
Otago	Giant hogweed	<i>Heracleum mantegazzianum</i>	S	1	L	3	N	1	RS	1	3	ME	2	ME	2	S	2	NF	3
Horizons	Holly	<i>Ilex aquifolium</i>	CS	1	L	3	N	1	FR	2	8	HE	3	ME	2	S	2	NF	3
Taranaki	Holly	<i>Ilex aquifolium</i>	CS	1	M	5	MTC	3	RS	1	8	I	1	ME	2	S	2	RAMin	2
Tasman	Holly	<i>Ilex aquifolium</i>	E	1	M	5	LTN	0.8	VR	3	12	ME	2	PE	1	MT	3	RAMin	2
Tasman	Himalayan balsam	<i>Impatiens glandulifera</i>	E	1	M	5	MTN	0.3	FR	2	6	HE	3	ME	2	MT	3	RAMin	2
Auckland	Blue morning glory	<i>Ipomoea indica</i>	E	1	M	5	LTC	2	RS	1	4	ME	2	ME	2	S	2	RAMin	2

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Hawke's Bay	Blue morning Glory	<i>Ipomoea indica</i>	CS	1	M	5	MTC	3	FR	2	6	ME	2	ME	2	S	2	RAMin	2
Northland	Blue morning glory	<i>Ipomoea indica</i>	E	1	M	5	LTC	2	RS	1	10	ME	2	ME	2	S	2	RAMin	2
Taranaki	Blue Morning Glory	<i>Ipomoea indica</i>	E	1	M	5	MTC	3	FR	2	8	ME	2	ME	2	S	2	RAMin	2
Marlborough	Yellow flag Iris	<i>Iris pseudacorus</i>	CS	1	M	5	MTC	3	FR	2	11	ME	2	ME	2	MT	3	NF	3
Waikato	Yellow flag Iris	<i>Iris pseudacorus</i>	CS	1	M	5	MTC	3	FR	2	18	ME	2	PE	1	MT	3	RAM	1
Otago	Ragwort	<i>Jacobaea vulgaris</i>	CS	1	M	5	N	1	FR	2	5	ME	2	RC	3	MT	3	NF	3
Tasman	Ragwort	<i>Jacobaea vulgaris</i>	A	0.95	M	5	HTC	4	FR	2	4	HE	3	RC	3	MT	3	NF	3
Auckland	Jasmine	<i>Jasminum polyanthum</i>	E	1	M	5	MTC	3	RS	1	4	ME	2	ME	2	S	2	RAMin	2
GWRC	Jasmine	<i>Jasminum polyanthum</i>	E	1	M	5	N	1	RS	1	4	ME	2	ME	2	S	2	NF	3
Northland	Jasmine	<i>Jasminum polyanthum</i>	E	1	M	5	MTC	3	FR	2	12	ME	2	ME	2	S	2	RAMin	2
Taranaki	Jasmine	<i>Jasminum polyanthum</i>	E	1	M	5	MTC	3	FR	2	7	ME	2	ME	2	S	2	RAMin	2
Taranaki	Japanese walnut	<i>Juglans ailanthifolia</i>	E	1	M	5	N	1	FR	2	6	ME	2	ME	2	MT	3	RAMin	2
Auckland	Sharp rush	<i>Juncus acutus</i>	E	1	M	5	MTC	3	FR	2	5	ME	2	ME	2	M	1	RAM	1
Auckland	Lagarosiphon	<i>Lagarosiphon major</i>	CS	1	HI	10	LTN	0.8	VR	3	5	ME	2	RC	3	S	2	RAMin	2
Bay of Plenty	Lagarosiphon	<i>Lagarosiphon major</i>	S	1	M	5	HTC	4	VR	3	5	ME	2	ME	2	MT	3	RAMin	2
Marlborough	Lagarosiphon	<i>Lagarosiphon major</i>	CS	1	HI	10	MTC	3	VR	3	11	I	1	ME	2	MT	3	RAMin	2
Northland	Lagarosiphon	<i>Lagarosiphon major</i>	CS	1	HI	10	P	1	VR	3	5	ME	2	PE	1	S	2	RAMin	2
Otago	Lagarosiphon	<i>Lagarosiphon major</i>	A	0.95	M	5	LTC	2	VR	8	4	I	1	PE	1	M	1	RAM	1
