

REVIEW OF WEED MANAGEMENT PROGRAMMES IN REGIONAL PEST MANAGEMENT PLANS



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R5396

REVIEW OF WEED MANAGEMENT PROGRAMMES IN REGIONAL PEST MANAGEMENT PLANS



Japanese honeysuckle, *Lonicera japonica* (Photo: Melissa Hutchison).

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1. INTRODUCTION

The Parliamentary Commissioner for the Environment (PCE) is currently undertaking an investigation into management of invasive plants (weeds¹) in New Zealand. The aim of the investigation is to identify what is working well, what is not, and to highlight areas for improvement.

The regional sector plays a key role in managing weeds in New Zealand and holds a substantial amount of information that is relevant for the PCE's investigation. The PCE has identified the need to undertake a review of weed management initiatives in Regional Pest Management Plans (RPMPs) across New Zealand, and has engaged Wildland Consultants Ltd (in collaboration with Lincoln University) to undertake this review.

This report documents the methods and findings of our review of weed management programmes in RPMPs. Accompanying the report are spreadsheets with data on weed management programmes in each region and information gained from online surveys of council staff.

2. METHODS

2.1 Data collation

2.1.1 Characteristics of each region

Data on population size, total land area, and areas of key land use/habitat types were compiled for each region (Table 1). Population data were sourced from Statistics New Zealand (2020) and the areas of selected land use types were derived from the Land Cover Database (LCDB) version 5 (Manaaki Whenua-Landcare Research 2019). The LCDB is a multi-temporal thematic database that uses satellite imagery to classify New Zealand's land cover into 35 different categories.

The area of pastoral farming in each region was calculated by summing the High Producing Exotic Grassland and Low Producing Exotic Grassland LCDB categories. The area of native vegetation in each region was calculated by summing the Alpine Grass/Herbfield, Broadleaved Indigenous Hardwoods, Depleted grassland, Fernland, Flaxland, Indigenous Forest, Manuka and/or Kanuka, Matagouri or Grey Scrub, Sub Alpine Shrubland, and Tall Tussock Grassland categories. Urban land areas were calculated using the Built-up Area (settlement) and Urban Parkland/Open Space categories.

¹ We use the term 'weed' in this report to refer to invasive plants and/or pest plants, irrespective of whether they are formally recognised as a pest in a Regional Pest Management Plan.

Table 1: Human population and land use data for each region. Population data came from Statistics New Zealand (2020) and land use data were sourced Land Cover Database version 5 (Manaaki Whenua-Landcare Research 2019). The percentage of each land use type (Pastoral farming, Native Vegetation, and Urban Land) in the region was calculated by dividing the area of each land use by the total land area in the region.

Region	Total Area (ha)	Population (2018)	Population density (people/ha)	Pastoral Farmland (% in region)	Native Vegetation (% in region)	Urban Land (% in region)
Northland	1,292,748	179,076	0.139	46.9%	30.6%	0.8%
Auckland*	513,348	1,571,718	3.062	42.9%	23.7%	11.7%
Waikato	2,465,619	458,202	0.186	53.0%	26.3%	1.2%
Bay of Plenty	1,261,515	308,499	0.245	26.3%	41.0%	1.2%
Gisborne*	835,867	47,517	0.057	41.4%	31.8%	0.3%
Hawkes Bay	1,417,942	166,368	0.117	60.1%	21.1%	1.6%
Taranaki	725,910	117,561	0.162	53.4%	40.3%	1.0%
Manawatu-Wanganui	2,221,587	238,797	0.107	56.2%	32.9%	0.7%
Wellington	813,005	506,814	0.623	51.7%	31.0%	2.5%
Tasman*	971,389	52,389	0.054	13.1%	69.5%	0.3%
Nelson*	43,632	50,880	1.166	11.2%	46.9%	6.5%
Marlborough*	1,050,894	47,340	0.045	27.6%	51.3%	0.3%
Canterbury	4,523,971	599,694	0.133	42.0%	33.4%	0.8%
West Coast	2,335,893	31,575	0.014	7.4%	80.0%	0.1%
Otago	3,189,159	225,186	0.071	47.3%	37.9%	0.5%
Southland	3,188,719	97,467	0.031	30.7%	58.5%	0.2%
Chatham Islands*	98,567	663	0.007	23.4%	43.5%	0.1%

* Unitary authority.

2.1.2 Extraction of data from RPMP and CBA documents

Regional pest management plans (RPMPs) and associated cost-benefit analysis (CBA) reports for the 17 regions (11 regional councils and six unitary authorities) were downloaded from council websites (Table 2). Most regions have RPMPs that cover a period of 10 years, however five regions (Hawkes Bay, Manawatu-Wanganui, Wellington, Marlborough, and the Chatham Islands) have RPMPs with a duration of 20 years. Some RPMPs had not been finalised at the time of our review (i.e. Auckland, Bay of Plenty, and the Chatham Islands).

Data requirements for the review were confirmed in consultation with PCE staff, and a template for data entry (an Excel workbook) was created. Relevant data and information were extracted from each RPMP, including:

- A list of weed species (or taxa) and types of management programmes, i.e. Exclusion, Eradication, Progressive Containment, Sustained Control, and Site-led, as defined by the National Policy Direction for Biosecurity (MPI 2015).
- Area/zone in which each weed management programme applies and proposed management objectives, including whether a ‘good neighbour rule’ applies.
- Extent (distribution/abundance) of each weed species/taxon within each region.
- Budgets allocated by councils for weed management programmes.

Table 2: Regional pest management plans (RPMPs) used in this review.

Region/District	RPMP Version	Duration (years)	Comments
Northland	2017-2027	10	
Auckland*	2020-2030	10	We extracted and analysed data from the proposed RPMP (version 2019-2029) as the final version of the RPMP (2020-2030) was released after we had completed the data analyses for this review (the RPMP became operative in January 2021).
Waikato	2014-2024	10	
Bay of Plenty	2020-2030	10	We analysed data provided by Bay of Plenty Regional Council from their proposed RPMP. The final version of the RPMP was released after we had completed the data analyses for this review (the RPMP became operative in December 2020).
Gisborne*	2019-2029	10	
Hawkes Bay	2018-2038	20	
Taranaki	2018-2028	10	
Manawatu-Wanganui	2017-2037	20	
Wellington	2019-2039	20	
Tasman*	2019-2029	10	Nelson and Tasman have a joint RPMP.
Nelson*	2019-2029	10	Nelson and Tasman have a joint RPMP.
Marlborough*	2018-2038	20	
Canterbury	2018-2028	10	
West Coast	2019-2029	10	
Otago	2019-2029	10	
Southland	2019-2029	10	
Chatham Islands*	2021-?	20?	We analysed data provided by Environment Canterbury for the proposed Chatham Islands RPMP (the draft RPMP had not been released at the time of our review). The previous Chatham Islands Regional Pest Management Strategy was operative from 2008-2018.

* Unitary authority.

Weed species/taxa

An overall list of weed species or taxa was compiled from all the RPMPs. In many cases, the scientific and/or common names used for particular species varied across RPMPs, therefore each species/taxon was assigned a standardised scientific and/or common name (according to the Manaaki Whenua/Landcare Research Plant Names Database).

In some regions, two or more related weed species may be managed under the same RPMP programme (e.g. banana passionfruit, cotoneaster, exotic broom, giant gunnera, nassella, thistles, wild ginger, and wilding conifers), whereas other regions have a separate management programme for each individual species. In order to allow for comparison among regions it was sometimes necessary to aggregate several species into one taxon for the data analysis (see Appendix 1 for a list of all weed species and aggregate weed taxa used in the review).

Weed extent in each region

The total number of hectares occupied by each weed species (or taxon) in each region was extracted from the RPMPs (when this information was available). In addition, the extent of each weed species in each region was classified into four categories, according to its stage of infestation in the region (see Table 3 and Figure 1).

Weed invasions typically follow an S-shaped curve, with an initial early infestation stage (lag-phase), followed by a period of more rapid spread as the weed establishes until it becomes widespread, with the full trajectory requiring many decades, to centuries, to complete (Williams 1997, Sax *et al.* 2005).

Table 3: Categories used to define the extent of each weed species in each region.

Category	Definition
Absent	The weed does not currently occur in the region (in the wild).
Early infestation	The weed occupies relatively few sites in the region and is at an early stage of spread.
Established	The weed is present at a wide range of sites but is still spreading into other suitable habitat in the region.
Widespread	The weed is widespread and common in suitable habitat in the region.

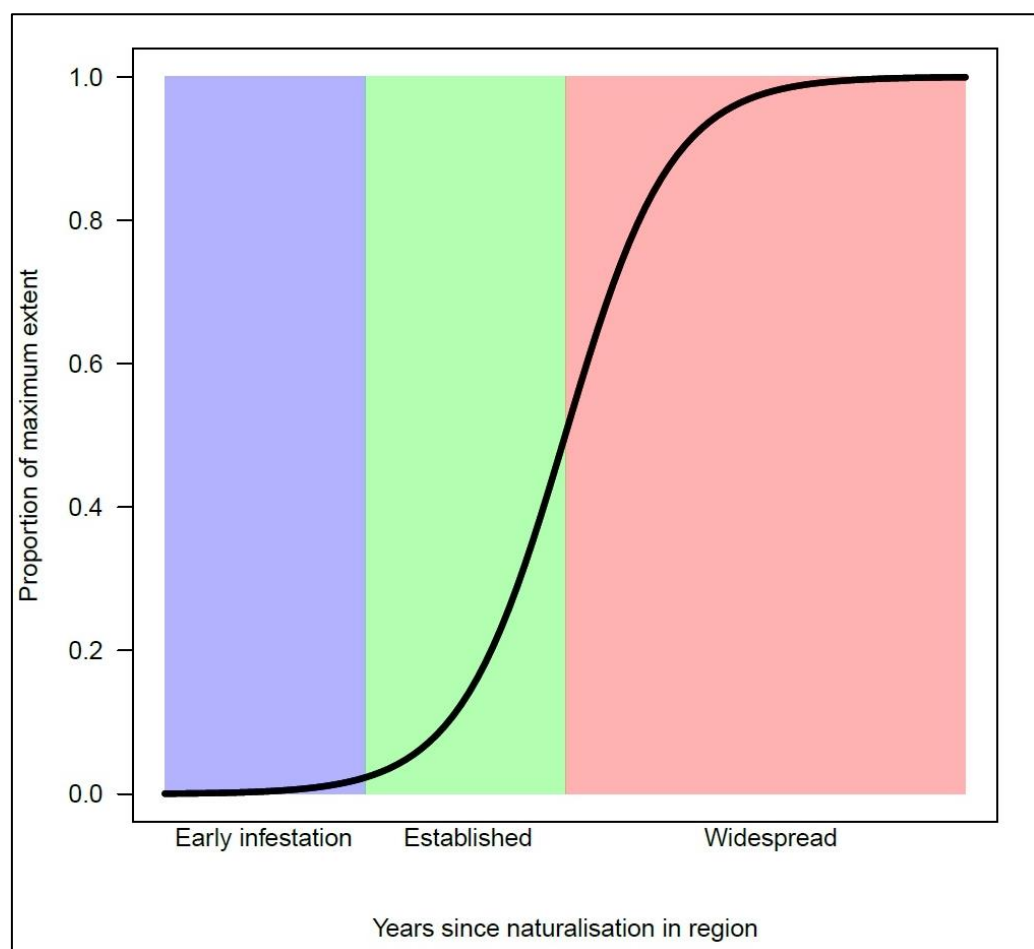


Figure 1: Stages in the infestation process used to categorise the extent of each weed species in each region.

Proposed outcomes of RPMP weed management programmes

The proposed outcome or objective of each weed management programme (sought by the council) was identified using information in RPMP and CBA documents. Five broad categories were used to define management objectives (Table 4). Two of the categories (Exclusion and Eradication) were equivalent to the first two pest management intermediate outcomes listed in the National Policy Direction (NPD) (MPI 2015), whereas the other three categories (Hold steady, Decline, and Slower increase) were not directly related to the outcomes specified in the NPD. Councils were later asked to review the objective we assigned to each weed management programme, and amend it if necessary (see section 2.1.4). Using standardised categories allows us to compare the outcomes sought for different types of management programmes and weed taxa both within and among regions.

Table 4: Proposed objectives for weed management programmes in RPMPs.

Objective of weed management programme	Explanation of outcome sought
Exclusion	The weed will be prevented from establishing in the wild in the region.
Eradication	The weed will be eradicated from the region (or from a defined area within the region).
Hold steady	The weed will be kept at its current extent/level of infestation.
Decline	The extent of the weed will decrease.
Slower increase	The extent of the weed will continue to increase but the rate of increase will be slower under the proposed management.

2.1.3 Characteristics of weed species in RPMPs

The status of each weed species was assessed according to the Ministry for Primary Industries (MPI) Unwanted Organisms register (MPI 2020b), National Pest Plant Accord (NPPA) (MPI 2020a), the Department of Conservation (DOC) environmental weeds list (Howell 2008), and an updated list of conservation weed species in New Zealand (Clayson Howell 2020 unpublished data). Other traits compiled for each weed species were its life form and year of first discovery in the wild in New Zealand (see Table 5).

Weeds were classified into four different life form categories following Gatehouse (2008): annual/biennial herbaceous plants (“short-lived herbs”), perennial herbaceous plants (“long-lived herbs”), shrubs and woody vines (“short-lived woody”), and trees (“long-lived woody”). These life forms correlate with the weeds’ life span and how quickly they reach maturity, both of which are important factors that will influence their rate of spread within and between regions. Whether a species was a Biodiversity pest and/or Production pest was assessed using information in the literature on the habitats/land uses they occupy and their impacts, information in the RPMPs (e.g. some RPMPs state whether each weed is a biodiversity or production pest), and our own knowledge of the impacts of these weeds in New Zealand.

Each weed’s year of first discovery in the wild in New Zealand (an estimate of a weed’s naturalisation year) was sourced from Gatehouse (2008), who derived these data from Webb (1988), Healy and Edgar (1980), various other botanical publications, and herbarium collection data. In addition, we categorised species into two groups: those that were first discovered before (and including) 1980 (200 taxa) and those after 1980 (67 taxa) (the year 1980 was chosen to separate more recently naturalised taxa from earlier

naturalisations). If the year of first discovery was not known, we assumed that these weed species had naturalised relatively recently and they were assigned to the ‘after 1980’ category for the data analyses.

Table 5: Traits compiled for each weed species and their data sources.

Weed Trait	Category	Information Source/s
National Pest Plant Accord weed	Yes/No	MPI (2020a)
Unwanted Organism	Yes/No	MPI (2020b)
DOC environmental weed	Yes/No	Howell (2008)
DOC conservation weed	Yes/No	Clayson Howell (2020) unpublished data
Life form	Short-lived herb, Long-lived herb, Short-lived woody, Long-lived woody	Gatehouse (2008) and unpublished data
Year of first discovery in the wild in New Zealand	Year	Gatehouse (2008) and unpublished data
Biodiversity pest	Yes/No	AgResearch (2020)
Production pest	Yes/No	Auckland Council (2020) Craw (2000) Environment Canterbury (2020) Howell (2008) Manaaki Whenua/Landcare Research (2020) Massey University (2020) Waikato University (2020) Weedbusters (2020)

2.1.4 Organisms of Interest

Some RPMPs contain an appendix with a list of weed species that are not managed through formal RPMP programmes but are recognised as actual or potential weeds in the region. These species are called ‘Organisms of Interest’, ‘Non-RPMP pests’, ‘Harmful Organisms’, ‘Advisory Plants’ or ‘National Pest Plant Accord species’, depending on the RPMP. They are not subject to rules in the RPMP (although some of the weeds listed as Organisms of Interest in the Southland RPMP are managed through Site-led programmes in the RPMP). For example, the Canterbury RPMP states: “The above organisms are not declared pests under this Plan and occupiers or other persons will not be subject to any obligations under the Plan or under the [Biosecurity] Act.”

We compiled a list of Organisms of Interest (or equivalent) for each region from the published RPMP documents, and assigned a number of characteristics to each weed species/taxon, i.e. whether they were listed as Unwanted Organisms by MPI, or on the NPPA or DOC conservation weed lists (2008 and 2020), or whether they were a production and/or biodiversity pest, and their year of first discovery in the wild in New Zealand (see Table 5 for information on the sources used to assign these traits).

2.1.5 Distributions of conservation weeds

The Department of Conservation (DOC) provided data on conservation weeds in New Zealand for this investigation. Clayson Howell (Science Advisor, DOC, Wellington) provided an updated list of conservation weed species in New Zealand (382 species) and data on the regional distribution of each species. The regional distribution data was

sourced from the DOC weeds database, iNaturalistNZ observation records (www.inaturalist.nz), Global Biodiversity Information Facility (GBIF) platform (<https://www.gbif.org/>), and National Vegetation Survey database (<https://nvs.landcareresearch.co.nz/>). Since collecting effort for plants varies among regions, for the purposes of this report, we converted this extent data to a simple presence/absence of each weed in each region.

2.1.6 Council survey Part 1 - online questionnaire (Google Forms)

An online questionnaire (using the Google Forms platform) was developed in consultation with PCE staff in order to gather the information needed from regional councils and unitary authorities for this review (see Appendix 1). The aim of the questionnaire was to supplement the desktop data collation exercise and to document the following:

- How councils decided which weed species to include in their current RPMP e.g. whether species were included for production or biodiversity reasons, trade-offs between inclusion of well-established versus recently established species, and the extent to which CBAs were used to define and select management objectives.
- Mechanisms available to councils to respond to changing impacts of new and existing pest plants during the operational lifespan of the RPMP.
- Council management of weed species outside of the RPMP (including Organisms of Interest).
- Monitoring/surveillance methods and use of weed occurrence data by councils (e.g. types of weed occurrence data collected by councils, and how data are stored and used).
- Collaboration with neighbouring regional councils/unitary authorities, territorial authorities, communities, landowners, and Crown land managers (e.g. Department of Conservation, Land Information New Zealand, Ministry of Defence) in relation to weed management.
- Barriers to effective weed management in each region.
- The level of effort/investment by councils in relation to regional weed management (including numbers of staff and external contractors, and what proportion of the weed management is undertaken on council land versus privately-owned land).

The questionnaire contained a mixture of numerical and categorical questions, as well as the option for some questions to include additional comments. Some of the survey questions were compulsory while others were optional.

The appropriate staff member(s) at each council were identified (by the PCE and/or Wildland Consultants) and sent an email with a link to the online survey form. Most councils responded within the requested timeframe (approximately 3 weeks). Some council staff were sent follow-up emails with questions or additional comments in relation to the survey, and in some cases phone calls were also part of the council engagement process.

2.1.7 Council survey Part 2 - weed management programmes in each RPMP

The second part of the council survey involved sending spreadsheets (Excel workbooks) to council staff. Councils were asked to review (and correct) existing data that had been collated from RPMPs and CBA reports for their regions, and to provide missing data that was not able to be obtained from these documents. The information requested comprised data on the individual weed management programmes in each RPMP, such as the proposed outcome/objective of each programme (five categories), and the extent of different weed species/taxa in each region (i.e. the four extent categories and/or number of hectares occupied, if known).

2.1.8 Council survey Part 2 - council budgets and expenditure

A second spreadsheet (Excel workbook) was also sent to councils in order to gather information on RPMP budgets and expenditure. Councils were asked to provide the following information for each of the following six financial years (2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020 and 2020/2021):

1. What was the annual expenditure by your council (\$) in each financial year for (a) All RPMP programmes (pest animals and weeds) and (b) RPMP weed programmes.
2. What percentage (%) of the overall RPMP budget for weeds was allocated to each of these programme types?
 - Exclusion
 - Eradication
 - Progressive Containment
 - Sustained Control
 - Site-led

2.2 Data limitations

2.2.1 Extraction of data from RPMP and CBA documents

The amount of relevant data and information that was able to be extracted from each RPMP (and associated CBA report) varied, with some RPMPs containing more detailed information on individual weed species and management programme objectives than others. Most RPMPs and CBA reports did not contain any information on proposed budgets for individual management programmes or the total budget for weed management in the region. Also, the proposed outcome of each management programme was typically not clearly identified or quantified.

2.2.2 Council survey Part 1 - online questionnaire (Google Forms)

All of the councils provided responses to the online questionnaire, but some of the optional questions were not answered by some councils.

2.2.3 Council survey Part 2 - weed management programmes in each RPMP

Most councils were unable to provide all of the data requested for Part 2 of the council survey. For example, most councils could not provide data on proposed budgets for

individual weed management programmes in their RPMP. Most councils were unable to provide accurate quantitative data on the extent (distribution and abundance) of individual weed species (or taxa) in each region, particularly for well-established or widespread species.

2.2.4 Council survey Part 2 - council budgets and expenditure

The majority of councils completed the budgets and expenditure spreadsheet, but some councils did not provide data for all of the financial years requested, or they provided data in a different format to what was requested (e.g. by combining budgets for different RPMP programme types).

2.3 Data analysis

All data summaries and analysis were completed with R (R Core Team 2020) using the R packages AICcmodavg (Mazerolle 2020), maptools (Bivand and Lewin-Koh 2019), piecewiseSEM (Lefcheck 2016), pvclust (Suzuki *et al.* 2019), vegan (Oksanen *et al.* 2019), and xtable (Dahl *et al.* 2019). Statistical results in the Results section report the value of the appropriate test distribution (F, chi-sq), the degrees of freedom of the test (“df”), and the probability of concluding that there is an effect when there was none (“P”, with $P < 0.05$ being the minimum threshold for results to be regarded as statistically significant).

When summaries in tables include data with missing values (for example, for year of first discovery, impact type, or life form), we were careful to include all categories other than missing data, so that the number of missing values can be extracted. For example, if 38.2% of RPMP weeds are summarised as herbaceous and 47.6% are woody (as in Table 13 in the Results), this indicates that life form data had not been obtained for 14.2% of the taxa.

Generalised linear models (GLMs) were used to better understand why some weed taxa are listed in more RPMPs than others. This used the number of RPMPs each taxon was listed in as the response variable, with a poisson error distribution. The explanatory variables used were the year of first discovery (an estimate of the weed’s year of naturalisation), as both a linear and quadratic term, life form, and whether or not each weed was a biodiversity pest and/or a production pest. The year 1980 was used to graphically illustrate differences among regions in the management of relatively recently naturalised weed species (i.e. species that have naturalised during the last four decades, versus weeds that have been wild for longer which are typically more well-established and widespread). Life form was treated as an ordered factor, ordered by life length. A model without interactions and a model with 2-way interactions were compared with AICc using the AICcmodavg package. An R-squared value for the best model was estimated using the Nagelkerke method using the rsquared function of the piecewiseSEM package.

Weed distribution data provided by Clayson Howell (DOC) was used to analyse the overlap between the weed taxa managed by regional councils and DOC, using both the new 2020 DOC conservation weeds list and the older published list (Howell 2008). We simplified the 2020 extent data to presence/absence of each conservation weed species/taxa per region in order to calculate the number of conservation weeds per region, and we compared this with the number of RPMP weed taxa in each region.

We attempted to explain the number of weed taxa listed in RPMPs with the following regional attributes: the number of naturalised seed plants per region, the number of

conservation weeds per region, regional area, human population, area of pastoral farming, biodiversity land, and urban land, and the RPMP weed budget of each area. Because there were only 16 regions, there was not sufficient degrees of freedom to attempt to compare complex multivariate models. Instead, separate GLMs were run for each explanatory variable, with the exceptions of combining (area + population), and (pastoral + biodiversity + urban areas), since these are closely related. In each GLM, the number of RPMP weed taxa was the response variable, and a quasipoisson error distribution was used. Since the Auckland region is an outlier, each model was repeated with and without Auckland included.

A combination of GLMs and chi-squared tests were used to compare RPMP weed taxa with 'Organisms of Interest'. Each variable was tested in a separate model: year of discovery (gaussian GLM), number of regions present (gaussian GLM), whether or not a weed was discovered after 1980 (binomial GLM), life form (chi-squared test), and whether it was a biodiversity or production pest (chi-squared test). The number of regions occupied by each weed was based on the 10 geographic regions used by Gatehouse (2008) (rather than the 17 regional councils/districts). These combine some adjacent political regions, e.g., Northland and Auckland. This was necessary in Gatehouse (2008) to reliably assign every naturalised plant in New Zealand to a region using available data. More up-to-date, detailed, and consistent occupancy data for New Zealand weeds is still not available since a large minority of New Zealand's herbarium specimens remain undigitised and many council weed databases are difficult to access.

To describe the similarities among regions in their RPMP weed lists, Ward Hierarchical Clustering was done using the *pvc* package, which calculates *p* values for each clustering branch using multiscale bootstrap resampling. This produced an easy-to-interpret graphical depiction of the relationships among the regions' RPMP weed lists. A permutational MANOVA (multivariate analysis of variance) using the *adonis2* function of the *vegan* package was used to assess the extent to which the weed similarities among the RMPs could be explained by attributes of the regions. The explanatory variables included in *adonis2* were regional area, human population, area of pastoral farming, area of native vegetation, area of urban land, latitude and longitude (the mid-point of each region was used), and each regions' total RPMP budget and RPMP weed budget. All variables were scaled using the *scale* function.

Budgets for individual RPMP programmes were unavailable for most regions, but all councils (except Hawkes Bay, West Coast, and the Chatham Islands) were able to provide a total RPMP weed budget and the percentage of the overall budget allocated to each RPMP programme type. We were interested in how much of each region's RPMP weed budget was allocated to weeds that had only biodiversity impacts. In the absence of programme budgets, we estimated this using the proportion of the weeds in each programme type, for each region, that had biodiversity-only impacts versus production impacts (many of which also impact on biodiversity). We then used this proportion to estimate how much of the budget for each programme type per region was allocated to biodiversity-only weeds. For example, Auckland spends 13% of its RPMP weed budget on Sustained Control programmes, and 146 of the 195 weed taxa it manages as Sustained Control programmes (75%) have only biodiversity impacts. Therefore, we estimated that 9.8% of Auckland's total RPMP weed budget (75% of 13%) was allocated to Sustained Control programmes of weeds that only have biodiversity impacts. We did the same calculation for each programme type and summed them to get overall per region estimates. This approach assumes that, within a programme type and region, biodiversity-only weeds

and production weeds have, on average, the same budgets. We would expect that production weeds would have higher average budgets than biodiversity-only weeds in many regions, making our estimates of regions' budgets for biodiversity-only weeds more likely to be overestimates than underestimates.

To have a closer look at the consistency of programme types among regions, we selected six of the most widely listed RPMP weeds, three with biodiversity impacts (purple loosestrife, old man's beard, spartina) and three with production impacts (ragwort, gorse, nassella). For each weed, we mapped out the main RPMP programme type in each region. In cases where a weed was listed in more than one programme within a region, we selected the programme that applied to the whole region. For consistency, when we mapped a programme that was not applied to the whole region, we labelled it 'Site-led'.

3. RESULTS

3.1 Weed management programmes in RPMPs

In total, New Zealand regional councils (and unitary authorities) manage 334 weed species through their current RPMPs (Appendix 1). In some cases, two or more related species are managed together under the same RPMP programme (e.g. banana passionfruit, cotoneaster, exotic broom, nassella, and wilding conifers), however these groupings are not always consistent among the regions. The 334 weed species were therefore aggregated into 267 standardised taxa for the data analysis (32 of the taxa comprise two or more species) (Table 6).

Table 6: Number of weed taxa in different types of management programmes in Regional Pest Management Plans (RPMPs). Taxa may include clusters of related weed species that are managed together under one RPMP programme (e.g. banana passionfruit, exotic broom, cotoneaster, thistles, and wilding conifers).

Region	Total per RPMP ¹	Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led
Northland	87	14	24	5	44	0
Auckland	211	13	33	21	183	31
Waikato	65	8	21	20	7	12
Bay of Plenty	40	12	15	19	11	0
Gisborne	69	14	13	18	13	14
Hawkes Bay	32	5	8	11	9	0
Taranaki	15	0	5	0	10	0
Manawatu-Wanganui	49	11	18	23	0	0
Wellington	15	2	5	2	4	3
Tasman-Nelson	57	8	15	7	18	10
Marlborough	28	1	4	0	23	0
Canterbury	40	10	7	5	13	10
West Coast	37	7	7	20	4	0
Otago	28	6	1	11	5	7
Southland	31	2	7	13	4	7
Chatham Islands	17	2	8	5	2	0
TOTAL	267	68	102	87	210	74

¹ The Total per RPMP is less than the sum of the categories because some weeds are managed by some regions in multiple categories (such as Sustained Control region-wide, with more intensive Site-led control in parts of a region).

We compared the number of RPMP weed taxa in each region (Figure 2a) with the total number of naturalised seed plant species (Hazel Gatehouse, 2008, unpublished data) and conservation weed species (Clayson Howell, DOC, unpublished data) (Figure 2b & c). The number of weeds listed in RPMPs was significantly greater in regions with more naturalised seed plants ($F = 10.5$, $df = 1,13$, $P = 0.006$), and more conservation weeds ($F = 5.9$, $df = 1,13$, $P = 0.03$). However, in both cases, this effect was only due to the high number of RPMP weeds, naturalised seed plants, and conservation weeds in Auckland. With Auckland removed, these effects were no longer statistically significant, despite a considerable variation in the number of naturalised seed plants and conservation weeds across these regions (naturalised seed plants without Auckland: $F = 2.4$, $df = 1,12$, $P = 0.15$, conservation weeds without Auckland: $F = 0.72$, $df = 1,12$, $P = 0.41$).

While the number of weed taxa listed in RPMPs varies considerably among the regions (Table 6), this variation cannot be explained by biological and geographical differences among regions. Not only did the number of naturalised seed plants and conservation weeds not predict the number of RPMP weeds, when Auckland was excluded as an outlier, but there was also no detectable effect of land area, human population, or area of pastoral, biodiversity, and urban land uses, when Auckland was excluded. The considerable variation in the number of weeds managed through RPMPs must instead be primarily due to political and cultural differences among the regional councils.

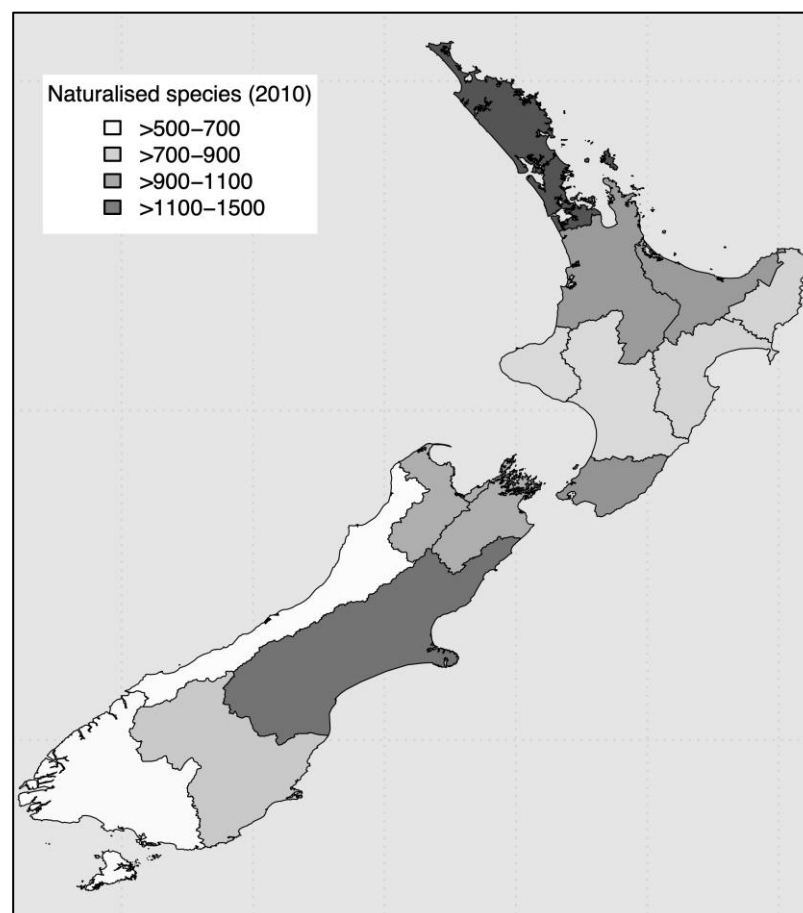


Figure 2a: Number of naturalised seed plant species in each region (Hazel Gatehouse, unpublished data).

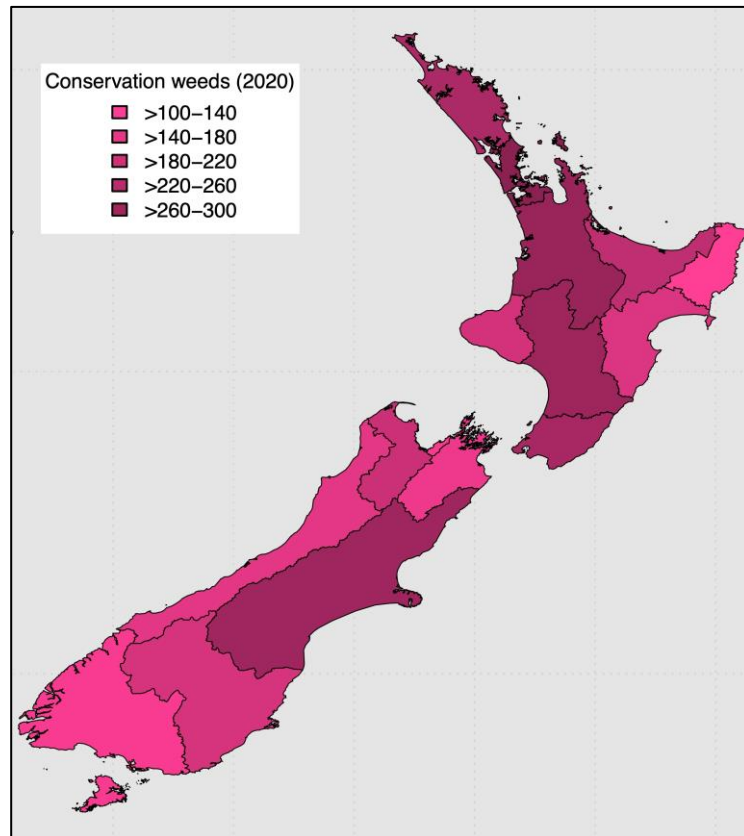


Figure 2b: Number of conservation weed species in each region (Clayson Howell, Department of Conservation, unpublished data).

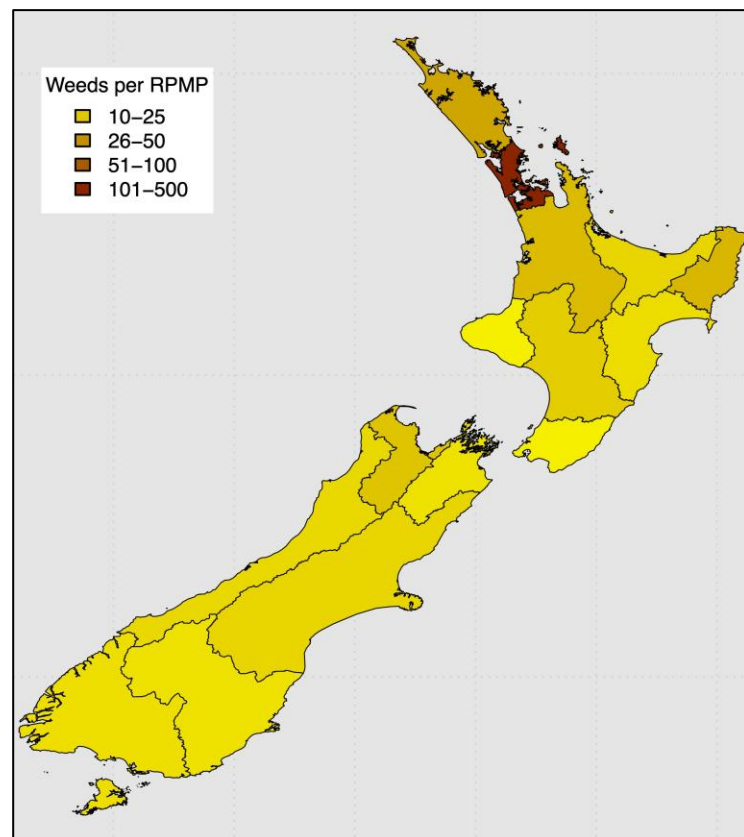


Figure 2c: Number of RPMP weed taxa in each region.

Some regional councils use a combination of different types of RPMP programmes to manage a single weed species (or a suite of species) within their regions. For instance, many councils have region-wide management programmes as well as targeted management of the same species in defined parts of the region. For example, in Canterbury, white broom (*Cytisus multiflorus*) is managed throughout the region under a Site-led programme, and is also subject to a Sustained Control programme in the Hill and High Country Zone (see Appendix 2). Table 7 summarises the range of RPMP weed management approaches in the different regions.

Table 7: Number of RPMP weed programmes of different types in each region, separated into region-wide programmes and those covering only part of a region.

Region	Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led
Region-wide Programmes					
Northland	15	25	5	45	0
Auckland	1	15	13	194	0
Waikato	8	21	18	7	0
Bay of Plenty	5	12	8	5	0
Gisborne	15	13	15	10	14
Hawkes Bay	5	8	8	9	0
Taranaki	0	5	0	9	0
Manawatu-Wanganui	11	18	15	0	0
Wellington	3	5	2	2	0
Tasman-Nelson	8	14	7	10	0
Marlborough	1	3	0	22	0
Canterbury	10	8	10	18	17
West Coast	7	7	15	4	0
Otago	6	1	17	0	0
Southland	3	7	11	4	0
Chatham Islands	2	8	5	2	0
Programmes Restricted to Part of a Region					
Northland	0	0	5	0	0
Auckland	12	20	8	1	34
Waikato	0	0	4	2	12
Bay of Plenty	7	3	11	6	0
Gisborne	0	0	3	3	0
Hawkes Bay	0	0	3	0	0
Taranaki	0	0	0	0	0
Manawatu-Wanganui	0	0	15	0	0
Wellington	0	0	0	2	3
Tasman-Nelson	0	1	0	11	10
Marlborough	0	1	0	8	0
Canterbury	0	0	6	13	0
West Coast	0	0	8	0	0
Otago	0	0	0	7	7
Southland	0	0	4	0	7
Chatham Islands	0	0	0	0	0

Regions also vary in their use of ‘good neighbour rules’ (these were previously referred to as ‘boundary control rules’), which set rules for control of particular weeds on neighbouring properties (Table 8). The use of good neighbour rules varies among, and within, regions. For example, the Gisborne RPMP has 37 region-wide weed management programmes with associated good neighbour rules, but five councils (Bay of Plenty, Hawkes Bay, Wellington, Tasman-Nelson, and Marlborough) do not have any region-wide RPMP weed programmes with good neighbour rules. Both cases illustrate how regional councils use the RPMP process to vary their weed management within their regions, as well across weed species.

Table 8: Number of RPMP weed programmes in each region where Good Neighbour Rules apply (for weed control across property boundaries). Region-wide programmes are separated from programmes that apply to part of a region only.

Region	Good Neighbour Rules: Region-wide	Good Neighbour Rules: Part of Region
Northland	6	0
Auckland	1	8
Waikato	22	13
Bay of Plenty	0	0
Gisborne	37	6
Hawkes Bay	0	2
Taranaki	9	0
Manawatu-Wanganui	10	7
Wellington	0	0
Tasman-Nelson	0	2
Marlborough	0	2
Canterbury	15	11
West Coast	3	0
Otago	8	5
Southland	4	1
Chatham Islands	1	0

Proposed management outcomes

Tables 9–11 show the varying expectations among councils of the potential outcomes from their RPMP weed programmes (Sustained Control, Progressive Containment, and Site-led weed programmes only). Potential outcomes for Sustained Control programmes ranged from a slower increase in the weed population (i.e. the weed will still increase but the rate will be slower than with no regional control), to holding a weed population steady (i.e. keeping the weed at its current level of infestation), through to regional eradication or exclusion (Table 9). For example, Northland and Auckland councils expect that the majority of their Sustained Control programmes will result in a slower increase in these weed populations, whereas all of the Sustained Control programmes in the Tasman-Nelson RPMP are expected to cause a decline in those weed populations.

Table 9: Management objectives for RPMP **Sustained Control** weed management programmes. Objectives were assigned using information in RPMP and CBA documents, and the data were later reviewed by councils (in Part 2 of the Council survey). Data were unavailable for some regions.

Region	Exclusion	Eradication	Decline	Hold Steady	Slower Increase
Northland	0	0	0	3	42
Auckland	2	0	0	0	193
Waikato	0	0	1	8	0
Bay of Plenty ¹	0	0	0	11	0
Gisborne	0	0	8	5	0
Hawkes Bay	0	0	0	9	0
Taranaki	0	0	0	9	0
Manawatu-Wanganui ²	-	-	-	-	-
Wellington	0	0	2	2	0
Tasman-Nelson	0	0	21	0	0
Marlborough	0	0	18	12	0
Canterbury	0	0	0	4	0
West Coast	0	0	1	22	8
Otago	0	2 ³	2	3	0
Southland	0	0	0	4	0
Chatham Islands ¹	-	-	-	-	-

¹ The RPMPs for the Bay of Plenty and Chatham Islands were not finalised at the time of this review.

² The Manawatu-Wanganui RPMP does not have any Sustained Control weed programmes.

³ Otago has gorse and Scotch broom Sustained Control programmes in defined areas that are currently free of gorse and Scotch broom. These programmes aim to eliminate any gorse and broom plants that establish in these defined areas, which explains why the management objective for these programmes was given as Eradication.

Table 10: Management objectives for RPMP **Progressive Containment** weed management programmes. Objectives were assigned using information in RPMP and CBA documents, and the data were later reviewed by councils (in Part 2 of the Council survey). Data were unavailable for some regions.

Region	Eradication	Decline	Hold Steady	Slower Increase
Northland	2 ³	6	2	0
Auckland	13 ³	6	0	2
Waikato	3 ³	17	2	0
Bay of Plenty ¹	0	19	0	0
Gisborne	0	0	18	0
Hawkes Bay	0	11	0	0
Taranaki ²	-	-	-	-
Manawatu-Wanganui	0	13	17	0
Wellington	0	2	0	0
Tasman-Nelson	0	7	0	0
Marlborough ²	-	-	-	-
Canterbury	0	23	0	0
West Coast	0	16	0	0
Otago	0	17	0	0
Southland	0	13	2	0
Chatham Islands ¹	-	-	-	-

¹ The RPMPs for the Bay of Plenty and Chatham Islands were not finalised at the time of this review.

² These regions do not have any Progressive Containment weed programmes in their RPMPs.

³ Northland, Auckland, and Waikato all have Progressive Containment programmes that aim for eventual zero density of some weeds in their regions. For example, the Waikato RPMP aims to control all known infestations of alligator weed, climbing spindleberry, and old man's beard to zero density by 2024 and "as practicable, reduce towards zero density any further infestations that are identified over the duration of the plan." This aim for eventual zero density of some weeds explains why the management objective for these programmes was given as Eradication.

Table 11: Management objectives for RPMP **Site-led** weed management programmes. Objectives were assigned using information in RPMP and CBA documents, and the data were later reviewed by councils (in Part 2 of the Council survey). Data were unavailable for some regions.

Region	Eradication	Decline	Hold Steady
Northland ²	-	-	-
Auckland	0	32	2
Waikato	0	8	4
Bay of Plenty ¹	-	-	-
Gisborne	0	0	14
Hawkes Bay ²	-	-	-
Taranaki ²	-	-	-
Manawatu-Wanganui ²	-	-	-
Wellington	0	3	0
Tasman-Nelson	7	3	0
Marlborough ²	-	-	-
Canterbury ²	-	-	-
West Coast	0	16	1
Otago	0	1	6
Southland	4	2	1
Chatham Islands ¹	-	-	-

¹ The proposed RPMPs for the Bay of Plenty and Chatham Islands have not yet been finalised.

² These regions do not have any Site-led weed programmes in their RPMPs.

3.1.1 Characteristics of weed species in RPMPs

There is some overlap between the weed species managed through RPMPs and those listed in the National Pest Plant Accord (MPI 2020a), the MPI Unwanted Organisms register (MPI 2020b), and the environmental or conservation weeds listed by the Department of Conservation (Howell 2008 and Howell 2020 unpublished data) (Table 12). However, notably, 69 weed taxa (25.8%) are managed by regional councils through their RPMPs, but are not listed on any of these other weed lists (see Appendix 1).

The percentage of weed taxa in each RPMP that are listed as Unwanted Organisms, NPPA weeds, or DOC weeds, varies substantially among the regions. For example, almost all (93.3%) of the weed taxa in the Wellington RPMP are listed in the NPPA, whereas less than half (46.0%) of the RPMP weed taxa in Northland and Auckland are in the NPPA. All of the weed taxa managed through the Chatham Islands proposed RPMP are listed as conservation weeds by DOC, in contrast with Hawkes Bay, where only 65.6% of the RPMP weed taxa are listed as DOC weeds (Table 12).

Table 12: Percentage of weed taxa in each RPMP listed in the National Pest Plant Accord (MPI 2020a), Unwanted Organisms register (MPI 2020b), and listed as weeds by the Department of Conservation (Howell 2008, Howell 2020 unpublished data).