Taranaki	Lagarosiphon	<i>Lagarosiphon major</i>	E	1	M	5	MTC	3	VR	3	4	I	1	PE	1	S	2	RAMin	2
Tasman	Lagarosiphon	<i>Lagarosiphon major</i>	E	1	M	5	N	1	FR	2	4	I	1	PE	1	M	1	RAM	1
Hawke's Bay	Himalayan honeysuckle	<i>Leyceseria formosa</i>	CS	1	M	5	LTC	2	VR	3	9	HE	3	ME	2	S	2	RAM	1
Horizons	Himalayan honeysuckle	<i>Leyceseria formosa</i>	CS	1	M	5	LTC	2	FR	2	16	HE	3	RC	3	S	2	RAMin	2
Southland	Himalayan honeysuckle	<i>Leyceseria formosa</i>	CS	1	M	5	LTC	2	FR	2	13	ME	2	PE	1	MT	3	RAM	1

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Bay of Plenty	Tree privet	<i>Ligustrum lucidum</i>	CS	1	HI	10	HTC	4	FR	2	15	HE	3	PE	1	S	2	RAM	1
Northland	Tree privet	<i>Ligustrum lucidum</i>	S	1	HI	10	HTC	4	FR	2	8	ME	2	ME	2	MT	3	NF	3
Tasman	Tree privet	<i>Ligustrum lucidum</i>	E	1	HI	10	HTC	4	VR	3	6	ME	2	ME	2	MT	3	NF	3
Waikato	Tree privet	<i>Ligustrum lucidum</i>	CS	1	HI	10	HTC	4	VR	3	18	ME	2	PE	1	S	2	RAM	1
Northland	Chinese privet	<i>Ligustrum sinense</i>	S	1	HI	10	HTC	4	FR	2	5	ME	2	ME	2	MT	3	NF	3
Tasman	Chinese privet	<i>Ligustrum sinense</i>	E	1	HI	10	HTC	4	VR	3	6	ME	2	ME	2	MT	3	NF	3
Waikato	Chinese privet	<i>Ligustrum sinense</i>	CS	1	HI	10	HTC	4	VR	3	18	ME	2	PE	1	S	2	RAM	1
Marlborough	Japanese honeysuckle	<i>Lonicera japonica</i>	E	1	HI	10	MTC	3	FR	2	10	ME	2	PE	1	S	2	RAM	1
Bay of Plenty	Creeping gloxinia	<i>Lophospermum erubescens</i>	E	1	MI	2	HTC	4	VR	3	7	ME	2	ME	2	MT	3	RAMin	2
Auckland	Tree lupin	<i>Lupinus arboreus</i>	E	1	HI	10	LTN	0.8	VR	3	4	HE	3	ME	2	S	2	NF	3
Hawke's Bay	Tree lupin	<i>Lupinus arboreus</i>	E	1	M	5	LTC	2	FR	2	8	HE	3	ME	2	S	2	RAM	1
Marlborough	Tree lupin	<i>Lupinus arboreus</i>	E	1	M	5	MTC	3	FR	2	8	HE	3	PE	1	MT	3	RAM	1
Otago	Russell lupin	<i>Lupinus polyphyllus</i>	A	0.95	HI	10	LTC	2	VR	7	4	ME	2	ME	2	S	2	NF	3
Tasman	Russell lupin	<i>Lupinus polyphyllus</i>	E	1	M	5	MTN	0.3	FR	2	13	ME	2	PE	1	MT	3	RAMin	2
GWRC	Boxthorn	<i>Lycium ferocissimum</i>	E	1	M	5	N	1	RS	1	7	ME	2	ME	2	MT	3	NF	3
Otago	Horehound	<i>Marrubium vulgare</i>	CS	1	HI	10	MTC	3	VR	4	1	I	1	PE	1	M	1	NF	3
Northland	Cape honeyflower	<i>Melianthus major</i>	W	0.5	M	5	N	1	RS	1	4	ME	2	ME	2	MT	3	RAMin	2
GWRC	Parrots feather	<i>Myriophyllum aquaticum</i>	E	1	L	3	N	1	FR	2	5	ME	2	ME	2	MT	3	NF	3