Region	% NPPA (MPI 2020a)	% Unwanted Organisms MPI (2020b)	% DOC weeds (Howell 2008)	% DOC weeds (Howell 2020)
Northland	46.0%	42.5%	69.0%	81.6%
Auckland	46.0%	45.0%	66.8%	81.0%
Waikato	73.8%	66.2%	73.8%	81.5%
Bay of Plenty	67.5%	60.0%	72.5%	80.0%
Gisborne	56.5%	53.6%	72.5%	81.2%
Hawkes Bay	56.2%	50.0%	62.5%	65.6%
Taranaki	60.0%	60.0%	86.7%	86.7%
Manawatu-Wanganui	69.4%	69.4%	77.6%	89.8%
Wellington	93.3%	86.7%	86.7%	93.3%
Tasman-Nelson	59.6%	56.1%	71.9%	82.5%
Marlborough	60.7%	57.1%	64.3%	75.0%
Canterbury	57.5%	52.5%	67.5%	82.5%
West Coast	70.3%	73.0%	91.9%	94.6%
Otago	64.3%	64.3%	85.7%	89.3%
Southland	54.8%	54.8%	90.3%	90.3%
Chatham Islands	58.8%	58.8%	100.0%	100.0%
New Zealand	43.8%	40.4%	59.9%	76.8%

Regions vary in their emphasis on production and biodiversity weeds, with eastern regions managing proportionally more weeds that have production impacts, while northern and western regions manage proportionally more weeds that have only biodiversity impacts (Table 13, Figures 3–5). Regions also vary in the proportion of RPMP weeds that are woody, with the Chatham Islands, Southland, Auckland, and Northland managing the highest proportions of woody weeds (Table 13, Figure 6).

Table 13: Weed taxa listed in RMPs per region (excluding Organisms of Interest), summarised by their broad types of impact (on production and/or biodiversity) and broad life forms (woody or herbaceous). When percentages for % woody and % herbaceous do not add to 100%, this indicates that life form data was unavailable for some taxa.

Region	% Production only	% Biodiversity only	% Biodiversity & Production	% Woody	% Herbaceous
Northland	3.4%	72.4%	24.1%	43.7%	41.4%
Auckland	7.6%	72.0%	19.9%	41.7%	45.0%
Waikato	12.3%	58.5%	27.7%	29.2%	58.5%
Bay of Plenty	15.0%	37.5%	45.0%	35.0%	55.0%
Gisborne	23.2%	43.5%	33.3%	30.4%	63.8%
Hawkes Bay	40.6%	25.0%	34.4%	31.2%	68.8%
Taranaki	26.7%	40.0%	33.3%	26.7%	66.7%
Manawatu-Wanganui	14.3%	49.0%	34.7%	32.7%	59.2%
Wellington	6.7%	40.0%	53.3%	40.0%	53.3%
Tasman-Nelson	15.8%	50.9%	33.3%	38.6%	57.9%
Marlborough	21.4%	32.1%	46.4%	25.0%	60.7%
Canterbury	17.5%	37.5%	45.0%	35.0%	65.0%
West Coast	10.8%	56.8%	32.4%	32.4%	64.9%
Otago	14.3%	46.4%	39.3%	35.7%	60.7%
Southland	9.7%	48.4%	41.9%	45.2%	45.2%
Chatham Islands	5.9%	58.8%	35.3%	52.9%	35.3%
New Zealand	11.2%	70.8%	17.6%	38.2%	47.6%

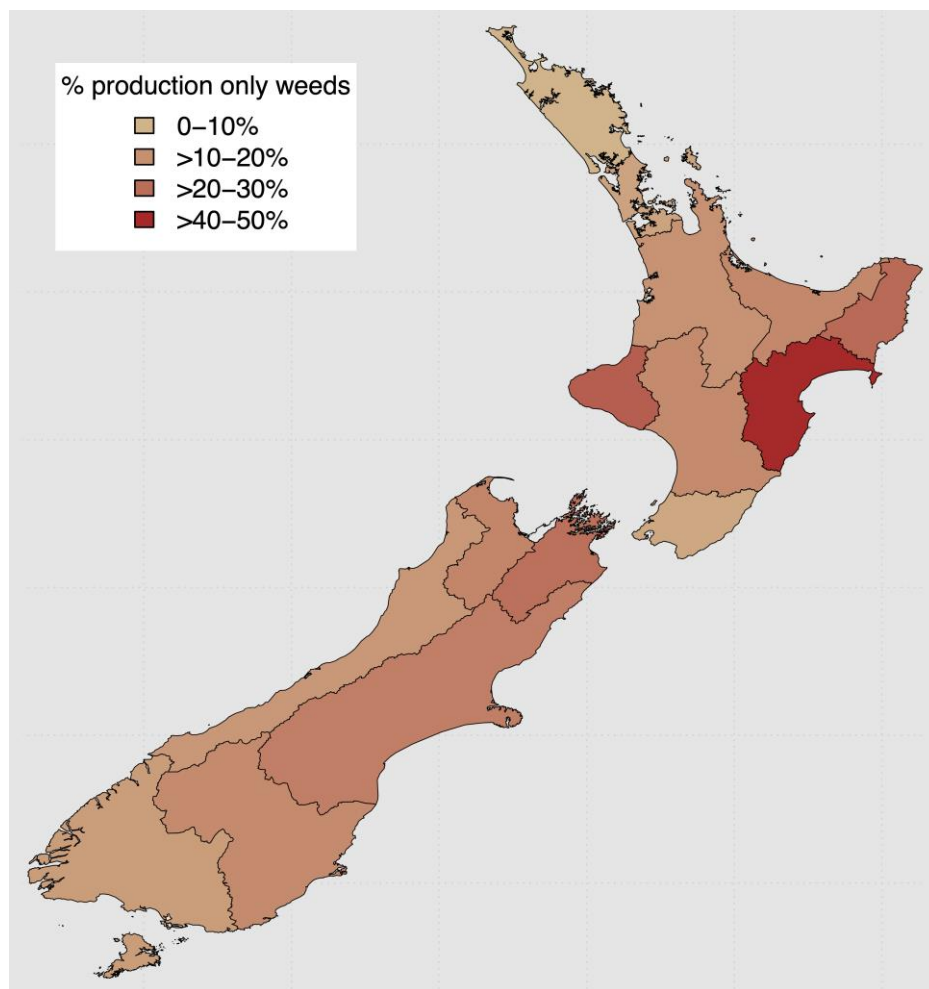


Figure 3: Percentage of weed taxa in RPMPs that have only production impacts (e.g. impacts on agriculture, horticulture, and/or forestry). Chatham Islands are not shown.

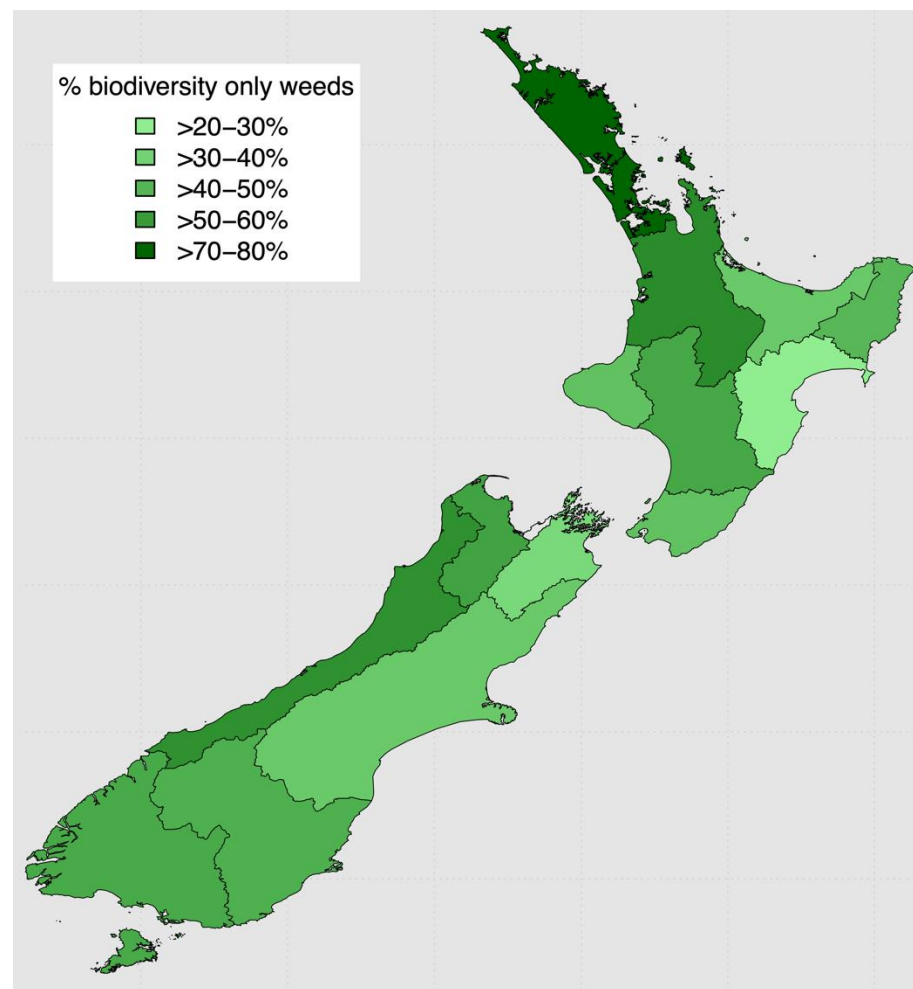


Figure 4: Percentage of weed taxa in RPMPs that have only biodiversity impacts. Chatham Islands are not shown.

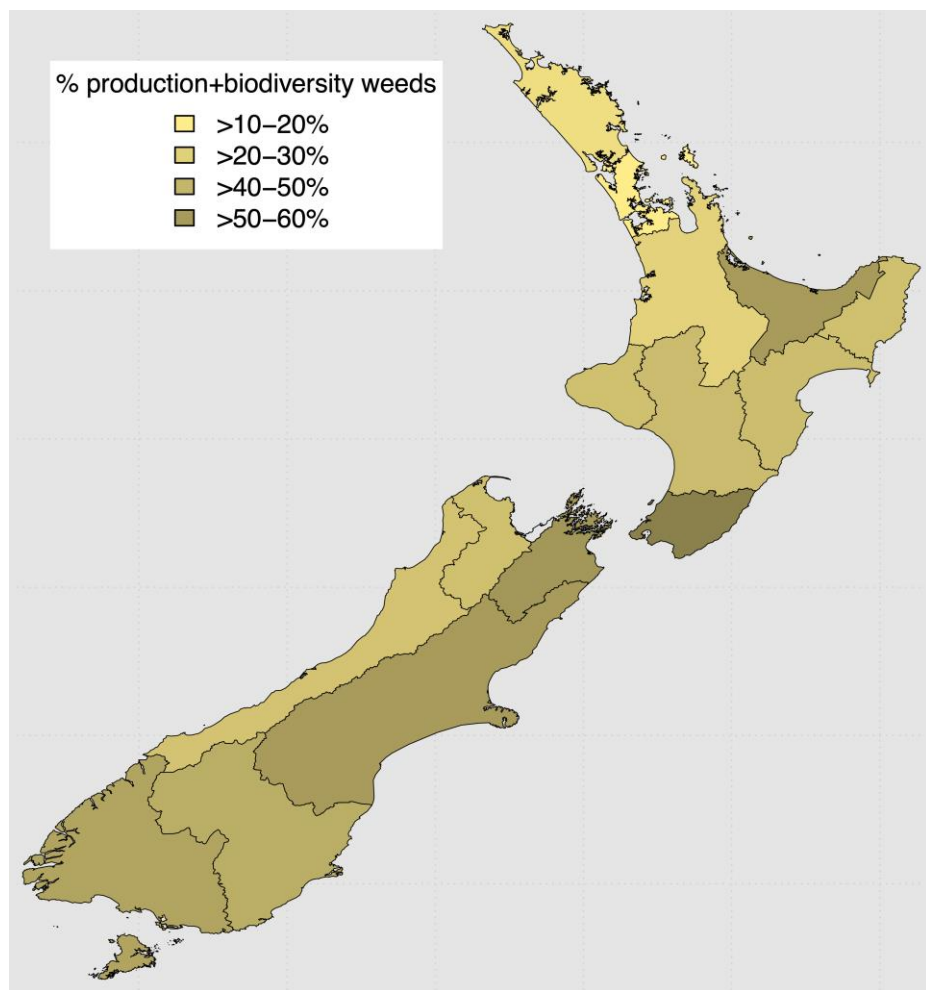


Figure 5: Percentage of weed taxa in RPMPs that have both production and biodiversity impacts. Chatham Islands are not shown.

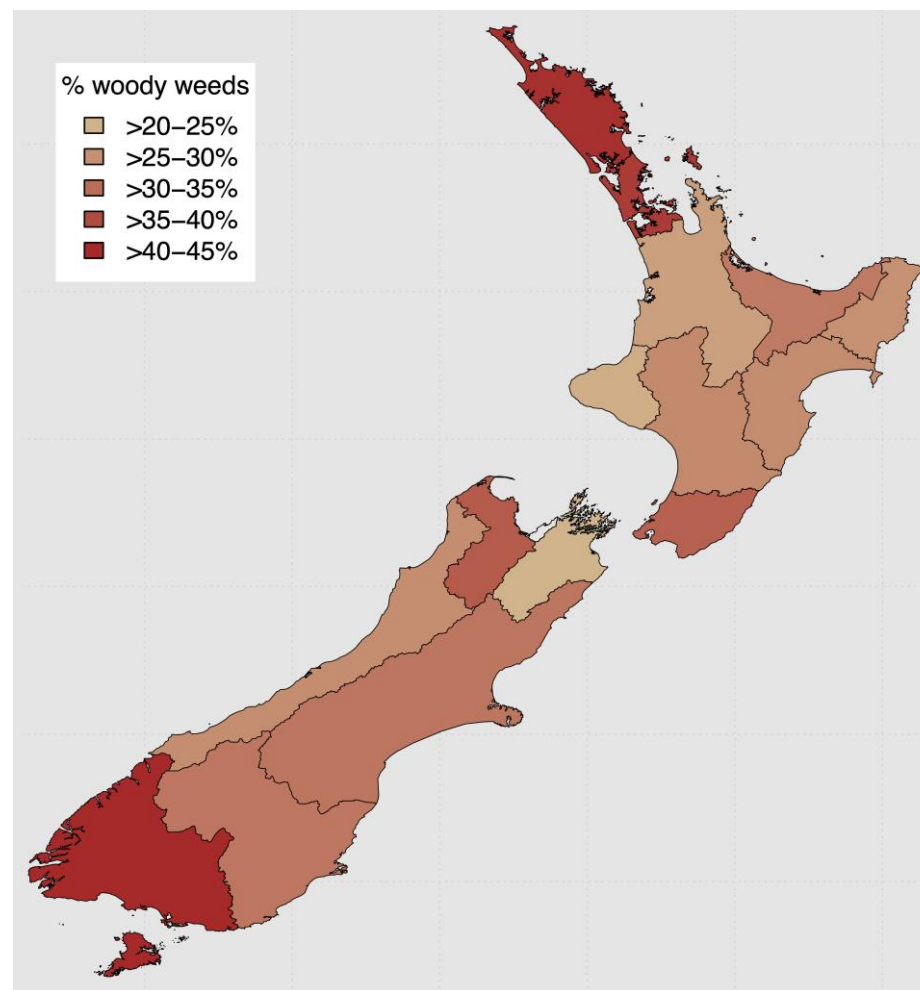


Figure 6: Percentage of weed taxa in RPMPs that are woody (trees, shrubs, and woody vines). Chatham Islands are not shown.

Weed management differs from mammalian pest control, both in the much greater number of weed species requiring control, and in the ongoing establishment and spread of many new weed species every decade. It is therefore of interest to look at the weed taxa that are listed in RPMPs in the context of the ongoing invasion of weeds into New Zealand landscapes. Table 14 shows the proportion of weed taxa listed in RPMPs that are in different broad categories of spread (i.e. infestation stage) in each region, from absent to widespread. For most regions, the majority of weeds managed through RPMPs are already well established in the region (Table 14). Nevertheless, there are some differences between regions. For example, the Canterbury RPMP has the highest percentage (22.5%) of weed taxa that are not yet established wild in the region, while Taranaki does not have any RPMP programmes for weed taxa that are currently absent from the region.

Northern regions list proportionally many more recently naturalised species on their RPMPs than southern regions (Table 14, Figures 7–8). More than 10% of the RPMP weeds listed by Northland, Auckland, and Waikato were first discovered wild in New Zealand in 1980 or later, whereas less than 10% of the weeds listed by other regions are recently naturalised (Table 14).

Table 14: Percentages of RPMP weed taxa (excluding Organisms of Interest) in different categories according to their extent in each region (Absent, Early infestation, Established, or Widespread), and the amount of time they have been naturalised in New Zealand (before or after 1980).

Region	% Absent	% Early infestation	% Established	% Widespread	% Naturalised after 1980	% Naturalised before 1980
Northland	17.2%	13.8%	32.2%	35.6%	14.9%	72.4%
Auckland	8.5%	18.0%	55.0%	18.5%	13.3%	74.9%
Waikato	9.2%	41.5%	32.3%	16.9%	10.8%	76.9%
Bay of Plenty	9.8%	48.8%	29.3%	12.2%	7.5%	82.5%
Gisborne	20.3%	18.8%	55.1%	5.8%	5.8%	89.9%
Hawkes Bay	15.6%	21.9%	31.2%	31.2%	6.2%	93.8%
Taranaki	0%	33.3%	46.7%	20.0%	6.7%	86.7%
Manawatu-Wanganui	18.4%	20.4%	40.8%	20.4%	6.1%	85.7%
Wellington	13.3%	20%	20.0%	46.7%	6.7%	86.7%
Tasman-Nelson	12.3%	12.3%	71.9%	3.5%	7.0%	87.7%
Marlborough	3.6%	67.9%	14.3%	14.3%	7.1%	82.1%
Canterbury	22.5%	25.0%	35.0%	17.5%	5.0%	95.0%
West Coast	18.9%	8.1%	59.5%	13.5%	0%	97.3%
Otago	17.9%	21.4%	28.6%	32.1%	3.6%	92.9%
Southland	6.5%	38.7%	29.0%	25.8%	0%	90.3%
Chatham Islands	11.8%	47.1%	29.4%	11.8%	0%	88.2%
New Zealand	12.0%	24.7%	34.5%	18.0%	13.1%	73.8%

If we look at the weed taxa listed in RPMPs in New Zealand as a whole, and compare them with all of the vascular plant species naturalised in New Zealand, it is clear that there is a strong bias in RPMPs towards weeds that have been wild in New Zealand since early last century. The average date of first discovery of RPMP weeds is 1935 and only 13.1% of RPMP weeds nationally were discovered on or after 1980 (Table 14). The bulk of the RPMP weeds were first discovered in the wild between 1890 and 1960 (Figure 8). The proportion of the naturalised plants discovered each decade that are listed in RPMPs declines steadily per decade from 1910–2020 (Figures 9–10).

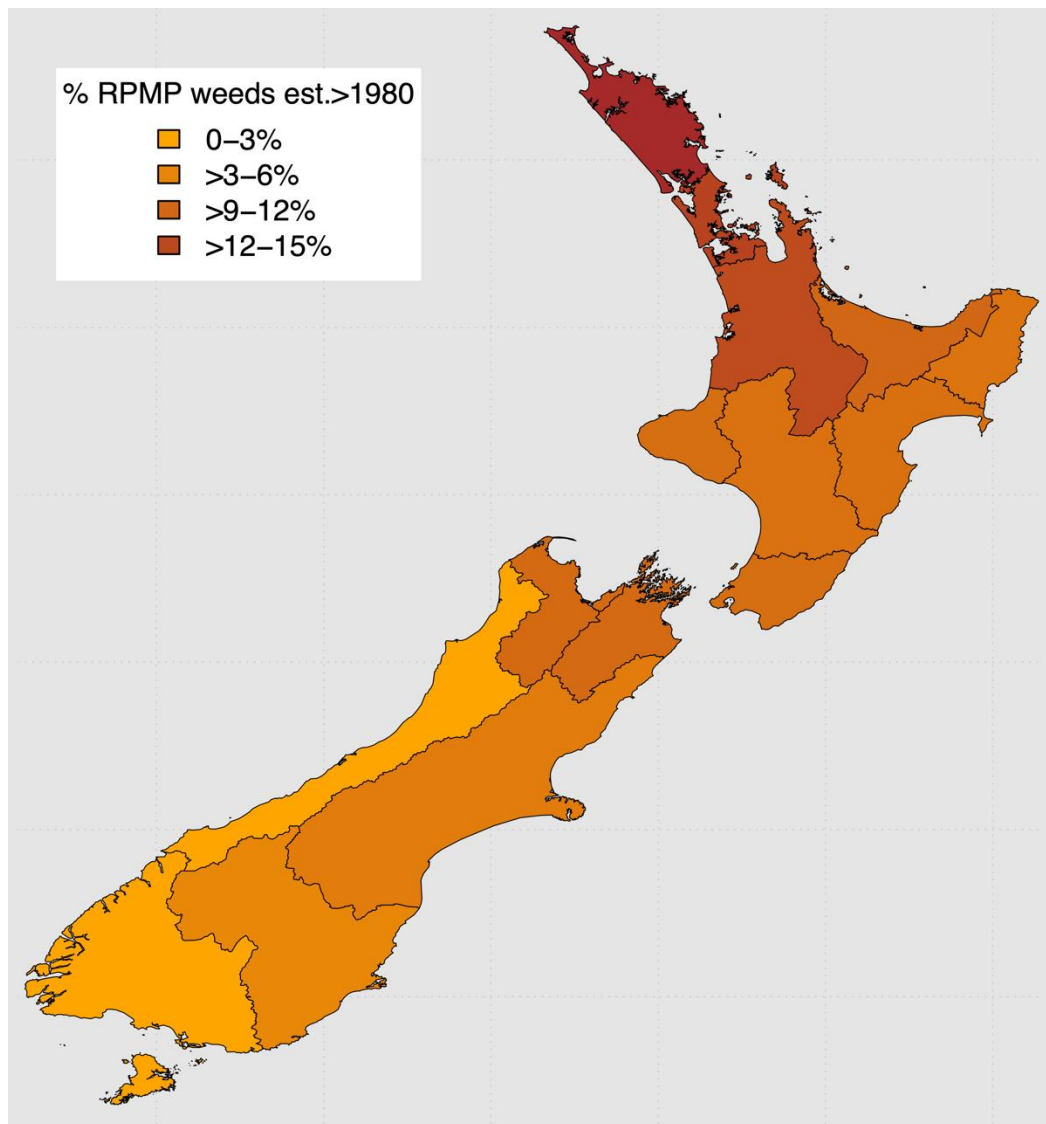


Figure 7: Percentage of weed taxa in RPMPs (excluding Organisms of Interest) that were first discovered wild in New Zealand after 1980. Chatham Islands not shown

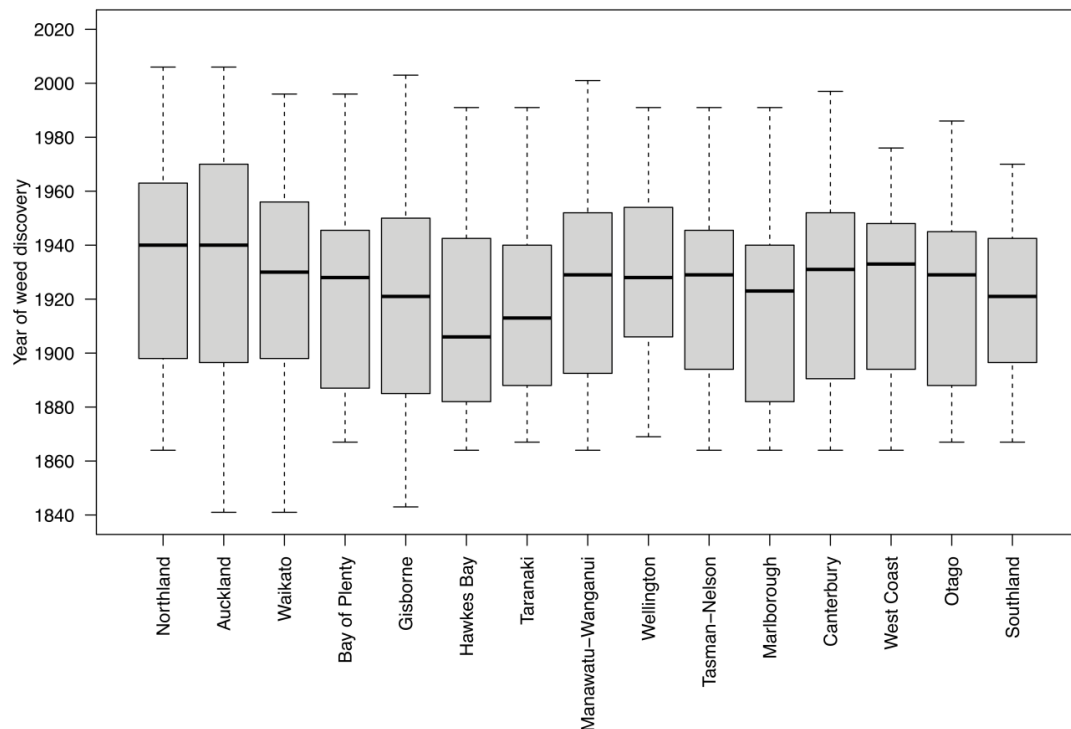


Figure 8: Distribution of weed taxa in RPMPs by the year each taxon was first discovered wild in New Zealand. This box-and-whisker plot has the median as the midline, the grey box spans the middle 50% of the data, and the whiskers extending to the furthest data points. Most weeds listed in RPMPs have been wild in New Zealand for 80 years or more.

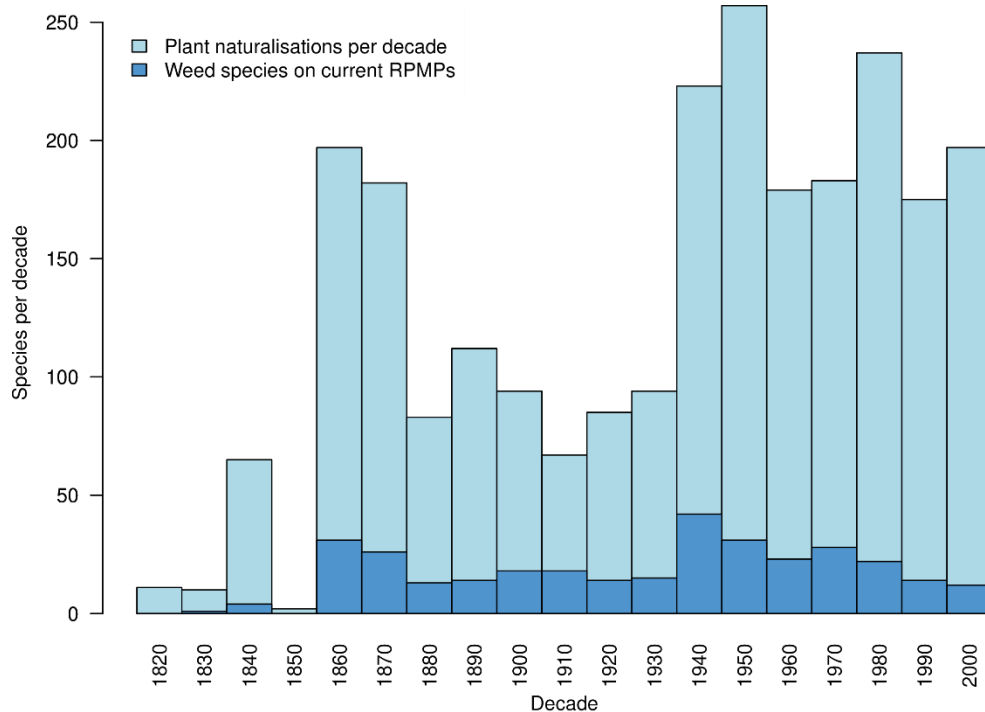


Figure 9: The number of naturalised seed plant species discovered each decade in New Zealand, compared with the number of these species listed in current RPMPs.

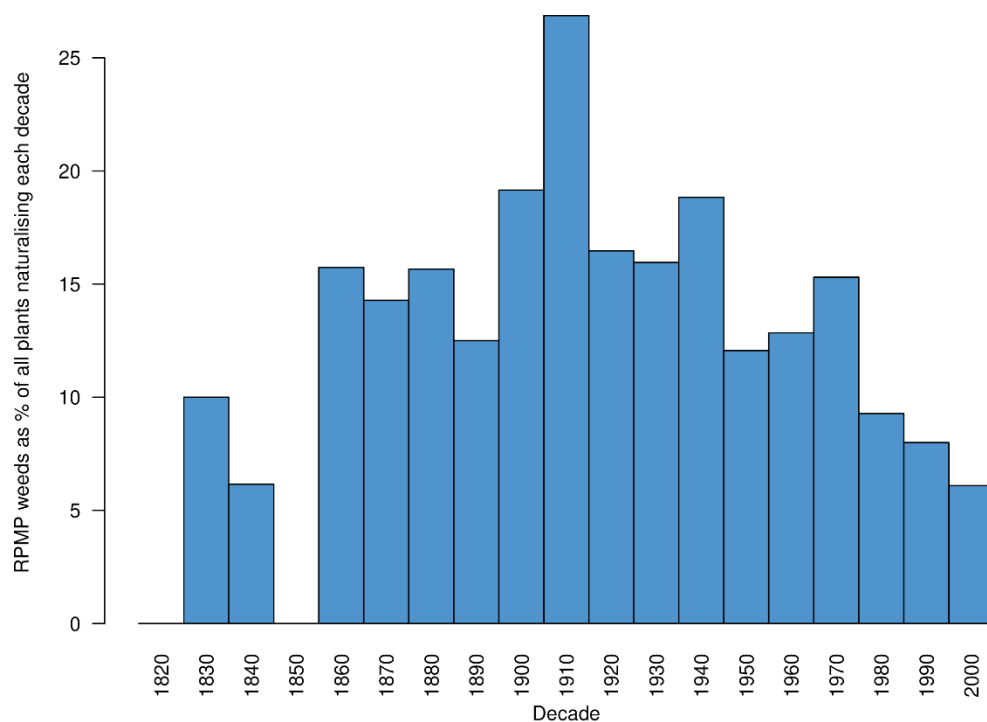


Figure 10: The proportion of plant species naturalising per decade that are listed in current RPMPs. Note that the year of discovery data was only available up to 2010, and is sourced from (Gatehouse 2008) and Hazel Gatehouse (unpubl. data), who sourced much of it from (Webb *et al.* 1988).

Figure 11 shows in more detail how the RPMP programmes used by regions to manage weeds, aligns with the stages of weed invasion. As expected, most (but not all) exclusion programmes are for weeds that councils reported were absent from their regions, and most (but not all) eradication programmes are targeted at early infestation weeds. The programmes assigned to established and widespread weeds vary much more widely among councils. The relative number of programmes for weeds with production impacts, versus only biodiversity impacts, also varies considerably among regions. Programmes for production weeds outnumber biodiversity-only weeds in most regions for the widespread weeds, while this imbalance is not present in most regions for programmes targeted at absent and early infestation weeds.

Another way to compare the weed taxa managed in different regions is through clustering and ordination methods, which look at how similar the weed taxa are in each RPMP. Regions that have more similar RPMP weeds get clustered closer together. Figure 12 illustrates the similarity among regions in their RPMP weeds, which generally follows the geographic proximity of the regions. For example, Auckland splits out most strongly from the other regions, and, not surprisingly, has an RPMP weed list most similar to that of Northland. Similarly, the Canterbury and Otago RPMPs are grouped closely together, along with the West Coast, reflecting the similarities in the weed taxa being managed by councils in the centre of the South Island. The pattern also appears to hold across Cook Strait, with the Wellington and Marlborough RPMPs being most similar to each other.

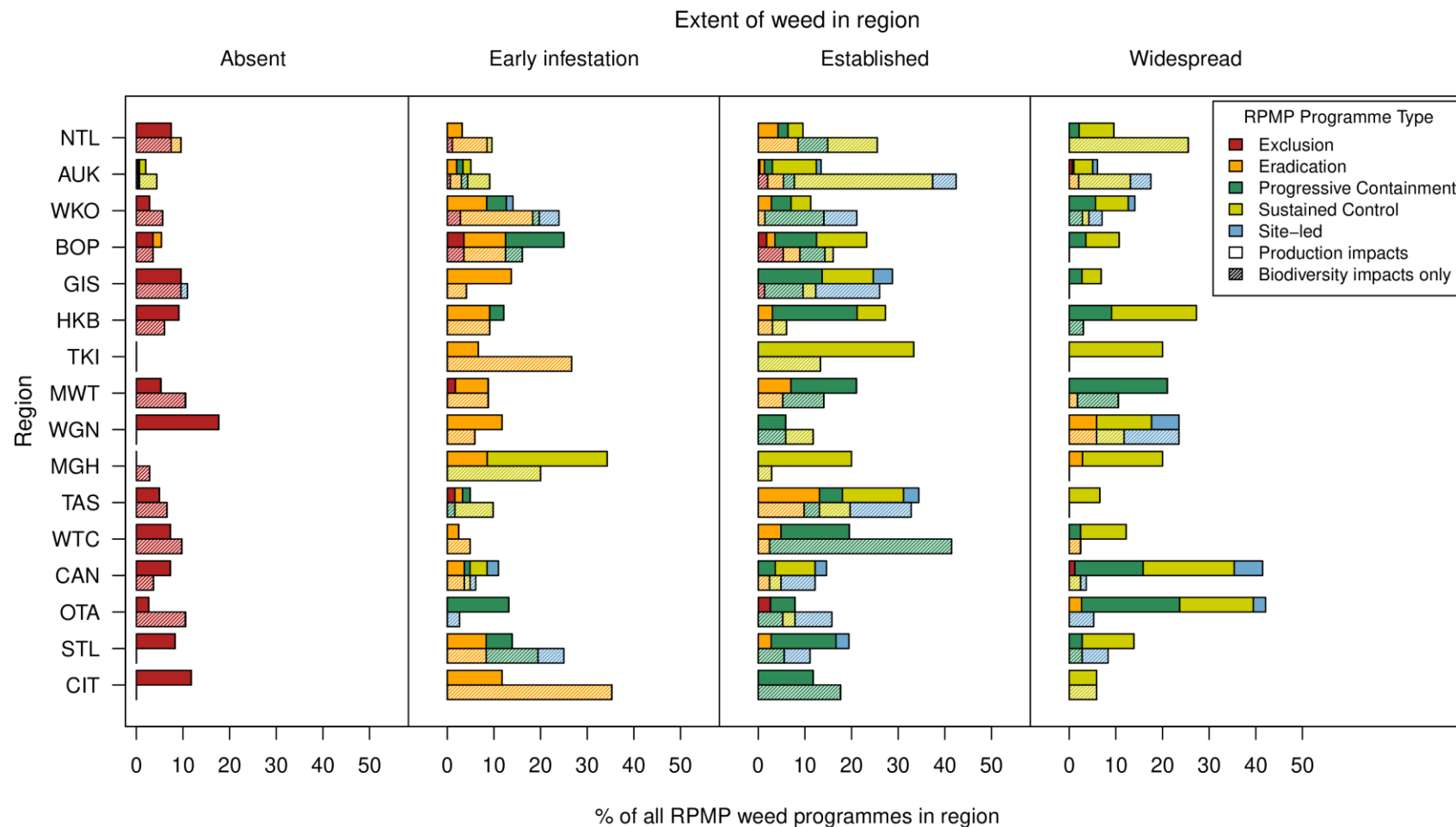


Figure 11: How the programme types assigned to weeds in current RPMPs changes based on a weed's invasion stage, from absent in a region through to widespread. The bars show the number of RPMP programmes in each programme type and impact category, as a percentage of all of the weed programmes in that region's RPMP. The top row of bars in a region are the programmes for weeds that have production impacts, while the lower row of bars are for a region's programmes for weeds that only have biodiversity impacts. Since the length of the bars are relative to the total number of programmes in a region, they do not show the differences in the overall number of programmes among regions. See Table 6 and Figure 2 for variation among regions in the total number of weeds being managed through RPMPs. NTL = Northland, AUK = Auckland, WKO = Waikato, BOP = Bay of Plenty, GIS = Gisborne, HKB = Hawkes Bay, TKI = Taranaki, MWT = Manawatu-Wanganui, WGN = Wellington, TAS = Tasman-Nelson, MGH = Marlborough, CAN = Canterbury, WTC = West Coast, OTA = Otago, STL = Southland, CIT = Chatham Islands.

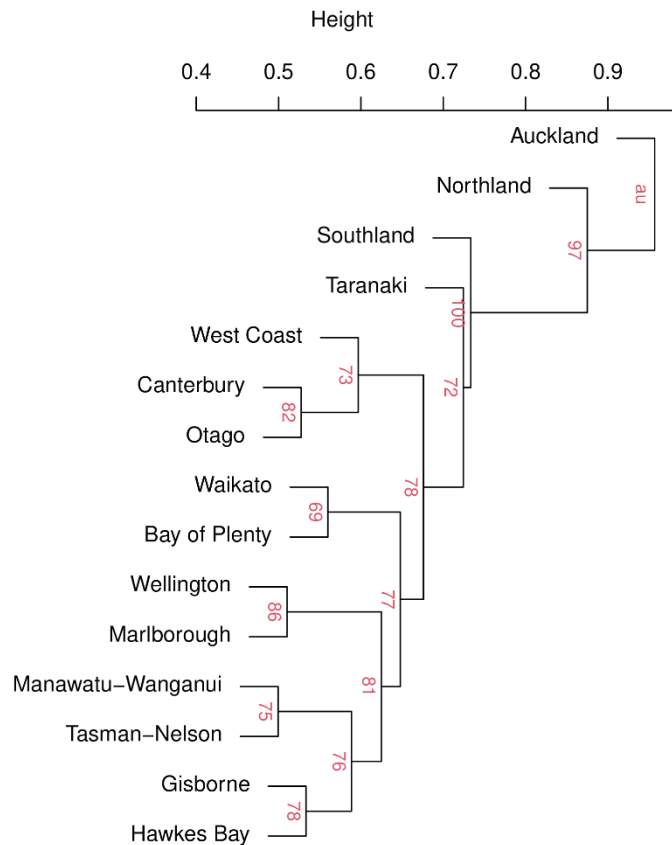


Figure 12: Ward Hierarchical Clustering of RPMP lists, showing which regions are most similar in their listed weed taxa. The numbers in red are the percentage probabilities that each branch is the most correct arrangement of the regions.

Earlier, we showed how the variation in the total number of weed taxa listed in RPMPs cannot be easily explained with biological and geographical attributes of the regions. The adonis results (Table 15) show that regional variation in which weeds are listed is similarly difficult to explain. This attempts to explain the similarity in weed composition among regions based on a number of regional variables. Taken together, a region’s latitude and longitude, human population size, areas of pastoral farming, biodiversity, and urban, plus the total and weed RPMP budgets, can explain about 65% of the variation in RPMP weed lists among regions. However, none of these variables alone shows a statistically significant effect (Table 15)

Table 15: Adonis results explaining the similarity among regions in the weeds they list in their RPMPs. The explanatory variables are regional area, human population size, area of pastoral farming, area of native vegetation, area of urban land, latitude and longitude, each regions' total RPMP budget, and the budget for weed management under the RPMP. The R^2 column shows the sequential contribution that each variable makes to explaining the variation among regions in their RPMP weed lists. $Pr(>F)$ values are considered to be statistically significant when <0.05 .

	Df	SumOfSqs	R^2	F	$Pr(>F)$
Area	1	0.16	0.06	0.79	0.72
Latitude	1	0.12	0.04	0.58	0.93
Longitude	1	0.24	0.08	1.19	0.27
Population	1	0.22	0.08	1.09	0.36
Pastoral	1	0.20	0.07	0.99	0.48
Native	1	0.16	0.05	0.78	0.74
Urban	1	0.32	0.11	1.59	0.07
WeedBudget	1	0.23	0.08	1.14	0.30
RPMPBudget	1	0.24	0.08	1.17	0.28
Residual	5	1.01	0.35		
Total	14	2.89	1.00		

Almost half of the weed taxa managed through RPMPs (111 taxa, 41.6% of all RPMP weed taxa) are listed by only one region (Figure 12). In contrast, very few weed taxa are listed by most regions (only 22 taxa, or 8.2%, are listed by more than eight regions). Weed taxa listed in RPMPs of more than nine regions or more are shown in Table 16. Of those weed taxa that are listed by more than one region, most are also listed by one or more adjacent regions (Table 17). The type of management programme applied in each region is illustrated for six of the most commonly listed weed taxa (Figures 13–18).

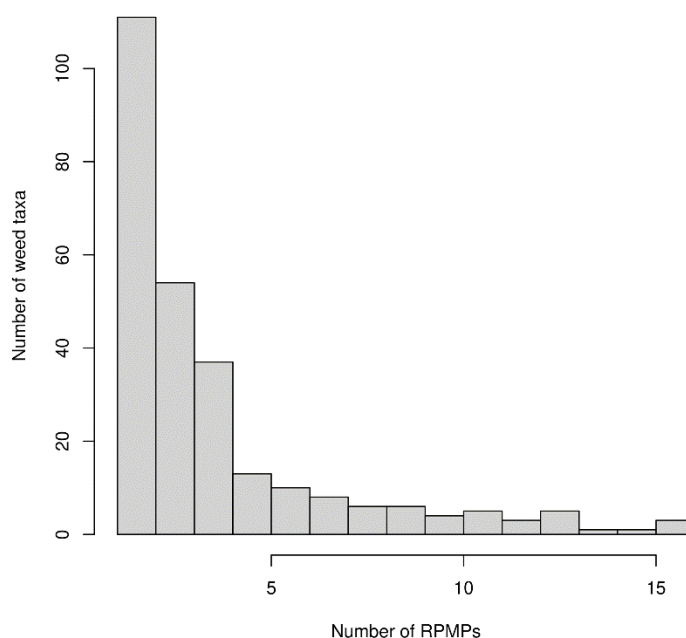


Figure 12: A histogram of the number of weed taxa in RPMPs by the number of regions that list each taxon. A large minority of taxa are listed by only one region.

Table 16: Weed species (or taxa) that are listed in nine or more RPMPs, and the number of RPMPs in which they are managed.

Weed Taxa	Common Name	Number of RPMPs
<i>Clematis vitalba</i>	old man's beard	15
<i>Nassella neesiana</i> , <i>N. tenuissima</i> , <i>N. trichotoma</i>	Chilean needle grass, Mexican feather grass, nassella tussock	15
<i>Ulex europaeus</i>	gorse	15
<i>Spartina alterniflora</i> , <i>S. anglica</i> , <i>S. x townsendii</i>	spartina	14
<i>Calicotome spinosa</i> , <i>Cytisus scoparius</i> , <i>Genista monspessulana</i> , <i>Spartium junceum</i>	Scotch broom, spiny broom, Montpellier broom, Spanish broom	13
<i>Cenchrus macrourus</i>	African feather grass	12
<i>Chrysanthemoides monilifera</i>	boneseed	12
<i>Jacobaea vulgaris</i>	ragwort	12
<i>Solanum mauritianum</i>	woolly nightshade	12
Wilding conifers (various species)	wilding conifers	12
<i>Gunnera manicata</i> , <i>G. tinctoria</i>	giant gunnera, Chilean rhubarb	11
<i>Gymnocoronis spilanthoides</i>	Senegal tea	11
<i>Lythrum salicaria</i>	purple loosestrife	11
Banana passionfruit (<i>Passiflora</i> spp.)	banana passionfruit	10
<i>Berberis darwinii</i>	Darwin's barberry	10
<i>Carduus nutans</i> , <i>C. acanthoides</i>	nodding thistle, plumeless thistle	10
<i>Celastrus orbiculatus</i>	climbing spindle berry	10
<i>Cobaea scandens</i>	cathedral bells	10
<i>Araujia hortorum</i>	moth plant	9
<i>Hedychium flavescens</i> , <i>H. gardnerianum</i>	yellow ginger, kahili ginger	9
<i>Lagarosiphon major</i>	lagarosiphon	9
<i>Solanum marginatum</i>	white-edged nightshade	9

Table 17: How many of the RPMP weed taxa listed by regions are also listed by neighbouring regions and how many are only listed by non-neighbouring regions. Neighbouring regions share a land border.