Marlborough	Chilean needle grass	<i>Nassella neesiana</i>	A	0.95	HI	10	HTC	4	VR	3	4	I	1	PE	1	S	2	RAM	1
Marlborough	Nassella tussock	<i>Nassella trichotoma</i>	A	0.95	HI	10	HTC	4	VR	3	4	ME	2	PE	1	S	2	RAM	1
Otago	Nassella tussock	<i>Nassella trichotoma</i>	S	1	M	5	HTC	4	VR	3	9	ME	2	ME	2	MT	3	NF	3
Auckland	Royal fern	<i>Osmunda regalis</i>	E	1	L	3	N	1	FR	2	5	ME	2	ME	2	M	1	RAM	1
Waikato	Royal fern	<i>Osmunda regalis</i>	E	1	M	5	MTC	3	VR	3	4	I	1	PE	1	S	2	RAMin	2
GWRC	Brush wattle	<i>Paraserianthes lophantha</i>	E	1	M	5	N	1	FR	2	7	ME	2	RC	3	MT	3	NF	3
Taranaki	Brush wattle	<i>Paraserianthes lophantha</i>	E	1	HI	10	MTC	3	FR	2	7	HE	3	RC	3	MT	3	RAMin	2

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Auckland	Saltwater paspalum	<i>Paspalum vaginatum</i>	E	1	HI	10	N	1	FR	2	10	ME	2	ME	2	S	2	RAM	1
Northland	Saltwater paspalum	<i>Paspalum vaginatum</i>	E	1	HI	10	N	1	FR	2	10	ME	2	ME	2	S	2	RAM	1
Marlborough	Banana passionfruit	<i>Passiflora 'Tacsonia' subgroup</i>	E	1	HI	10	HTC	4	VR	3	9	HE	3	PE	1	M	1	RAM	1
Otago	Banana Passionfruit	<i>Passiflora 'Tacsonia' subgroup</i>	E	1	HI	10	LTC	2	VR	3	16	I	1	RC	3	MT	3	NF	3
Tasman	Banana passionfruit	<i>Passiflora 'Tacsonia' subgroup</i>	E	1	HI	10	MTC	3	FR	2	15	ME	2	ME	2	S	2	RAMin	2
Waikato	Banana passionfruit	<i>Passiflora 'Tacsonia' subgroup</i>	E	1	M	5	MTC	3	FR	2	9	ME	2	ME	2	MT	3	RAMin	2
Horizons	Blue passionflower	<i>Passiflora caerulea</i>	E	1	L	3	LTC	2	FR	2	5	HE	3	ME	2	S	2	RAMin	2
Auckland	Chinese knotweed	<i>Persicaria chinensis</i>	E	1	L	3	LTN	0.8	VR	3	8	ME	2	ME	2	S	2	NF	3
Horizons	Phragmites Karka	<i>Phragmites karka</i>	CS	1	M	5	HTC	4	RS	1	12	I	1	PE	1	M	1	RAM	1
Hawke's Bay	Inkweed	<i>Phytolacca octandra</i>	CS	1	M	5	LTC	2	FR	2	11	ME	2	ME	2	S	2	RAMin	2
Waikato	Wilding Conifers	<i>Pinus spp.</i>	E	1	MI	2	MTC	3	FR	2	17	ME	2	PE	1	S	2	RAMin	2
Northland	Taiwanese cherry	<i>Prunus campanulata</i>	E	1	M	5	LTC	2	RS	1	6	ME	2	ME	2	MT	3	RAMin	2
Taranaki	Taiwan cherry	<i>Prunus campanulata</i>	E	1	HI	10	LTC	2	FR	2	10	ME	2	RC	3	MT	3	RAMin	2
Tasman	Taiwan cherry	<i>Prunus campanulata</i>	E	1	M	5	MTN	0.3	FR	2	11	ME	2	ME	2	MT	3	RAM	1
Taranaki	Cherry laurel	<i>Prunus laurocerasus</i>	E	1	M	5	N	1	RS	1	6	ME	2	ME	2	MT	3	RAMin	2