Region	Total per RPMP	Only listed by this region	Listed by neighbouring regions	Listed by other regions but not neighbours
Northland	87	8	67	8
Auckland	211	77	92	23
Waikato	65	6	57	0
Bay of Plenty	40	2	36	0
Gisborne	69	5	34	25
Hawkes Bay	32	0	30	1
Taranaki	15	0	13	2
Manawatu-Wanganui	49	1	37	8
Wellington	15	0	14	1
Tasman-Nelson	57	5	36	13
Marlborough	28	1	20	5
Canterbury	37	0	27	10
West Coast	40	4	28	5
Otago	28	0	23	2
Southland	31	2	18	8
Chatham Islands	17	0	17	0

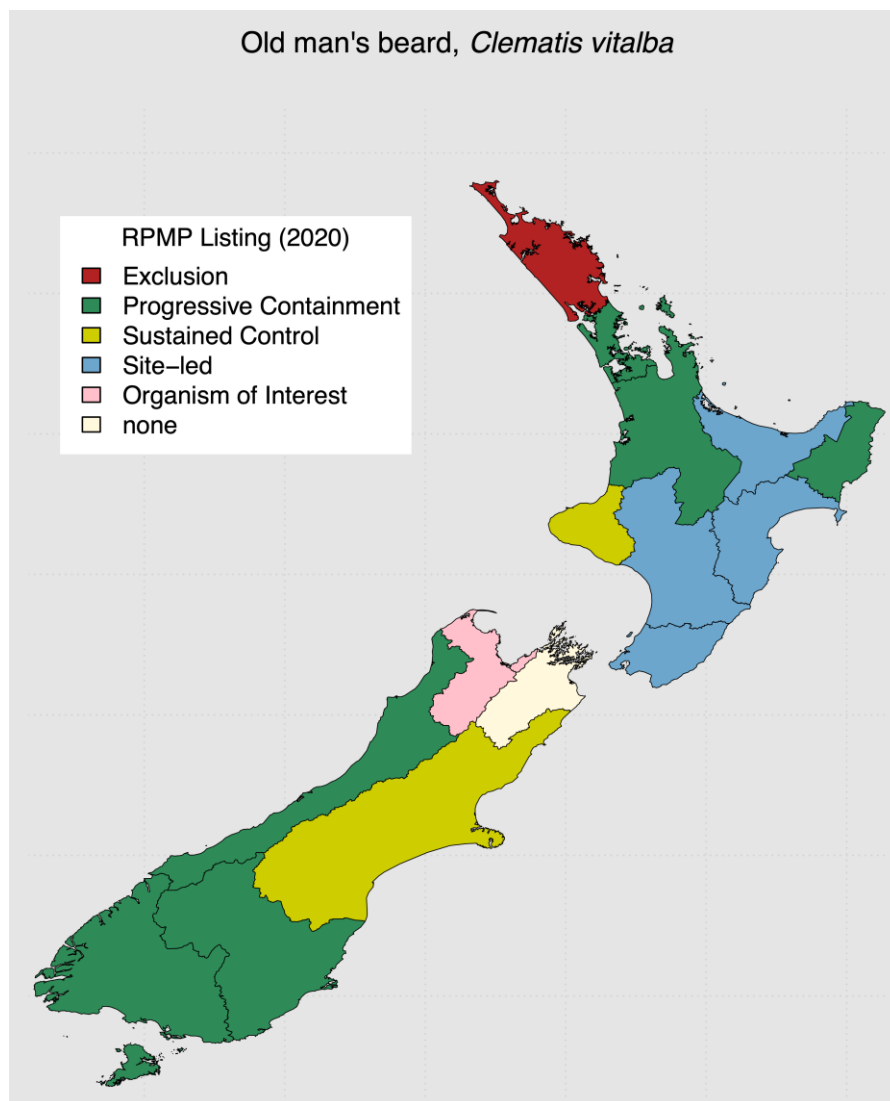


Figure 13: Types of RPMP programme for old man's beard (*Clematis vitalba*).

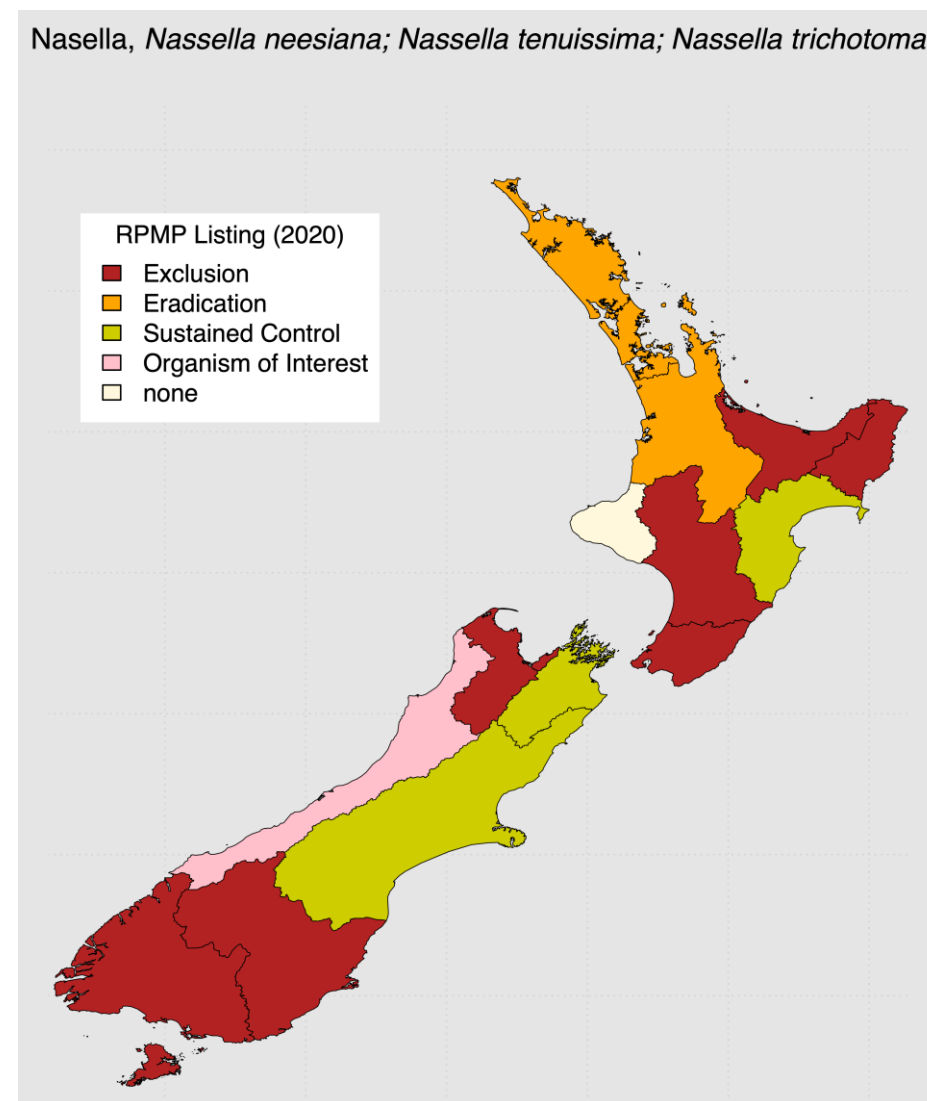


Figure 14: Types of RPMP programme for nassella/ Chilean needlegrass (*Nassella neesiana*, *N. tenuissima*, *N. trichotoma*).

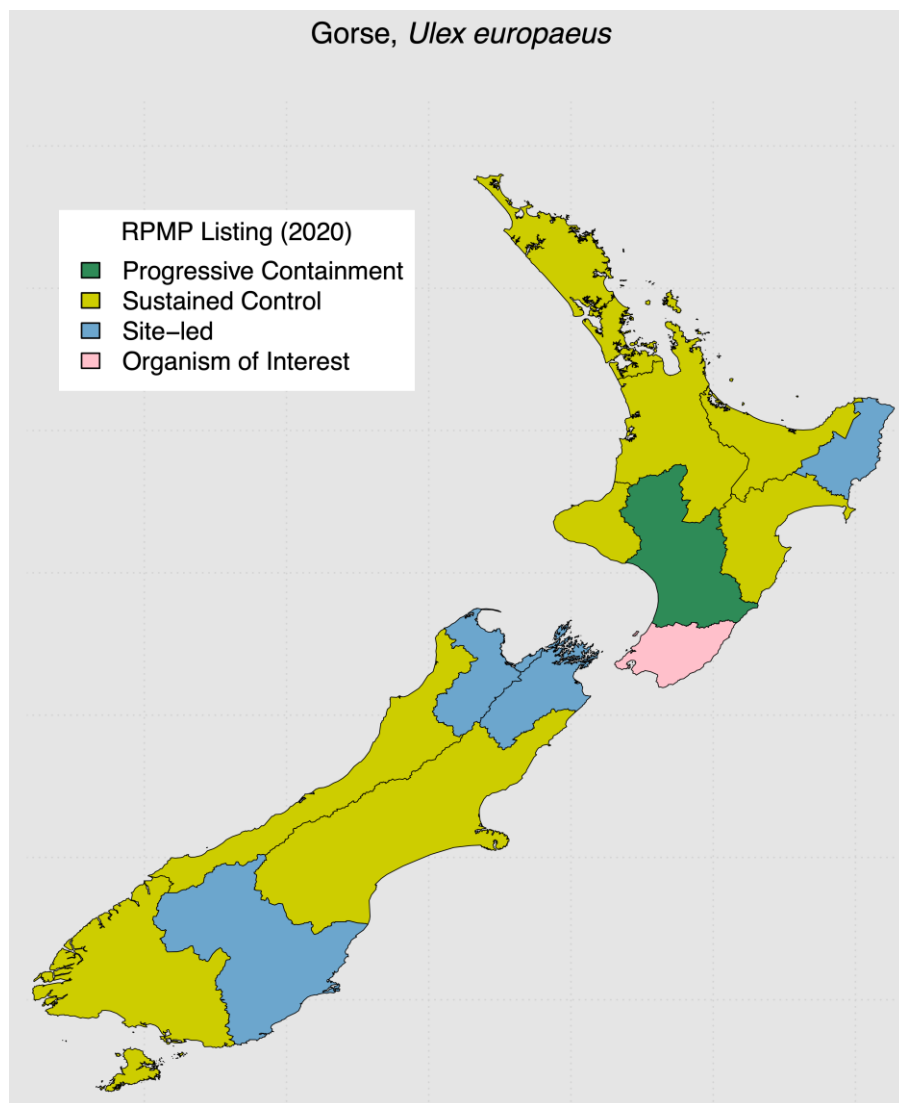


Figure 15: Types of RPMP programme for gorse (*Ulex europaeus*).

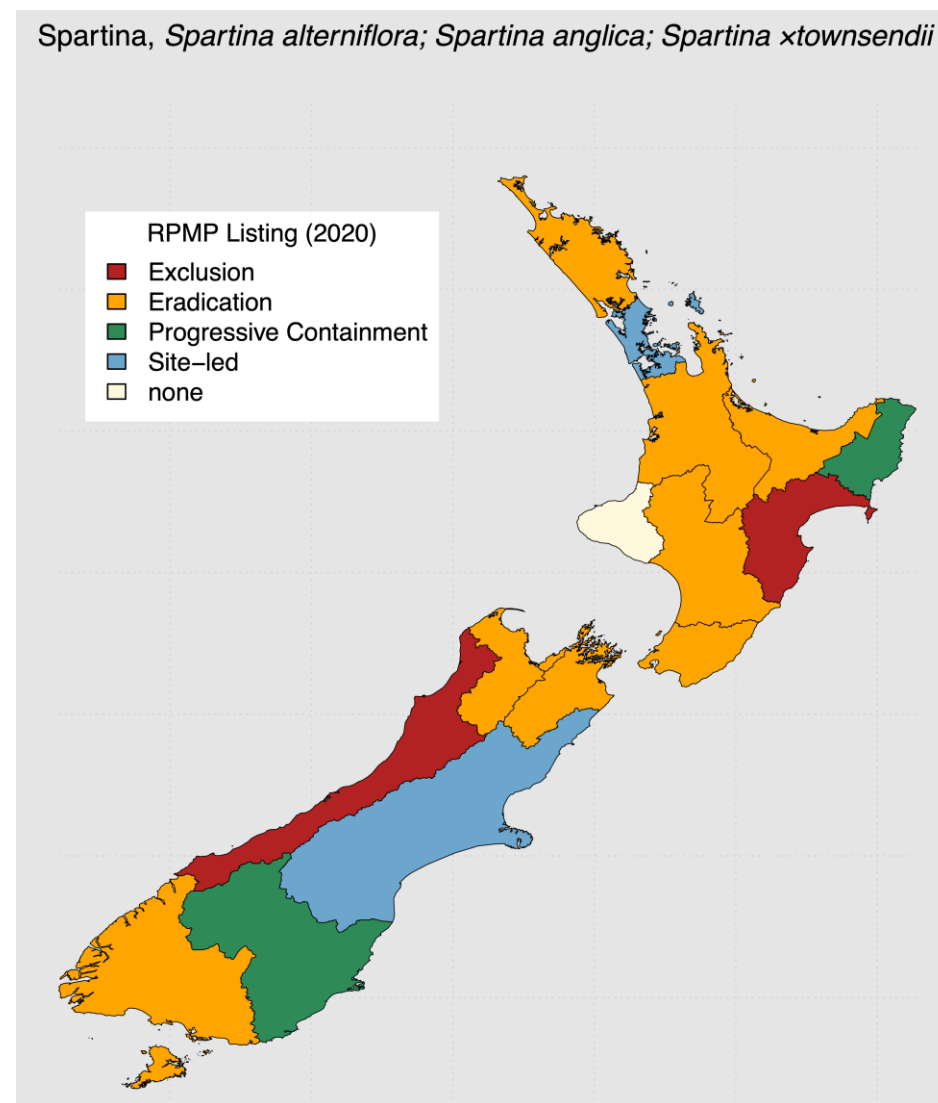


Figure 16: Types of RPMP programme for spartina (*Spartina alterniflora*, *S. anglica*, *S. x townsendii*).

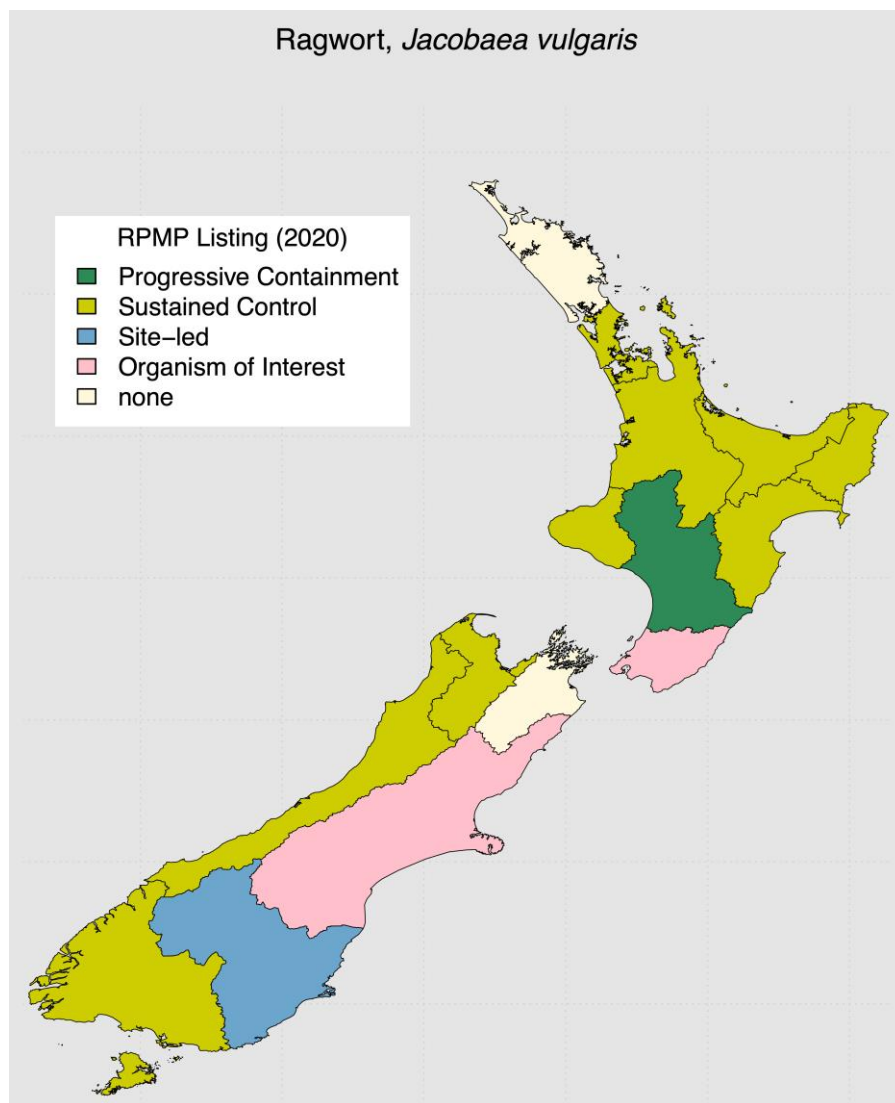


Figure 17: Types of RPMP programme for ragwort (*Jacobaea vulgaris*).

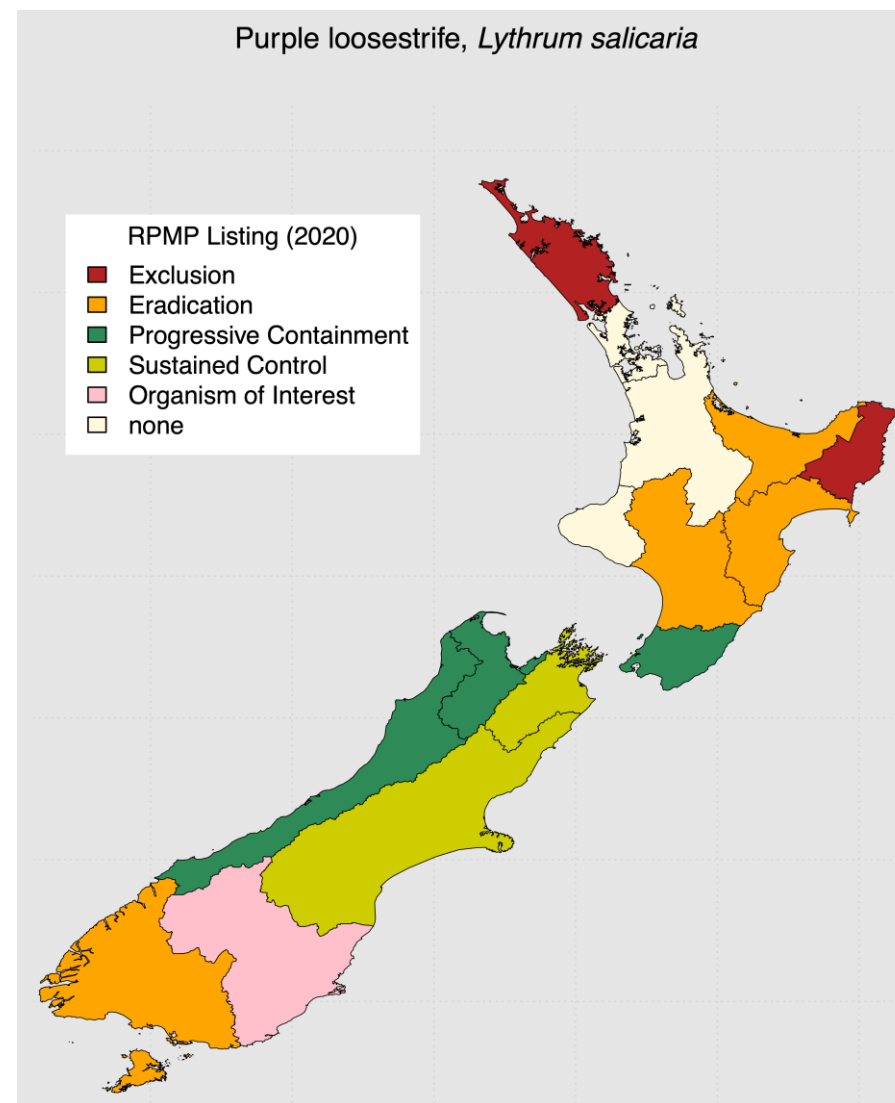


Figure 18: Types of RPMP programme for purple loosestrife (*Lythrum salicaria*).

Generalised linear models were used to better understand why some weeds are frequently listed in RPMPs while others are rarely listed. The best supported model included two-way interactions of the explanatory variables (Table 18), with an R^2 of 0.53 (meaning that the model explained about 53% of the variation in the number of RPMPs each weed was listed in). The number of regions that listed a weed was significantly affected by when the weed was first discovered in New Zealand (the longer a weed has been wild in New Zealand, the more RPMPs it is likely to be listed in).

Table 18: Analysis of Deviance Table for a Generalised Linear Model explaining why some weed taxa are listed in more RPMPs than others. There are statistically significant direct effects of year of discovery and whether or not a weed is a production pest, and significant interaction effects of production pest:year of discovery, biodiversity pest:lifeform, and production pest:lifeform. Effects with statistically significant P-values ($P < 0.05$) are in bold. See the text for a more detailed explanation.

	Df	Deviance	Resid. Df	Resid. Dev	Pr(<Chi)
(Intercept)			225	543.25	
Year of Discovery	1	11.77	224	531.47	0.0006
Biodiversity pest	1	0.23	223	531.24	0.6312
Production pest	1	71.81	222	459.43	0.0000
I(Year of Discovery²)	1	16.76	221	442.67	0.0000
lifeform	3	4.30	218	438.37	0.2310
Year of Discovery:Biodiversity pest	1	0.00	217	438.37	0.9575
Year of Discovery:Production pest	1	0.83	216	437.55	0.3636
Biodiversity pest:I(Year of Discovery ²)	1	0.66	215	436.89	0.4175
Production pest:I(Year of Discovery²)	1	3.39	214	433.50	0.0657
Biodiversity pest:lifeform	2	15.42	212	418.08	0.0004

Whether or not a weed had production impacts had a statistically significant effect on how many RPMPs it was listed in, but the direction of this effect depended significantly on the weed's year of discovery (Table 18). Production weeds that have been in New Zealand for a century were much more widely listed in RPMPs than non-production (biodiversity) weeds, while this difference was much less for more recently established weeds (Figure 19). For example, the model predicts that a weed with production impacts that was first discovered in 1920 would be listed in 1.7 times more current RPMPs than an equivalent non-production weed. In comparison, for weeds first establishing in 1990, the reverse applies, with non-production weeds listed in 1.1 times more RPMPs than equivalent production weeds. This suggests that long-established and widespread production weeds (like gorse and Scotch broom) continue to be listed in many RPMPs, while long-established and widespread biodiversity weeds (like sycamore and elderberry) largely get managed in other ways. Northern regions are more likely to list both recently established weeds and biodiversity weeds, which likely explains the different behaviour of recent weeds with regards to their production impacts.

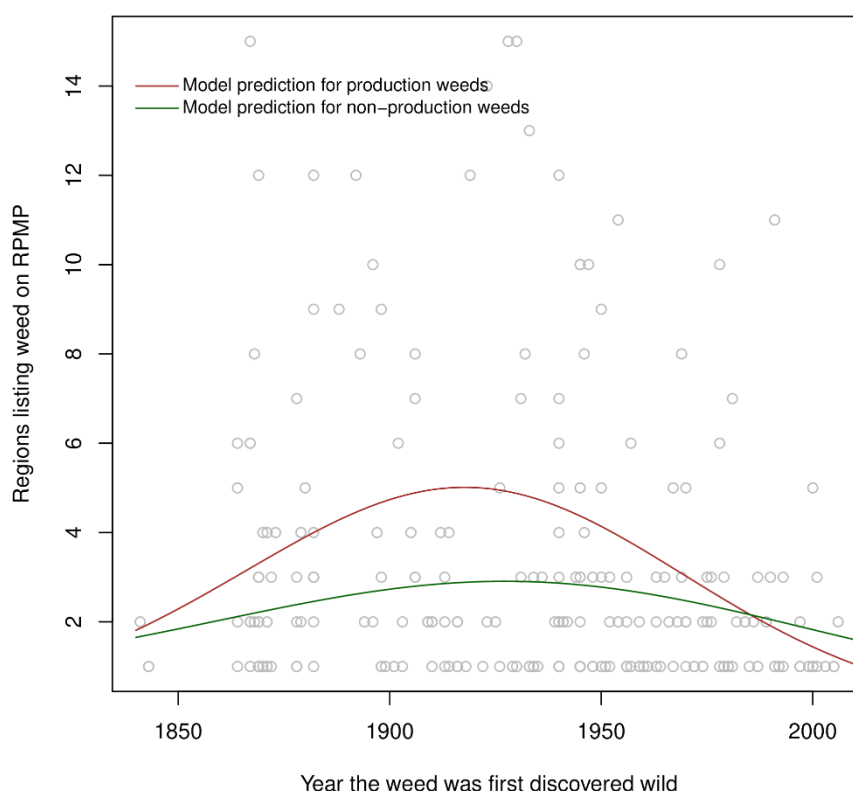


Figure 19: The relationship between the year a weed was first discovered wild in New Zealand and how many RPMPs it is listed in. The grey circles are all weed taxa listed in current RPMPs. The lines are the fitted results from a generalised linear model, for weeds that have production impact and those that don't have production impact. The difference in the curves is a statistically significant relationship (see Table 18). The fitted lines average the predictions from all values of the other explanatory variables (for example, all four categories of weed lifeform).

There were also statistically significant interactions of biodiversity and production pest status with lifeform (Table 19). Weeds that were only production pests were more likely to be widely listed in RPMPs if they were short-lived herbs (e.g. ragwort). Weeds that were only biodiversity pests were less likely to be widely listed if they were trees rather than herbaceous (e.g. *Tradescantia* versus sycamore). Tree weeds were most likely to be widely listed in RPMPs when they had both production and biodiversity impacts.

Table 19: The predicted average number of RPMPs a weed will be listed in, based on its life form and whether or not it has production and/or biodiversity impacts. These predictions are from a generalised linear model (see Table 18), based on statistically significant interactions between life form and production and biodiversity impacts.

Life form	Production-only weeds	Biodiversity-only weeds	Biodiversity + Production weeds
Short-lived herb	4.59	2.70	1.81
Long-lived herb	2.12	2.83	4.43
Short-lived woody	1.43	2.02	5.33
Trees	2.07	1.79	4.72

3.1.2 How do councils decide which weeds to manage through RPMPs

In our online survey, we asked council staff how important a number of factors were for deciding which weeds to include in their RPMPs. They were asked to rate each factor from not important (1) to very important (5). The results are summarised in Table 20. The factors most highly ranked were “Weeds early in their spread that can be affordably eradicated now”, “Weeds early in their spread with high impacts that can be slowed”, and “Excluding weeds that are absent from your region but are a problem in other regions”. Reducing impacts of established weeds (on biodiversity, production and human health), while still important, was ranked of lower importance. Given the ongoing strong bias in current RPMPs towards listing well-established weeds, these aspirations of biosecurity staff are likely being tempered by other factors such as council politics.

Table 20: Responses from council staff on the importance of a list of factors for deciding which weeds were added to each regions’ RPMP. There were five options for responses, from 1 (not important) to 5 (very important).

Factor	Average response	Range
Weeds early in their spread that can be affordably eradicated now	4.47	3–5
Weeds early in their spread with high impacts that can be slowed	4.47	4–5
Excluding weeds that are absent from your region but are a problem in other regions	4.24	2–5
Weeds that require regional leadership/co-ordination for effective management	4.18	3–5
Weed risk assessment process–identification of high risk/impact weeds	4.00	1–5
Weeds listed in the previous Regional Pest Management Strategy or Plan	3.94	1–5
Cost-benefit analysis results	3.71	2–5
Reducing impacts of established weeds on native biodiversity and the environment	3.65	2–5
Responding to ratepayers’ concerns about particular weeds	3.41	2–5
Reducing impacts of established weeds on primary production	3.29	1–5
Reducing impacts of established weeds on human health/well-being	2.76	1–5

3.1.3 RPMP weed budgets and effort

Table 21 gives a breakdown of each regions’ total RPMP budget and RPMP weed budget, and how this is allocated across the different types of weed management programmes. There is considerable variation both in the total investment in RPMP weed control and the relative allocation of this among programmes. For example, Auckland invests the bulk of its budget in Site-Led programmes, while Waikato invests most of its budget in Progressive Containment programmes. In contrast, more than a third of some regions’ RPMP budgets are allocated to Eradication programmes (Wellington, Nelson and Tasman). With the exception of Wellington region, relatively little is invested in Exclusion programmes for high-risk weeds not yet present in regions, but then regions may deal with new incursions through other mechanisms (see below).

Table 21: Total annual RPMP budget for each region (2020-2021 financial year), with a breakdown of spending on weeds, both in total and on different types of weed management programmes (i.e. Exclusion, Eradication, Progressive Containment, Sustained Control, and Site-led programmes). Note that comparable budget data were not available for two regions.

Region	Total RPMP budget per annum (\$million)	RPMP Weed budget per annum (\$million)	Percentage (%) of budget per RPMP Programme Type				
			Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led
Northland	\$8.87	\$1.66	0.1	29.5	24.5	37.5	8.5
Auckland	\$22.64	\$5.05	0	13.0	0	7.0	80.0
Waikato	\$9.59	\$2.62	1.0	6.0	85.0	4.0	4.0
Bay of Plenty	\$3.23	\$1.76	9.2	13.2	48.0	28.9	0
Gisborne	\$1.33	\$0.54	2.0	5.0	21.0	8.0	4.0
Hawkes Bay	\$3.65	\$0.88	2.0	18.0	73.0	7.0	0
Taranaki	\$2.0	\$1.0	0	15.0	0	80.0	5.0
Manawatu-Wanganui	\$4.18	\$1.86	2.0	18.0	73.0	7.0	0
Wellington	\$4.00	\$2.16	27.0	37.0	17.0	0	19.0
Tasman	\$0.64	\$0.32	10.0	36.0	24.0	23.0	8.0
Nelson	\$0.15	\$0.08	10.0	36.0	24.0	23.0	8.0
Marlborough	\$1.66	\$1.45	0	5.3	11.3	83.3	0
Canterbury	\$6.55	\$5.79	1.5	2.9	4.2	83.4	8.0
West Coast ¹			Data not available				
Otago	\$1.90	\$0.68	0.3	0.2	67.0	23.0	9.5
Southland	\$1.30	\$0.57	0	14.5	72.0	6.4	7.1
Chatham Islands ²			Data not available				

¹ The total expenditure for the West Coast Biosecurity Programme in the 2019-2020 financial year was \$133,370 – this includes management of pests outside the RPMP, therefore the RPMP budget would have been less than this figure.

² The total expenditure on Chatham Islands RPMP weed management programmes in the 2019-2020 financial year was \$263,000.

RPMP weed budget had a significant effect on the number of RPMP weed taxa listed by councils ($F = 5.2$, $df = 1,12$, $P = 0.04$, Figure 20), suggesting that councils with larger RPMP weed budgets manage significantly more weed taxa, however this result was influenced strongly by the large budget and number of weed taxa for Auckland region – when Auckland was removed from the analysis there was no relationship between RPMP weed budget and the number of weed taxa listed in each RPMP (without Auckland: $F = 0.005$, $df = 1,11$, $P = 0.95$). For example, Canterbury and Auckland both have RPMP weed budgets over \$5 million (Table 21), but Auckland lists 211 weed taxa while Canterbury lists just 40 (Table 6). Similarly, Northland and Bay of Plenty both have weed budgets between \$1.6–1.8 million, while Northland lists 87 weed taxa and Bay of Plenty lists 40. Southland and Gisborne both budget around \$550,000 for weeds but Gisborne lists 69 weed taxa and Southland only 31. The average budget per RPMP weed taxon ranges from \$7,376 per weed in Gisborne to \$134,725 per weed in Canterbury. We did not have access to the individual RPMP programme budgets to explore this further. However, clearly there is a wide range of regional decisions being made on how much to spend on how many weeds.

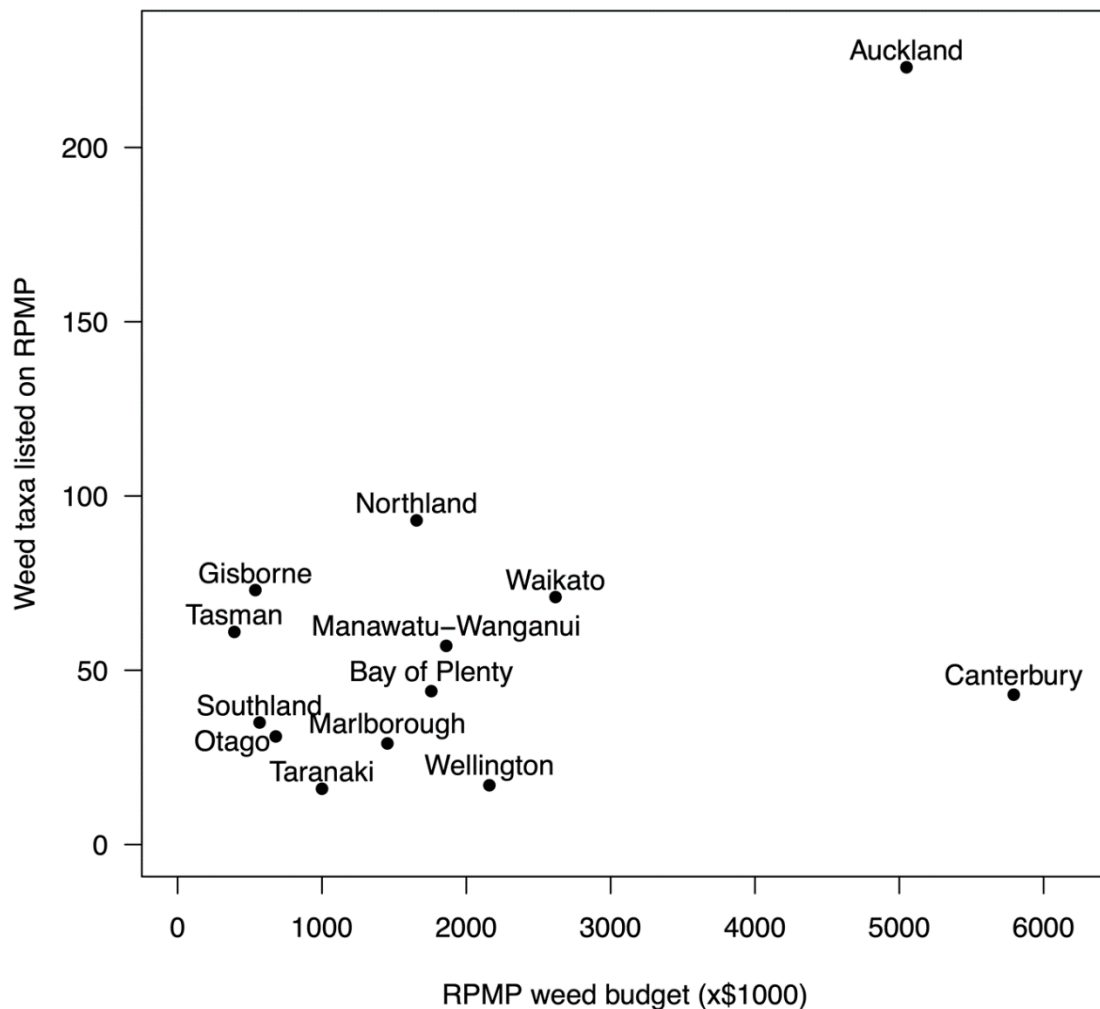


Figure 20: The RPMP weed budgets of each region plotted against the number of weed taxa listed per RPMP. There is no statistically significant relationship between the two axes. Weed budgets were not available for the Chatham Islands, Hawkes Bay, and the West Coast. 'Tasman' includes the combined RPMP weed budgets for Tasman and Nelson.

There was considerable variation among regions in the estimated percentage of their total RPMP weed budget allocated to weeds that only impact on biodiversity (Figure 21). The northern regions in general focus considerably more of their budgets on biodiversity-only weeds than other regions; for example, Auckland allocates approximately 80% of its RPMP weed budget to biodiversity-only weeds, whereas Canterbury and Otago allocate <20% of their budgets to these weeds.

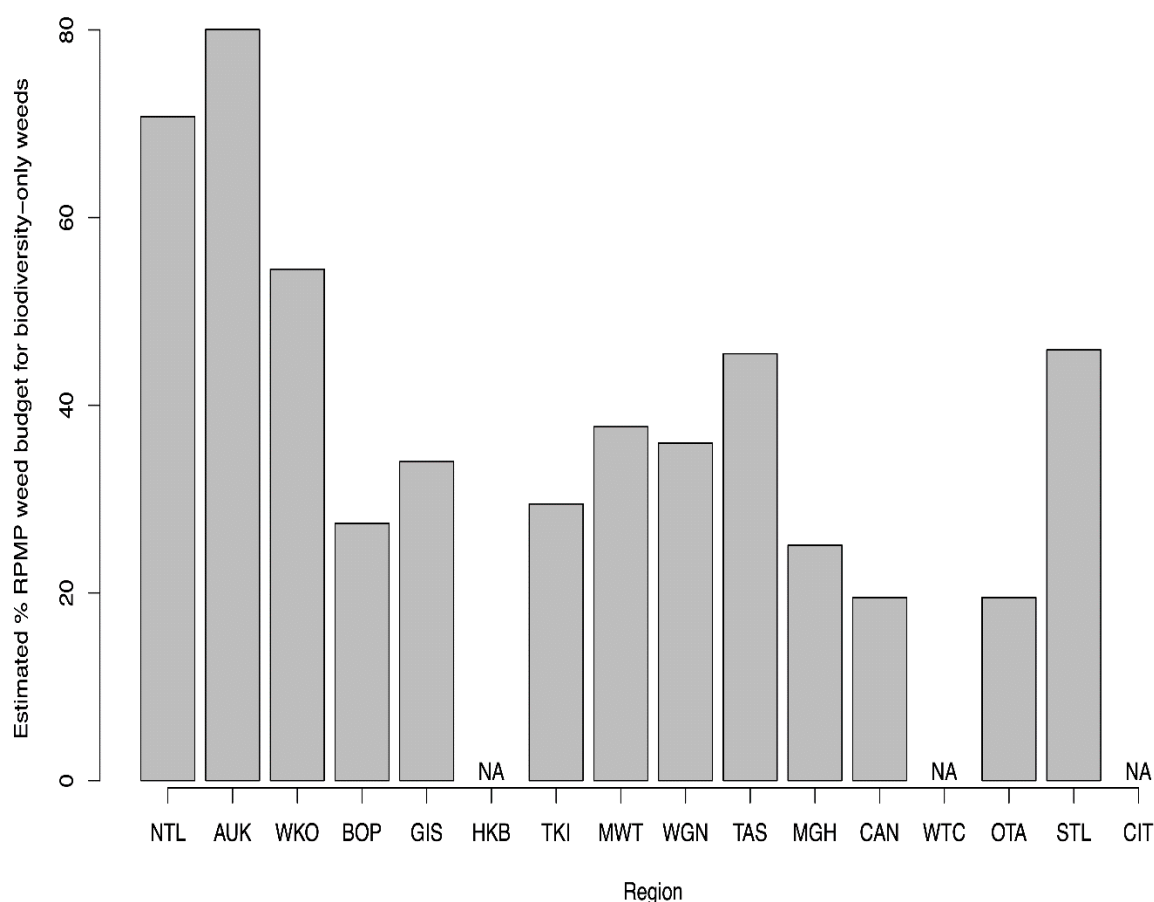


Figure 21: Estimated percentage of RPMP weed budgets allocated to weeds that have impacts on biodiversity only (i.e. not on production). Data were unavailable for some regions. NTL = Northland, AUK = Auckland, WKO = Waikato, BOP = Bay of Plenty, GIS = Gisborne, HKB = Hawkes Bay, TKI = Taranaki, MWT = Manawatu-Wanganui, WGN = Wellington, TAS = Tasman-Nelson, MGH = Marlborough, CAN = Canterbury, WTC = West Coast, OTA = Otago, STL = Southland, CIT = Chatham Islands.

3.2 Weeds managed outside RPMPs

Weeds managed through RPMP programmes are not the only weeds managed by regional councils. Some weed species are managed by councils through programmes associated with, for example, parks, biodiversity, and community support programmes. In our online questionnaire, we asked councils about weed management that occurs outside of the RPMP process (see Tables 22–23). The responses are perhaps best summarised by Environment Canterbury, which replied that the number of weeds they manage outside of their RPMP is “too numerous to answer” and that “Biodiversity officers and land occupiers may manage any weed thought to be impacting on a site with high native biodiversity values”. Greater Wellington Regional Council similarly responded that they manage a number of weeds in their Key Native Ecosystem (KNE) programmes, but a good indication of the weeds that they target are those listed as Harmful Organisms on their RPMP (the equivalent of Organisms of Interest in other regions’ RPMPs). Nelson City emphasised that the weeds they manage outside of their RPMP are “generally environmentally invasive weeds”.

Only a subset of weeds managed by councils are deemed of high enough and consistent enough regional impact to warrant management through an RPMP listing. Northland Regional Council, Marlborough Regional Council, and Horizons Regional Council also noted that they invest in weed biocontrol outside of their RPMPs – this also applies to other regions. All the council's responses are detailed in Table 23.

Auckland Council noted that some of the weeds targeted for control at specific sites are either too “ruderal and generally low impact outside of threatened plant sites” or socially of too high value to manage regionally through the RPMP.

Table 22: Council responses to questions about management of weeds outside the RPMP (online questionnaire): “Does your council manage any weed species outside the RPMP through other council programmes (e.g. biodiversity programmes)?”, “What percentage (%) of the weed management undertaken by council staff and contractors in your region is done outside of RPMP programmes?”, and “Approximately how much does your council spend per annum (\$ excluding GST) on non- RPMP weed management (by council staff and contractors) in your region?”

Region	Does your council manage any weed species outside the RPMP through other council programmes?	What percentage of weed management in your region is done outside of RPMP programmes?	How much does your council spend per annum (excl. GST) on non-RPMP weed management in your region?
Northland	Yes	10%	\$325,000
Auckland	Yes	-	\$80,000
Waikato	Yes	-	-
Bay of Plenty	Yes	50%	\$1,605,000
Gisborne	No	0	-
Hawkes Bay	Yes	10%	\$15,000
Taranaki	Yes	10%	\$10,000
Manawatu-Wanganui	Yes	30%	\$570,000
Wellington	Yes	30%	\$600,000
Tasman	Yes	10%	\$10,000
Nelson	Yes	80%	\$500,000
Marlborough	Yes	-	\$35,000
Canterbury	Yes	10%	-
West Coast	Yes	10%	\$10,000
Otago	No	0	-
Southland	Yes	-	\$750,000
Chatham Islands	Yes	60%	\$200,000

Table 23: Responses from councils about management of weeds outside their RPMPs. Gisborne and Otago councils did not answer this question.

Region	Response
Northland	Northland Regional Council's RPMP includes an Appendix describing their non-regulatory pest control methods. This work is driven by community partnerships rather than being restricted to a designated list of pest species. They also fund/invest in biocontrol research and development for a range of pest species.
Auckland	A variety of weeds are managed by the council outside of the RPMP. Species vary depending on the site. These species were not considered as suitable for regional regulation, either because they're ruderal and generally low impact outside of threatened plant sites, or because they're of high value as a resource such as ornamentals or forage species and therefore socially difficult to manage regionally.

Region	Response
Waikato	Waikato Regional Council supports some community groups to undertake site management e.g., Daly pine control at Raglan. Most of these control efforts are focused on the species listed in the RPMP but classed as advisory pests.
Bay of Plenty	Wattles are controlled at Lake Tarawera, and various weeds throughout the council's biodiversity programme. Coast care site management, for example of coastal dunes and lowland wetlands, are reliant on ongoing pest plant control to prevent degradation. Similarly estuary care site management can require, for example, mangrove removal. Rivers and drainage maintenance of flood protection assets requires site-specific weed control. Wilding pine control is done on Rangataiki frost flats. Council support for community groups can involve support with weed control.
Hawkes Bay	A variety of weeds are managed by the council outside of the RPMP, including boneseed, purple ragwort, pampas, climbing spindleberry, African love grass, African fountain grass, marram grass, cotoneaster species, willow species, and blue passion flower.
Taranaki	Boneseed is managed outside the RPMP. Which other weeds are targeted depends on the site through site-led biodiversity programmes.
Manawatu-Wanganui	A variety of weeds are managed by the council outside of the RPMP, including velvetleaf, <i>Acacia longifolia</i> , yucca, <i>Cotoneaster</i> species, English ivy, Chilean flame creeper, sycamore, cherry laurel, willows, ornamental cherry, Japanese honeysuckle, holly, elder, Himalayan honeysuckle, karaka, jasmine, monkey puzzle and other exotic conifers, periwinkle, tradescantia, aluminium plant, climbing asparagus, Jerusalem cherry, and wild hops. Horizons also invests in biocontrol of Japanese honeysuckle and tradescantia outside the RPMP.
Wellington	Weeds managed in KNE programmes, mostly the same as listed in their RPMP as additional Harmful Organisms. Some weeds are also managed under MPI programmes, such as Cape tulip.
Tasman	Some marine invasives and weeds such as <i>Juncus gerardii</i> and jelly bean ice plant.
Nelson	The weeds controlled outside of the RPMP are generally environmentally invasive weeds, especially old man's beard, banana passionfruit, privet, bay laurel, cotoneaster, Spanish heath and gorse in ultramafic areas, wilding conifers, sycamore, yew, climbing asparagus, barberry species, pampas, water celery, Jellybean ice plant, and parrot's feather.
Marlborough	For the last three years, wilding conifers have been in effect managed outside the RPMP. Even though operational works (such as the National Wildings Programme) and involvement has been resource heavy. Additionally, many widespread weeds are managed on a site-led basis, but regulatory support via a Site-led programme in the RPMP has not been warranted or needed, so this control continues to be site-led management under voluntary Council-landholder initiatives to protect Significant Natural Areas. Council investment into biological control research and monitoring is also outside of the RPMP. Biological control is often the 'tool of choice' when dealing with widespread weed species.
Canterbury	Numerous weeds are managed outside of the RPMP. Biodiversity officers and land occupiers may manage any weed thought to be impacting on a site with high native biodiversity values.
West Coast	Parrot's feather is controlled outside of the RPMP.
Southland	These are listed in the RPMP as Organisms of Interest.
Chatham Islands	Gorse. The current Chathams RPMP has expired but a new suite of pests is proposed for the new RPMP.