Taranaki	Japanese hill cherry	<i>Prunus sargentii</i>	E	1	HI	10	LTC	2	FR	2	10	ME	2	RC	3	MT	3	RAMin	2
Tasman	Giant buttercup	<i>Ranunculus acris</i>	A	0.95	M	5	MTC	3	VR	3	7	ME	2	ME	2	S	2	NF	3
Auckland	Evergreen buckthorn	<i>Rhamnus alaternus</i>	E	1	L	3	MTC	3	FR	2	10	HE	3	ME	2	S	2	RAMin	2
Bay of Plenty	Italian buckthorn	<i>Rhamnus alaternus</i>	E	1	M	5	LTC	2	FR	2	5	ME	2	ME	2	S	2	RAM	1
Horizons	Evergreen buckthorn	<i>Rhamnus alaternus</i>	E	1	L	3	LTC	2	FR	2	7	HE	3	ME	2	S	2	RAMin	2
GWRC	Blackberry	<i>Rubus fruticosus</i>	CS	1	HI	10	MTC	3	VR	3	13	HE	3	ME	2	MT	3	NF	3
Horizons	Blackberry	<i>Rubus fruticosus</i>	CS	1	HI	10	MTC	3	FR	2	15	HE	3	ME	2	S	2	RAMin	2
Auckland	Climbing dock	<i>Rumex sagittatus</i>	E	1	M	5	LTC	2	FR	2	8	ME	2	ME	2	S	2	RAMin	2
GWRC	Climbing dock	<i>Rumex sagittatus</i>	E	1	M	5	N	1	FR	2	5	ME	2	ME	2	MT	3	NF	3
GWRC	Grey willow	<i>Salix cinerea</i>	E	1	M	5	N	1	FR	2	8	ME	2	PE	1	MT	3	NF	3

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Southland	Crack willow	<i>Salix fragilis</i>	CS	1	M	5	MTC	3	RS	1	17	ME	2	ME	2	MT	3	RAM	1
Hawkes Bay	Lily of the valley vine	<i>Salpichroa origanifolia</i>	E	1	M	5	LTC	2	VR	3	15	I	1	ME	2	S	2	RAM	1
Bay of Plenty	Brazilian pepper	<i>Schinus terebinthifolius</i>	CS	1	M	5	LTC	2	FR	2	24	ME	2	RC	3	MT	3	RAMin	2
GWRC	African club moss	<i>Selaginella kraussiana</i>	E	1	L	3	N	1	RS	1	3	ME	2	RC	3	MT	3	NF	3
Northland	African club moss	<i>Selaginella kraussiana</i>	E	1	HI	10	N	1	FR	2	2	ME	2	PE	1	S	2	RAMin	2
Taranaki	African club moss	<i>Selaginella kraussiana</i>	E	1	HI	10	LTC	2	VR	3	5	I	1	ME	2	S	2	RAMin	2
GWRC	Cape ivy	<i>Senecio angulatus</i>	E	1	HI	10	LTC	2	RS	1	10	ME	2	ME	2	S	2	RAMin	2
Otago	Cape Ivy	<i>Senecio angulatus</i>	E	1	L	3	P	1	RS	1	10	ME	2	ME	2	MT	3	NF	3
GWRC	Pink/purple ragwort	<i>Senecio glastifolius</i>	E	1	M	5	N	1	FR	2	9	HE	3	ME	2	MT	3	NF	3
Horizons	Pink/purple ragwort	<i>Senecio glastifolius</i>	W	0.5	M	5	HTC	4	VR	3	10	ME	2	RC	3	MT	3	NF	3
Northland	Gravel groundsel	<i>Senecio madagascariensis x inaequidans</i>	CS	1	HI	10	LTC	2	FR	2	8	ME	2	ME	2	M	1	NF	3
Taranaki	Yellow Bristle Grass	<i>Setaria pumila</i>	A	0.95	M	5	HTC	4	VR	3	3	ME	2	ME	2	S	2	NF	3
Tasman	Yellow bristle grass	<i>Setaria pumila</i>	A	0.95	HI	10	MTC	3	VR	3	3	ME	2	PE	1	MT	3	NF	3