3.2.1 Organisms of Interest

Most regions list Organisms of Interest in their RPMPs; only five regions do not include Organisms of Interest in their RPMPs (Auckland, Gisborne, Taranaki, Manawatu-Wanganui, and Marlborough). Southland does not have a list of Organisms of Interest in their RPMP document but instead has a list of Organisms of Interest on their website (this seems sensible as it can be easily added to and updated). In total, there are 293 weed species listed as Organisms of Interest across all the RPMPs; these were grouped into 247 weed taxa to enable comparison with the taxa managed under RPMP programmes (see Table 24). Of these taxa, 193 are weeds with RPMP programmes in one or more other regions, while 54 taxa are only included as Organisms of Interest across all regions.

Weeds listed as Organisms of Interest range from trees to wetland and aquatic weeds. We had expected that, compared with the main RPMP weeds, most of the weeds currently only listed as Organisms of Interest would be still in their early stages of spreading nationally, and be disproportionately biodiversity pests. Surprisingly, the opposite was true. Weeds listed only as Organisms of Interest on average have been wild in New Zealand for longer, and occur in more regions, than weeds with RPMP programmes (see Table 25). Weeds listed only as Organisms of Interest are also less likely than RPMP-only weeds to have only biodiversity impacts (Table 25). Weeds listed only as Organisms of Interest are also less likely than RPMP-only weeds to be woody weeds (Table 25).

Table 24: Number of weed taxa listed as 'Organisms of Interest' in each region. Organisms of Interest (also called 'Non-RPMP pests', 'Harmful Organisms', 'Advisory Plants' or 'National Pest Plant Accord species') are not subject to formal RPMP programmes or rules under the RPMP.

Region	Number of Taxa Listed as Organisms of Interest ¹
Northland	6
Auckland	-
Waikato	67
Bay of Plenty ²	59
Gisborne	-
Hawkes Bay	18
Taranaki	-
Manawatu-Wanganui	-
Wellington	83
Tasman-Nelson	32
Marlborough	-
Canterbury	57
West Coast	95
Otago	27
Southland	46
Chatham Islands	14
TOTAL	247

¹ Some clusters of related weed species (e.g. banana passionfruit, cotoneaster) were aggregated into one weed taxon for the analyses, therefore the number of species listed as Organisms of Interest is higher for some regions.

² The Bay of Plenty RPMP is currently subject to an Environment Court appeal by Forest and Bird. Our analysis was carried out with data for the proposed RPMP prior to this appeal.

Table 25: Weed taxa listed as Organisms of Interest, or equivalent, in current RPMPs, compared with weed taxa managed through RPMP programmes. Note that the Year of discovery in NZ omits a few taxa for which this date was unavailable, while the % discovered after 1980 column makes the assumption that any weeds without an available year of discovery likely first showed up wild in NZ after 1980. In both cases, “Organisms of Interest”-only weeds are typically those found wild in NZ earlier than RPMP-only weeds. The “# regions present” column uses the 10 geographic regions of Gatehouse (2008). For all variables, there is a statistically significant effect of weed category ($P < 0.001$).

Weed category	#	Year of discovery (mean(sd))	# regions present (mean(sd))	% discovered after 1980	% only biodiversity impacts	% woody
Organisms of Interest	54	1913.2(43.3)	6.5(3)	22.2	60.0	27.9
RPMP weeds only	74	1946.0(43.7)	3.1(2.6)	44.6	77.0	45.6
Both	314	1923.9(32.3)	4.8(2.4)	11.5	42.3	67.4

3.3 Monitoring and data management

In the online questionnaire, councils were asked about what types of methods they use to monitor the extent of weeds in their regions. The methods for monitoring regional weed extent that were used by the most regions were reports by members of the public and targeted field surveys of individual weed species, while the least used method was aerial imagery (Table 26).

Table 26: Responses from 17 regional councils on which methods they use to monitor the extent (distribution and abundance) of weeds in their regions.

Monitoring Method	Used by Councils
Field data – targeted surveys of individual weed species	17
Reports by members of the public	17
Field data – weeds observed during surveys for other purposes (e.g. biodiversity programmes, SNA surveys)	16
Field data – weeds surveys at specific sites (e.g. high biodiversity-value sites)	15
Field data – general weed surveillance (to detect new weed species or infestations in the region)	14
Field data – monitoring the outcomes of weed control operations	14
iNaturalist NZ distribution data	10
Aerial imagery*	8

* Aerial imagery, especially hyperspectral imagery, combined with machine learning, is beginning to make remote sensing of weed distributions feasible for some weeds (e.g., Sheffield and Dugdale 2020).

Councils were also asked about the types of weed occurrence data they record in the field (Table 27), and the methods they use to record and store these data (Tables 28-29). All councils collect some form of weed distribution data, and almost all collect some data on weed abundance and control, while most do not collect weed phenology data (e.g., when weeds are seeding). A combination of digital devices (Tablets/iPads/mobile phones) and GPS units were used by most councils to record weed occurrences. Most councils store weed occurrence data in council databases, but none of the councils said that they store weed data in a GIS system.

Table 27: Council responses to the question, "What types of weed data do council staff record in the field?". Councils were asked to select as many of the listed options as applied.

Region	Distribution data	Abundance data	Weed control	Phenology
Northland	Yes	Yes	Yes	Yes
Auckland	Yes	Yes	Yes	Yes
Waikato	Yes	Yes	Yes	No
Bay of Plenty	Yes	Yes	Yes	Yes
Gisborne	Yes	Yes	Yes	Yes
Hawkes Bay	Yes	Yes	Yes	No
Taranaki	Yes	Yes	Yes	No
Manawatu-Wanganui	Yes	Yes	No	Yes
Wellington	Yes	Yes	Yes	Yes
Tasman	Yes	Yes	No	No
Nelson	Yes	Yes	Yes	Yes
Marlborough	Yes	No	No	No
Canterbury	Yes	Yes	No	No
West Coast	Yes	No	Yes	No
Otago	Yes	Yes	No	No
Southland	Yes	Yes	Yes	No
Chatham Islands	Yes	Yes	Yes	No

Table 28: Council responses to the question, "How do council staff record weed occurrences in the field?". Councils were asked to select as many of the listed options as applied.

Region	Hand-written data sheets	Tablet/iPad/mobile phone	GPS unit
Northland	Yes	Yes	Yes
Auckland	No	Yes	Yes
Waikato	Yes	Yes	Yes
Bay of Plenty	Yes	Yes	Yes
Gisborne	Yes	No	Yes
Hawkes Bay	Yes	No	Yes
Taranaki	No	Yes	No
Manawatu-Wanganui	No	Yes	Yes
Wellington	Yes	Yes	Yes
Tasman-Nelson	No	Yes	Yes
Marlborough	Yes	Yes	No
Canterbury	No	Yes	Yes
West Coast	No	Yes	No
Otago	No	No	Yes
Southland	No	Yes	Yes
Chatham Islands	No	Yes	No

Table 29: Council responses to the question, “How does your council store weed occurrence data?”. Councils were asked to select as many of the listed options as applied.

Region	Hard copy	Spreadsheets	Databases	GIS
Northland	No	Yes	Yes	Yes
Auckland	No	Yes	Yes	Yes
Waikato	No	Yes	Yes	Yes
Bay of Plenty	Yes	Yes	Yes	Yes
Gisborne	Yes	Yes	No	Yes
Hawkes Bay	No	No	Yes	Yes
Taranaki	Yes	Yes	Yes	Yes
Manawatu-Wanganui	No	No	Yes	Yes
Wellington	No	No	Yes	Yes
Tasman-Nelson	Yes	No	Yes	Yes
Marlborough	Yes	No	Yes	Yes
Canterbury	No	No	Yes	Yes
West Coast	No	Yes	Yes	Yes
Otago	Yes	Yes	No	Yes
Southland	No	No	Yes	Yes
Chatham Islands	No	No	Yes	No

Councils were also asked about monitoring of non-RPMP weeds – their responses are shown in Table 30. Again, regions varied considerably in their responses. The response of Tasman-Nelson suggests that general weed surveillance has received less investment since the National Policy Direction for Pest Management 2015.

Table 30: Council responses to the question, “Does your council monitor non-RPMP weeds (i.e. weeds managed outside the RPMP)?”

Region	Monitoring of non-RPMP weeds	Where and when to monitor
Northland	No	
Auckland	Yes	If being managed as part of site-led programmes e.g. threatened plant protection. Also we have a network of forest monitoring plots across the region, which monitor all exotic species in those plots regardless of RPMP status.
Waikato	No	
Bay of Plenty	Yes	New to Region Pest Plant Surveillance programme identifies and ranks high risk weeds and sites. Ornamental pond surveys may also find new weed spp. Managing weeds for other purposes rather than biosecurity-led approach e.g. benefits to biodiversity or lake water quality. Site-led approach.
Gisborne	No	
Hawkes Bay	Yes	Pests we actively manage outside of the RPMP.
Taranaki	Yes	System allows recording of non RPMP species. we do YBG [Yellow bristle grass] as Feds asked us to do this is under our Strategy programme
Manawatu-Wanganui	Yes	We do have an Investigation programme for a small number of plants existing within the region which have been identified as potentially needing management. This list is formed from staff expertise, what is known of elsewhere, science advice, and from the RPMP species nomination process. Species are assessed against abundance, distribution, control options and suitability to management under a RPMP. Once investigated the plants are not subsequently monitored.

Region	Monitoring of non-RPMP weeds	Where and when to monitor
Wellington	Yes	We monitor progress of weed control in the KNE programme - at least annual surveys.
Tasman-Nelson	Yes	The ones perceived as the highest risk although this is limited now because general surveillance is not a valid programme in the National Policy Direction for Pest Management 2015 so not something we can put time to.
Marlborough	Yes	Areas with high biodiversity values threatened by weeds are identified in Ecological Restoration Plans (sites and specific weed threat is identified and monitored/reported on).
Canterbury	No	
West Coast	No	Generally don't undertake population trend monitoring for 'weeds', we do this work for 'declared pests' as prescribed by the Biosecurity Act. We do however undertake surveillance and record incidence of weeds being considered as potential future pests.
Otago	No	
Southland	No	
Chatham Islands	Yes	Monitor OOI's as per RPMP pest plants. Would also monitor a non RPMP pest plant/OOI if it was though it could present a risk to values in the region.

3.4 Collaboration with other organisations and neighbouring councils

In our survey of regional councils, there was clear evidence of widespread cooperation and data sharing among regions and other agencies in relation to weed management (Tables 31-32). Only Northland Regional Council and Gisborne District Council said “No” to the question “Does your council share weed occurrence data with other councils and agencies?”. Councils identified technological barriers, privacy concerns, and staff time as barriers to sharing information.

Table 31: Responses from 17 regional councils on which external organisations and groups they collaborate with on regional weed management.

Organisation	Number of councils who collaborate with them
Central government – Ministry for Primary Industries (MPI)	17
Department of Conservation (DOC)	17
Neighbouring regional councils/unitary authorities	17
Community groups	14
Iwi / Māori	12
QEII National Trust	12
Territorial authorities (city and district councils)	12
Land Information New Zealand (LINZ)	11
Non-governmental organisations (NGOs)	10
Federated Farmers	8
Central government – Ministry for the Environment (MfE)	4

Table 32: Council responses to the question, “Does your council share weed occurrence data with other councils and agencies?”

Region	Share data?	Data recipients
Northland	No	Only limited data sharing on request or for specific programmes.
Auckland	Yes	Ad hoc with other councils and DOC. MPI as part of service delivery by us for MPI-led eradications.
Waikato	Yes	We share information relating to collaborative cross boundary programmes e.g., wilding pines in central north island, velvetleaf esp. with Auckland. Probably not consistent across our entire programme.
Bay of Plenty	Yes	Neighbouring regional councils. Also other agencies where relevant e.g. district and city councils, DOC, LINZ, KiwiRail, Kiwifruit Vine Health, Te Arawa Lakes Trust, weed scientists. Consideration is given to privacy when sharing data.
Gisborne	No	-
Hawkes Bay	Yes	Share wilding conifer data.
Taranaki	Yes	Neighbouring councils and wider through BSWG.
Manawatu-Wanganui	Yes	Weed location and occurrence data is shared via GIS systems electronically with stakeholder agencies like District and city councils. We also input into and share/direct input information with the National Wilding Conifer Control Programme and LINZ Biosecurity programme.
Wellington	Yes	Crown Research Institutes, DOC, TLA's, KiwiRail, National Herbaria.
Tasman-Nelson	Yes	We have a joint RPMP with Nelson City Council. They have links to our database.
Marlborough	Yes	Tasman District Council (the management agency for the joint Tasman-Nelson Regional Pest Management Plan) has established a GIS database that is shared between both Councils for RPMP weeds.
Canterbury	Yes	All distribution datasets (polygon) are available for download as open data. Also accessible via the Council website. On occasions, there have been static manual exports and provision of data-sets to the likes of AgResearch who were doing modelling work.
West Coast	Yes	Regional and Unitary Councils, DOC, LINZ, CRI's etc.
Otago	Yes	DOC, Roading contractors.
Southland	Yes	DOC, Dunedin City Council, Clutha DC, Central Otago CD, Queenstown Lakes DC, Waitaki DC, ECan, Environment Southland, LINZ, Kiwi Rail, MPI.
Chatham Islands	Yes	Data has been shared through Biodata Services Stack project. Data also shared when requested by other Councils and agencies (e.g. DOC).

3.5 Barriers to effective regional weed management

In our survey of regional councils, we asked staff how important a series of factors were as barriers for the effective management of weeds in their regions. As before, they were asked to rate each factor from not important (1) to very important (5). The results are summarised in Table 33. The most important barriers identified, both averaging higher than 4 or 5, were “Funding and staff time” and “Accurate and up-to-date information on weed distributions”. Four factors averaged less than 2.5, meaning that they were typically regarded as somewhat to not important barriers (Table 33). These were health and safety and three factors associated with between and within agency coordination. It is encouraging that regional councils do not see these as barriers to weed management, although this should not be interpreted as meaning that there is not room for improvement.

Table 33: Responses from regional council staff on the importance of various factors as barriers to effective weed management in their regions. There were five options for responses, from 1 (not important) to 5 (very important).

Factor	Average response	Range
Funding and staff time	4.47	2–5
Accurate and up-to-date information on weed distributions	4.06	2–5
Public knowledge of and support for weed management	3.53	2–5
Identification and management of pathways for weed invasion	3.53	2–5
Control methods and technology	3.41	1–5
Clear, well-promoted processes for on-farm biosecurity	2.82	1–4
Staff training/expertise	2.76	1–5
Collaboration/co-ordination with other councils and agencies	2.47	1–5
Effective information exchange among councils	2.29	1–3
Health and safety	2.24	1–4
Clear and prompt identification of which organisation and/or staff members are responsible for managing particular weeds in the region	2.12	1–5

4. DISCUSSION

Regional councils and unitary authorities are the front lines of weed management in New Zealand. Combined, they manage more weed species than any other public agency, and a quarter of the weeds they manage through their RPMPs are not currently listed as MPI Unwanted Organisms, DOC conservation weeds, or on the National Pest Plant Accord. The scale and effectiveness of the weed management undertaken by regional councils will therefore have a big impact on the future of New Zealand's primary production and indigenous biodiversity.

Managing weeds is fundamentally different from managing pest mammals, or managing border incursions of pest insects and pathogens. That is because many of the future's worst weeds are currently already here as garden plants, in cultivation and for sale (Esler 1988, 2004, Williams and Cameron 2006). Some of these are in their early stages of naturalisation and spread in New Zealand and are just starting to be noticed in the wild parts of our cities and towns. Others have yet to be found in the wild.

Woody plants, in particular, can remain in cultivation for well over a century before being first discovered in the wild (Kowarik 1995, Pyšek and Jarošík 2005). Kowarik's (1995) landmark study reconstructed the introduction and first wild records of 184 naturalised woody species in Brandenburg, Germany. She found that only 31% had begun to spread within 100 years of introduction. The average time lag between introduction and first discovery in the wild was 147 years, and some species had lags of several centuries. For example, box alder (*Acer negundo*) was first introduced into Brandenburg in 1736 but was not recorded wild until 1919 (Kowarik 1995). This species has been cultivated in New Zealand since early in European settlement and was first found wild here in 1980, and is continuing to spread. It is not (yet) listed on any RPMPs. Another example is tree of heaven (*Ailanthus altissima*), first recorded cultivated in Brandenburg in 1780 and wild in 1902 (Kowarik 1995), and similarly in New Zealand being a long-time garden plant not seen wild until 1980. Unlike box alder, tree of heaven is now an MPI Unwanted Organism, an NPPA weed, and is listed as an RPMP weed by Auckland (as a defined-area Eradication pest for Aotea/Great Barrier Island).

This naturally slow establishment of woody plants means that the rate of discovery of new wild plant species, especially wild trees, continues to increase in New Zealand (Gatehouse 2008, Brandt *et al.* 2021, Hulme 2020), and likely will do so for many more decades to come. This relatively slow pace of plant invasion buys us time to act, but also makes it dangerously easy to ignore and pass the responsibility on to future generations.

The old adage "One year's seeding, seven years' weeding" applies to New Zealand national weed management as a whole. It is considerably more cost-effective in the long-term to hit new weeds early and prevent them becoming widespread in a region, than to deal with them once they are already well-established, whether they are highly invasive or just moderately invasive weeds (Harris *et al.* 2001). However, if councils are not able to correctly prioritise weed control funding, some new weed species will be seeding and starting to spread while regional funding is being used to control more widely established weeds (sometimes referred to as 'legacy weeds').

It is reassuring that most regional council staff are aware of this trade-off. When asked about the processes for deciding which weeds to manage through RPMPs, council staff ranked most highly the importance of targeting "Weeds early in their spread that can be affordably eradicated now", "Weeds early in their spread with high impacts that can be slowed", and "Excluding weeds that are absent from your region but are a problem in other regions." Unfortunately, the current RPMPs suggest that these are not yet high priorities in practise – most of the current RPMP weeds are widely-established species with well-understood impacts, which presumably makes them more socially and politically acceptable for councils to manage.

It is of concern that one quarter of the seed plants that naturalised in the 1910s are listed on one or more current RPMPs, while only one twentieth of the plants that naturalised in the 2000s are listed (Figure 10). There is no evidence to suggest that more recently naturalised species are less likely to become weeds than older naturalisations. Instead, recent naturalisations are being fuelled by the much more diverse gardens of recent decades compared with the gardens of the early English settlers (Gatehouse 2008). By continuing to focus more on well-established weeds, there is a risk that compounding weed control costs are being passed onto future RPMPs.

Before the National Policy Direction (NPD) for Pest Management (2015), there was more variation among RPMPs in the types of programmes implemented, and in the number of weed species listed. One of the purposes of the NPD was to bring more consistency, and transparency, to RPMPs. Before the NPD, several councils listed advisory pests or research pests on their RPMPs, which were species without targeted control programmes but for which council staff time could be spent on advising private landowners on weed control or on surveillance and weed impact work. It is of some concern that Tasman-Nelson responded to our survey that surveillance of non-RPMP weeds is "not something we can put time to" because "general surveillance is not a valid programme" in the NPD.

All but five councils now list 'Organisms of Interest' in their RPMPs, as allowed under the NPD, but it is unclear how much budget and staff time is allocated to those plants. We had expected that these would be disproportionately the recently naturalised and less well understood new weed species. Those would be the weeds that require careful assessment of whether or not prompt region-wide control is required. Instead, the opposite is the case, with Organisms of Interest being typically older and more widespread species than the weeds managed through RPMP programmes. We suspect that a main motivation for listing

Organisms of Interest is to meet the needs of landowner and community groups that are struggling to control these established weeds. We acknowledge the importance of using the considerable weed control expertise of council staff to support their constituents.

Our assessment of current regional council weed management suggests that it would be prudent to focus more effort on emerging weeds, and not just by listing more of these as Organisms of Interest. It is these emerging weeds that likely would benefit most from management through RPMP programmes, as they give councils stronger power to act and coordinate weed control across the regional landscape. However, we acknowledge that for many emerging weeds, especially those recently sourced from garden escapes, there are complicated political and social issues to navigate, before it is publicly acceptable to list them as a pest under the RPMP. MPI's Unwanted Organism designation may be better suited to act swiftly against an emerging weed, but then we also acknowledge the complicated politics involved in declaring an emerging weed an Unwanted Organism. Both processes would benefit from wider public awareness of the compounding threats of weeds to New Zealand, and the stronger leadership that this awareness would enable.

Many weeds are now well-established in New Zealand and it is debatable whether it is necessary to invest ratepayer money in the indefinite control of these weeds at a regional level. In sites with high biodiversity values that are impacted by these weeds, control of these weeds will primarily be the responsibility of the landowners and agencies managing those sites. In the case of regional parks, these agencies may well be regional councils and therefore justify Site-led RPMP control. Our data indicate that regional councils are largely not investing in management of widespread, long-established biodiversity weeds, but are continuing to do so for many weeds with production impacts, e.g. Scotch broom and gorse. There are undoubtedly strong political pressures, and real social benefits, for regional councils assisting landowners with management of these weeds. The challenge is to do so without drawing funding and focus away from the suppression of emerging weeds, which is arguably where regional investment and leadership can make the biggest difference.

Our results show that regional councils vary a lot in their approach to weed management. Some have elected to manage large numbers of different weed species through their RPMPs, while others have decided to manage most weeds through other processes. For example, Auckland Council has 211 RPMP weeds while Wellington has just 15 RPMP weeds (Table 6). Wellington instead has elected to manage most of its weed species, like Darwin's barberry (*Berberis darwinii*), German ivy (*Delairea odorata*), and Scotch broom (*Cytisus scoparius*), through its other programmes on a site-by-site basis. Councils also vary considerably in the weeds they choose to list in their RPMPs, the types of programmes they use to manage weeds, and whether these programmes apply region-wide or just in particular parts of each region. Some councils allocate relatively large budgets to regional weed management (e.g., Auckland and Canterbury) while others do not (and often cannot).

We interpret this variation in regional weed management as, in part, reflecting councils' nuanced understanding of the needs of their regions and the approaches that work best in their regions. Some of the variation is also likely driven by the different political pressures and social expectations for councils to provide weed control. Which weeds are managed through RPMPs, and which species receive the greatest regional funding, carries a substantial element of political influence in the current process.

Historically, regional councils have a good history of working together in the biosecurity space, through the Biosecurity Managers Group and through staff connections and

information exchange at the annual NETS (National Education and Training seminar) conference of the Biosecurity Institute. They have coordinated their investment in biological control programmes against weeds, some of which have been extraordinarily successful (including the impressive widespread control of the riparian weed mistflower). Councils have also coordinated their investment in new weed management tools, such as the new Find-A-Pest app (www.findapest.nz), focused on greatly expanding biosecurity surveillance. Regional council staff without question provide invaluable leadership in New Zealand's weed management.