Waikato	Yellow bristle grass	<i>Setaria pumila</i>	A	0.95	HI	10	HTC	4	VR	3	4	ME	2	PE	1	MT	3	NF	3
Hawke's Bay	Variiegated thistle	<i>Silybum marianum</i>	A	0.95	HI	10	MTC	3	VR	3	5	ME	2	ME	2	S	2	RAM	1
Bay of Plenty	Woolly nightshade	<i>Solanum mauritianum</i>	CS	1	HI	10	HTC	4	FR	2	14	HE	3	ME	2	MT	3	RAM	1
Northland	Woolly nightshade	<i>Solanum mauritianum</i>	CS	1	HI	10	HTC	4	FR	2	11	HE	3	ME	2	MT	3	NF	3
Tasman	Woolly nightshade	<i>Solanum mauritianum</i>	CS	1	M	5	LTC	2	FR	2	10	ME	2	PE	1	S	2	NF	3
Waikato	Woolly nightshade	<i>Solanum mauritianum</i>	CS	1	HI	10	HTC	4	FR	2	8	ME	2	PE	1	MT	3	RAMin	2
Otago	Spartina	<i>Spartina spp.</i>	E	1	M	5	N	1	VR	3	12	ME	2	ME	2	S	2	RAM	1
Auckland	Monkey apple	<i>Syzygium australe</i>	E	1	M	5	LTC	2	FR	2	6	HE	3	ME	2	MT	3	RAMin	2
Marlborough	Tradescantia	<i>Tradescantia fluminensis</i>	E	1	HI	10	MTC	3	VR	3	12	I	1	ME	2	S	2	RAM	1
Tasman	Tradescantia	<i>Tradescantia fluminensis</i>	E	1	HI	10	MTC	3	VR	3	8	ME	2	PE	1	S	2	NF	3
Otago	Chilean flame creeper	<i>Tropaeolum speciosum</i>	W	0.5	HI	10	MTC	3	VR	3	6	ME	2	RC	3	MT	3	NF	3

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Southland	Chilean flame creeper	<i>Tropaeolum speciosum</i>	E	1	M	5	LTC	2	VR	3	12	I	1	PE	1	M	1	RAM	1
Bay of Plenty	Gorse	<i>Ulex europaeus</i>	CS	1	HI	10	MTC	3	FR	2	23	ME	2	PE	1	S	2	RAM	1
Marlborough	Gorse	<i>Ulex europaeus</i>	A	0.95	HI	10	HTC	4	VR	3	3	ME	2	ME	2	MT	3	RAM	1
Southland	Gorse	<i>Ulex europaeus</i>	CS	1	HI	10	HTC	4	RS	1	23	ME	2	ME	2	S	2	NF	3
Tasman	Gorse	<i>Ulex europaeus</i>	CS	1	HI	10	HTC	4	VR	3	27	HE	3	PE	1	M	1	NF	3
GWRC	Perennial nettle	<i>Urtica dioica</i>	CS	1	L	2	N	1	RS	1	4	ME	2	RC	3	MT	3	NF	3
Auckland	Eel grass	<i>Vallisneria australis</i>	E	1	L	2	HTC	4	FR	2	4	I	1	PE	1	S	2	RAMin	2
Auckland	Periwinkle	<i>Vinca major</i>	E	1	M	5	N	1	RS	1	11	I	1	ME	2	M	1	NF	3
Horizons	Periwinkle	<i>Vinca major</i>	W	0.5	M	5	LTC	2	VR	3	9	ME	2	ME	2	S	2	RAMin	2
Tasman	Periwinkle	<i>Vinca major</i>	E	1	HI	10	LTC	2	VR	3	13	ME	2	PE	1	S	2	NF	3
Northland	Watsonia	<i>Watsonia bulbifera</i>	W	0.5	HI	10	LTN	0.8	VR	3	6	ME	2	PE	1	S	2	RAMin	2
GWRC	Bathurst bur	<i>Xanthium spinosum</i>	A	0.95	L	3	LTC	2	FR	2	1	ME	2	ME	2	MT	3	NF	3
Bay of Plenty	Noogoora burr	<i>Xanthium strumarium</i>	CS	1	M	5	HTC	4	FR	2	5	ME	2	ME	2	MT	3	NF	3
Auckland	Arum lily	<i>Zantedeschia aethiopica</i>	CS	1	M	5	LTC	2	FR	2	8	ME	2	ME	2	S	2	RAMin	2
GWRC	Arum lily	<i>Zantedeschia aethiopica</i>	CS	1	M	5	N	1	FR	2	13	ME	2	ME	2	S	2	NF	3
Taranaki	Arum Lily	<i>Zantedeschia aethiopica</i>	E	1	M	5	LTC	2	VR	3	7	ME	2	ME	2	S	2	RAMin	2

Appendix 5 – Top eleven weed species by importance, nominated by the Department of Conservation.

Attributes of the nominated weed species. Uses (O = Ornamental; S = soil stabilisation; F = Forestry) NC = Native Congeneric plant (Y/N); H = Habitat (T = Terrestrial); MR = mode of reproduction (A = Apomict; S = Sexual; V = Vegetative) note that species that produce seed are assumed to reproduce sexually, if a reference describing mode of reproduction could not be found; WNR = weedy in the native range (Y/N)

Common name	Latin name	Native range of weed	NC	Valued exotic congener	H	MR	MR reference	WNR
Black wattle	<i>Acacia mearnsii</i> Link	Australia	N	Acacias grown for forestry	T	S&V	(Anon 2021a)	N
Sycamore	<i>Acer pseudoplatanus</i> L.	Central Europe	N	Ornamentals	T	S	(Belletti et al. 2007)	N
Climbing asparagus	<i>Asparagus scandens</i> Thunb.	South Africa	N	Garden asparagus <i>Asparagus officinalis</i>	T	S&V	(Fukuda et al. 2005)	N
Taiwan cherry	<i>Prunus campanulata</i> Maxim.	Japan, Taiwan, S & E China	N	Multiple crops, ornamentals	T	S	(Ma et al. 2009)	N
Tree privet	<i>Ligustrum lucidum</i> W.T.Aiton	China	N	Ornamentals	T	S	(Starr et al. 2003)	N
Madeira vine	<i>Anredera cordifolia</i>	South America	N		T	V	(Dalrymple et al. 2015)	N
Pampas	<i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	South America (Chile?)	N		T	S	(Costas-Lippmann 1979)	N
Wild ginger	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	Asia	N	Ornamentals	T	S&V	(Wang et al. 2004)	N
Marram grass	<i>Ammophila arenaria</i> (L.) Link	Europe and W Asia	N		T	S&V	(Hertling & Lubke 2000)	N
Himalayan fairy grass	<i>Miscanthus nepalensis</i> (Trin.) Hack.	Nepal, India	N	<i>M. × giganteus</i> being developed as biofuel crop	T	S	Assumed sexual	N
Cotoneaster	<i>Cotoneaster glaucophyllus</i> Franch.	China	N	Ornamentals	T	A	(Nybom & Bartish 2007)	N