Weed management at a regional scale is undoubtedly complicated. Few weeds have the same level of consistent and widespread public awareness, and dislike, as possums and stoats, and some garden-escape weeds are still well-loved by some members of the community. There are also many hundreds of weed species, all with different biological characteristics, impacts, and rates and pathways of spread. Many established weeds are continuing to spread and have growing impacts, while many more are in the early stages of establishment. Deciding how much budget to assign to such a complicated set of challenges is difficult, and it is not surprising that councils vary widely in how much they budget for RPMP weed management, how many weeds they attempt to manage with this budget, and what proportion of their total RPMP budget they dedicate to weeds.

RPMP weed budgets vary by an order of magnitude from <\$0.5 million to >\$5 million, and the percentage of the total RPMP budget dedicated to weeds varies from 18% to 88% (Table 21). Councils also vary widely in which types of weeds they target, for example, varying from 19.5% to 88% in how much of their weed budget is allocated to biodiversity-only weeds. While some councils have fewer biodiversity weeds on their RPMPs than others, this does not necessarily indicate less council-wide investment in biodiversity weeds, as some councils prefer to target those weeds through other programmes. This makes it difficult to compare overall investment in weed management among regions.

The large amount of variation among regions makes it unlikely that these are all optimal weed management strategies for each particular region. We see a greater potential role here for national leadership and weed research, to assist in developing regional weed management strategies that will lead to the biggest cost:benefit ratios. Some data is available to attempt such regional modelling of these different weed management scenarios, but at this stage regional councils may not see it as their responsibility to lead and fund such a review.

Getting smarter about regional weed management will require easy access to large amounts of accurate data on weed distributions and impacts, and up-to-date assessments of the effectiveness of best-practise weed control methods. Regional councils have an important role in the collection and dissemination of this weed data, but it should not be their job alone and New Zealand as a whole could be doing this much better. From our own experiences, it remains difficult to find and access accurate weed data for New Zealand. Much of it is stored in regional council databases that are currently incompatible with one-another (although progress is being made). There are also still many historical weed distribution records locked up in undigitised herbarium specimens (although, again, progress is being made on digitising these). Increasingly, weed occurrence data are being provided directly by the public via iNaturalist NZ, and iNaturalist NZ is now, by far, New Zealand's largest provider of new plant records to the Global Biodiversity Information Facility (GBIF). The public should not be the biggest providers of current weed data to GBIF. Getting appropriately anonymised and geo-obscured council weed data onto GBIF

would supercharge weed research and management in New Zealand. This would greatly increase the volume and accuracy of our knowledge of weed distributions and spread rates, which are two essential parameters for optimising landscape-scale weed management strategies. The New Zealand weed data space would benefit from more leadership, coordination and data standardisation.

As we have shown here, current council weed management through the RPMP process varies considerably among regions, with different regions applying very different strategies to their regional weed management. Overall, this management remains disproportionately targeted at established and widespread weeds, especially those widespread weeds with production impacts. This approach would be fine if, like pest mammals, the invasion of new species had stopped some time ago. However, that is not the case with weeds, with many hundreds of new plant species expected to naturalise in New Zealand from existing garden plants over the next century. This process will potentially be accelerated by climate change (MPI 2016).

In conclusion, regional councils and unitary authorities are leading and undertaking a substantial amount of weed control in New Zealand. Their staff contain a depth of knowledge and experience that is very important for New Zealand's weed control effort, and New Zealand is without doubt a less weedy place because of their efforts. The current challenge for New Zealand is to get smarter about weed management so that we can best protect our biodiversity and landscapes from the impacts of emerging weeds in the long-term. While surveyed council staff identified the importance of acting against early incursion weeds, the great majority of the listed RPMP weeds and weed budgets are allocated to well-established weeds. An important role for regional councils, alongside other agencies, landowners, and community groups, is to get better at detecting and acting quickly against the worst of the many newly emerging weeds. As New Zealand enters a second year of responding to the global Covid19 pandemic, the general public are now very familiar with the effectiveness of a "go hard, go early" strategy for dealing with new incursions. Perhaps this could be a good opportunity for regional councils to apply this approach more broadly to regional weed management.

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COUNCIL SURVEY – ONLINE QUESTIONNAIRE

Regional Council Weed Management Survey

Earlier this year Simon Upton, the Parliamentary Commissioner for the Environment, embarked on a system-wide review of how New Zealand manages weeds, with the intention of identifying what is working well, what isn't, and highlighting areas for improvement. The regional sector plays a key role in managing weeds and holds a substantial amount of relevant information.

Given the broad scope of the system-wide review, the Commissioner has engaged Wildland Consultants to undertake a review of weed management initiatives in Regional Pest Management Plans (RPMPs) across New Zealand. The aims of this survey are to provide information for this piece of work, to supplement a desktop information-gathering exercise, and to ensure that key issues for effective regional weed management are identified.

Please complete this survey by Friday 28 August at the latest. Thanks!

***Required**

Email address *

Your council *

Mark only one oval.

- ☐ Northland Regional Council
- ☐ Auckland Council
- ☐ Waikato Regional Council
- ☐ Bay of Plenty Regional Council
- ☐ Gisborne District Council
- ☐ Hawkes Bay Regional Council
- ☐ Taranaki Regional Council
- ☐ Horizons Regional Council
- ☐ Greater Wellington Regional Council
- ☐ Tasman District Council
- ☐ Marlborough District Council
- ☐ Nelson City Council
- ☐ West Coast Regional Council
- ☐ Environment Canterbury
- ☐ Otago Regional Council
- ☐ Southland Regional Council
- ☐ Chatham Islands Council

Your name *

What is your role at the council? *

A. RPMP weed management

1. How did your council decide which weed species to include in the current RPMP? Please rate the factors below from 1 (not important) to 5 (very important). *

Mark only one oval per row.

	1	2	3	4	5
Weeds listed in the previous Regional Pest Management Strategy or Plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weed risk assessment process – identification of high risk/impact weeds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weeds that require regional leadership/co-ordination for effective management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weeds early in their spread that can be affordably eradicated now	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weeds early in their spread with high impacts that can be slowed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing impacts of established weeds on primary production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing impacts of established weeds on native biodiversity and the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reducing impacts of established weeds on human health/well-being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excluding weeds that are absent from your region but are a problem in other regions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Responding to ratepayers' concerns about particular weeds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost-benefit analysis results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1.1 Please add any other factors that your council used to decide which weed species to include in the current RPMP.

2. Is there a formal process (e.g. five-yearly review) to add new weed species or change the type/s of management programme for existing species during the lifespan of your RPMP? *

Mark only one oval.

Yes ☐

No ☐

2.1 If you selected Yes in Question 2, please describe this process. Does it differ in the importance given to the factors in Question 1?

2.2 Has the process described in Question 2.1 been used by your council before? *

Mark only one oval.

Yes ☐

No ☐

N/A ☐

2.3 If you selected Yes in Question 2.2, which species have been added and/or which management programmes have changed?

3. Does your RPMP list 'Organisms of Interest' (or equivalent)? *

Mark only one oval.

Yes ☐

No ☐

3.1 Why are 'Organisms of Interest' (or equivalent) listed (or not listed) in your RPMP? *

3.2 If you selected Yes in Question 3, what is the process for selecting these 'Organisms of Interest'?

3.3 If you selected Yes in Question 3, how do you manage these weeds in your region?

B. Non-RPMP weed management

4. Does your council manage any weed species outside the RPMP through other council programmes (e.g. biodiversity programmes)? *

Mark only one oval.

Yes ☐

No ☐

4.1 If you selected Yes in Question 4, which weed species are managed outside the RPMP?

5. What percentage (%) of the weed management undertaken by council staff and contractors in your region is done outside of RPMP programmes? *

Mark only one oval.

- ☐ 0%
- ☐ 10%
- ☐ 20%
- ☐ 30%
- ☐ 40%
- ☐ 50%
- ☐ 60%
- ☐ 70%
- ☐ 80%
- ☐ 90%
- ☐ I don't know

5.1 Approximately how much does your council spend per annum (\$ excluding GST) on non-RPMP weed management (by council staff and contractors) in your region?

5.2 Please provide any comments in relation to Question 5.

6. Please describe an example of a non-RPMP weed management programme in your region.

7. What happens if a new weed species (new to your region and/or new to New Zealand) is discovered in your region? What action is taken and by whom?

C. Monitoring, surveillance and data management

8. Approximately what percentage (%) of the total RPMP budget for weeds is allocated to monitoring and surveillance? *

Mark only one oval.

- 0% ☐
- 5% ☐
- 10% ☐
- 15% ☐
- 20% ☐
- 25% ☐
- 30% ☐
- 35% ☐
- 40% ☐
- 45% ☐
- 50% ☐
- 55% ☐
- ☐ I don't know

8.1 Please provide any comments in relation to Question 8.

9. How does your council monitor the extent (distribution and abundance) of weeds in your region? Please tick all that apply. *

Tick all that apply.

- ☐ Field data – general weed surveillance (to detect new weed species or infestations in the region)
- ☐ Field data – weeds surveys at specific sites (e.g. high biodiversity-value sites)
- ☐ Field data – targeted surveys of individual weed species
- ☐ Field data – monitoring the outcomes of weed control operations
- ☐ Field data – weeds observed during surveys for other purposes (e.g. biodiversity programmes, SNA surveys)
- ☐ Aerial imagery
- ☐ iNaturalist NZ distribution data
- ☐ Reports by members of the public
- ☐ _____

Other:

10. How do council staff record weed occurrences in the field? Please tick all that apply. *

Tick all that apply.

☐ Hand-written data sheets

☐ Tablet/iPad/mobile phone

☐ GPS unit

Other: ☐ _____

11. What types of weed data do council staff record in the field? Please tick all that apply. *

Tick all that apply.

☐ Distribution data – locations (GPS waypoints)

☐ Abundance data (number and size of individuals, size of infestation)

☐ Weed control (methods applied, effectiveness)

☐ Phenology (flowering/fruitletting)

Other: ☐ _____

12. How does your council store weed occurrence data? Please tick all that apply. *

Tick all that apply.

☐ Hard copy - field notes

☐ Digital - enter data into spreadsheets (e.g. Excel)

☐ Digital - enter data into council database/s

☐ Digital - enter geo-referenced data (e.g. GPS waypoints) in a GIS

Other: ☐ _____

13. Which council staff enter weed occurrence data into council databases? Please tick all that apply.

Tick all that apply.

☐ Biosecurity Officers

☐ Biodiversity Officers

☐ Park Rangers

Other: ☐ _____

14. Which council staff use weed occurrence data? Please tick all that apply. *

Tick all that apply.

☐ Biosecurity Officers

☐ Biodiversity Officers

☐ Park Rangers

Other: ☐ _____

15. Does your council share weed occurrence data with other councils and agencies? *

Mark only one oval.

☐ Yes

☐ No

15.1 If you selected Yes in Question 15, which other councils and agencies do you share weed occurrence data with and how are they shared?

15.2 If you selected No in Question 15, why doesn't the council share weed occurrence data?

Please tick all that apply.

Tick all that apply.

☐ Technological barriers (e.g. data not in digital form, incompatible databases, inconsistent data collection and storage methods)

☐ Concerns about sharing weed data on private land

☐ Sharing weed data with other councils/agencies is not a priority (little/no staff time allocated) Desire to

☐ retain ownership of the data due to time invested in data collection

☐ Other: _____

16. Does your council monitor non-RPMP weeds (i.e. weeds managed outside the RPMP)? *

Mark only one oval.

☐ Yes

☐ No

16.1 If you selected Yes in Question 16, how does the council decide when and where to monitor non-RPMP weeds?

16.2 If you selected Yes in Question 16, how does this approach differ from the approach for weeds managed under the RPMP?

16.3 If you selected Yes in Question 16, please give an example of a non-RPMP weed monitoring programme.

16.4 If you selected No in Question 16, why doesn't your council monitor non-RPMP weeds?

D. Collaboration with other organisations and neighbouring councils

17. Which organisations and groups does your council collaborate with in relation to regional weed management?
Please tick all that apply. *

Tick all that apply.

- ☐ Territorial authorities (city and district councils)
- ☐ Neighbouring regional councils/unitary authorities
- ☐ Department of Conservation (DOC)
- ☐ Land Information New Zealand (LINZ)
- ☐ QEII National Trust
- ☐ Iwi / Māori
- ☐ Central government - Ministry for Primary Industries (MPI)
- ☐ Central government - Ministry for the Environment (MfE)
- ☐ Federated Farmers
- ☐ Non-governmental organisations (NGOs)
- ☐ Community groups

Other: ☐ _____

18. Please describe how you collaborate with other organisations (listed in Question 17) in relation to weed management, and provide examples of effective (or poor) collaboration.

19. Please provide examples of weed species in your RPMP that are subject to different management objectives in neighbouring RPMPs (or are not listed in neighbouring RPMPs).

19.1 With regard to Question 19, how do these different management objectives impact the effectiveness of weed management programmes in your RPMP?

20. Have any pathways for weed invasion been identified for your region? *

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ I don't know

20.1 If you selected Yes in Question 20, please name the pathways and describe how they are being managed.

E. Barriers to effective weed management in your region

22. Please rate each factor below as a barrier to effective weed management in your region, from 1 (no or minor barrier) to 5 (major barrier). *

Mark only one oval per row.

	1	2	3	4	5
Funding and staff time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staff training/expertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Control methods and technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health and safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accurate and up-to-date information on weed distributions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effective information exchange among councils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaboration/co-ordination with other councils and agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear and prompt identification of which organisation and/or staff members are responsible for managing particular weeds in the region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public knowledge of and support for weed management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear, well-promoted processes for on-farm biosecurity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identification and management of pathways for weed invasion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22.1 Please describe any other factors that are barriers to effective weed management in your region and rate their importance from 1 (not a barrier) to 5 (major barrier).

23. Please rate your council's investment in each of the factors below in relation to weed management, from 1 (inadequate investment) to 5 (adequate investment). *

Mark only one oval per row.

	1	2	3	4	5
Funding and staff time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staff training/expertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Control methods and technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health and safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accurate and up-to-date information on weed distributions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effective information exchange among councils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaboration/co-ordination with other councils and agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear and prompt identification of which organisation and/or staff members are responsible for managing particular weeds in the region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public knowledge of and support for weed management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear, well-promoted processes for on-farm biosecurity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identification and management of pathways for weed invasion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23.1 Please add any comments in relation to Question 23.

24. Are there any major differences between the approaches to weed management stated in your RPMP and the actual practices on-the-ground? *

Mark only one oval.

- ☐ Yes
- ☐ No

24.1 If you selected Yes in Question 24, what are the main reasons for these differences? Please elaborate and provide examples of actual practices.

F. Weed management effort

Levels of expenditure and effort in relation to regional weed and biodiversity management

25. How many council staff (FTEs) are part of the following teams: *

Mark only one oval per row.

	0	1	2	3	4	5	6	7	8	9
Biodiversity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Biosecurity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parks and Recreation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25.1 If you selected '10+' staff in Question 28, please state how many are staff are in each team.

26. How many external contractors (or contractor hours per month or year) are engaged by the council to undertake weed management (all programmes)? *

27. How many external contractors (or contractor hours per month or year) are engaged by the council to undertake biodiversity management (including restoration work)?

28. What proportion of the weed management undertaken by council (staff and external contractors) in your region is done on regional/unitary council land versus privately-owned land? Please give approximate percentage (%) and/or budget (\$ excluding GST per annum, if known). *

G. General comments

29. Is there anything else you would like to add about what is working well, or not working effectively, with regard to weed management in your region?

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WEED TAXA LISTED IN REGIONAL PEST MANAGEMENT PLANS

Weed taxa listed in current Regional Pest Management Plans (RPMPs) and selected traits analysed in this review (see the Methods section of this report for further information).

Regions: NTL = Northland, AUK = Auckland, WKO = Waikato, BOP = Bay of Plenty, GIS = Gisborne, HKB = Hawkes Bay, MWT = Manawatu-Wanganui, WGN = Wellington, TAS = Tasman, MGH = Marlborough, CAN = Canterbury, WTC = West Coast, OTA = Otago, STL = Southland, CIT = Chatham Islands.

Biodiversity = Has negative impacts on indigenous biodiversity.

Production = Has negative impacts on production (agriculture, horticulture, or forestry).

Discovery Year = Year of first discovery in the wild in New Zealand (Hazel Gatehouse, unpublished data).

Organism of Interest = Listed as an 'Organism of Interest', 'Harmful Organism', 'Non-RPMP pest' or 'Advisory Plant' in the RPMP.

MPI = Listed as an Unwanted Organism by the Ministry for Primary Industries.

NPPA = Listed in the National Pest Plant Accord.

DOC = Listed as a conservation weed by the Department of Conservation (Clayson Howell, unpublished data, 2020).

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Abutilon theophrasti</i>	No	Yes	1978	NTL; TAS	GIS; WGN	HKB; WKO			STL	MPI
<i>Acacia dealbata</i>	Yes	No								DOC
<i>Acacia longifolia</i>	Yes	No	1896				AUK; NTL		BOP	DOC
<i>Acacia mearnsii</i>	Yes	No	1899				AUK			DOC
<i>Acacia paradoxa</i>	Yes	No	1910			AUK	AUK; NTL			DOC
<i>Acacia sophorae</i>	Yes	No							CIT	
<i>Acacia verticillata</i>	Yes	No	1945				AUK; NTL			DOC
<i>Acaena agnipila</i>	No	Yes	1870				AUK		CAN	
<i>Acanthus mollis</i>									WKO	
<i>Acer pseudoplatanus</i>	Yes	No	1879			CIT	NTL	OTA; TAS	CAN; STL; TAS; WKO; WGN	DOC
<i>Achnatherum caudatum</i>	Yes	Yes	1997			CAN				
<i>Aconogonon campanulatum</i>	Yes	No	1981		NTL					
<i>Actinidia arguta</i> ; <i>Actinidia deliciosa</i> ; <i>Actinidia polygama</i>	Yes	Yes	2000		NTL; TAS	AUK; BOP	BOP	WKO		DOC
<i>Agapanthus praecox</i>	Yes	No	1952				AUK; NTL	AUK; GIS	BOP; WKO	DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Agave americana</i>	Yes	No	1868				AUK; NTL		WKO	DOC
<i>Ageratina adenophora</i>	Yes	No	1925			WKO	AUK	WKO		DOC
<i>Ageratina riparia</i>	Yes	No	1913			WKO	AUK		BOP; CAN; WGN	DOC
<i>Ailanthus altissima</i>	Yes	No	1980		AUK		AUK		BOP; WTC	MPI; NPPA; DOC
<i>Akebia quinata</i>	Yes	No	1940		NTL	WKO; WTC	AUK; TAS		BOP; WGN; WTC	MPI; NPPA; DOC
<i>Akebia trifoliata</i>	Yes	No				AUK				
<i>Alisma plantago-aquatica</i>	Yes	No			AUK					DOC
<i>Allium vineale</i>									WGN	
<i>Alnus glutinosa</i>	Yes	No	1913				AUK		WKO	DOC
<i>Alocasia brisbanensis</i>	Yes	No	1867				AUK; NTL		BOP	DOC
<i>Aloe maculata</i>	Yes	No	1882				AUK			DOC
<i>Alternanthera philoxeroides</i>	Yes	Yes	1906	AUK; BOP; GIS; HKB; WGN	BOP; MWT	BOP; WKO	AUK	AUK	WTC	MPI; NPPA; DOC
<i>Ammophila arenaria</i>	Yes	No	1872				AUK		BOP; WGN	DOC
<i>Andropogon virginicus</i>	Yes	Yes	1976	CAN	AUK					DOC
<i>Angelica pachycarpa</i>									STL	
<i>Anredera cordifolia</i>	Yes	No	1940		TKI; TAS; WTC	AUK; GIS; WKO	AUK; MGH	AUK	BOP; WGN; WTC	MPI; NPPA; DOC
<i>Apium nodiflorum</i>									HKB	
<i>Aponogeton distachyos</i>	Yes	No	1869		AUK					DOC
<i>Araujia hortorum</i>	Yes	No	1888	OTA	AUK; CAN; TKI; WGN	GIS; MWT; WKO	AUK; MGH	AUK	BOP; HKB; WTC	MPI; NPPA; DOC
<i>Archontophoenix cunninghamiana</i>	Yes	No	1992				AUK	AUK		DOC
<i>Arctium minus</i>	Yes	Yes	1894			GIS	AUK		CAN; OTA	DOC
<i>Aristea ecklonii</i>	Yes	No	1933				AUK	AUK	NTL; WKO; WTC	MPI; NPPA; DOC
<i>Artemisia verlotiorum</i>	No	Yes		GIS					WGN	DOC
<i>Arum italicum</i>	Yes	No	1945				AUK			DOC
<i>Arundo donax</i>	Yes	No	1936		AUK; TKI		AUK	AUK; GIS	BOP; WKO; WTC	MPI; NPPA; DOC
<i>Asparagus aethiopicus;</i> <i>Asparagus plumosus</i>	Yes	No	1976		AUK; WTC		AUK	AUK; WKO	BOP; WTC	MPI; NPPA; DOC
<i>Asparagus asparagoides</i>	Yes	No	1905	WTC	STL	AUK	AUK	GIS	BOP; WKO; WGN; WTC	MPI; NPPA; DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Asparagus drepanophyllus</i> ; <i>Asparagus umbellatus</i>	Yes	No			AUK					
<i>Asparagus scandens</i>	Yes	No	1945		AUK	WKO	AUK; TAS	AUK	BOP; TAS; WGN; WTC	MPI; NPPA; DOC
<i>Austrostipa ramosissima</i>	Yes	No			BOP					
<i>Austrostipa rudis</i>	No	Yes	1989			AUK	MGH			
<i>Azolla pinnata</i>	Yes	No								DOC
<i>Baccharis halimifolia</i>	Yes	Yes	1975			CAN	AUK			MPI; DOC
Banana passionfruit (<i>Passiflora</i> spp.)	Yes	No	1947		CIT; MWT	GIS; MWT; WKO; WTC	AUK; TAS; WGN	CAN; OTA; WGN	BOP; HKB; NTL; STL; TAS; WKO; WTC	MPI; NPPA; DOC
<i>Banksia integrifolia</i>	Yes	No	1989				AUK; NTL	AUK	BOP; WKO	DOC
<i>Bartlettina sordida</i>	Yes	No	1974				AUK			DOC
<i>Berberis darwinii</i>	Yes	Yes	1945	BOP		BOP; HKB; MWT; STL; WKO; WTC	AUK; CAN	OTA; TAS	TAS; WGN; WTC	MPI; NPPA; DOC
<i>Berberis glaucocarpa</i>	Yes	Yes	1916				AUK; GIS		CAN; STL; WGN	DOC
<i>Betula pendula</i>									CAN; STL; WKO	
<i>Bidens frondosa</i>									CAN	
<i>Bomarea caldasii</i> ; <i>Bomarea multiflora</i>	Yes	No	1970		MWT	OTA; STL; TAS	AUK		WGN; WTC	MPI; NPPA; DOC
<i>Bryonia cretica</i>	Yes	No	1991		WKO				WGN; WTC	MPI; NPPA; DOC
<i>Buddleja salvifolia</i> ; <i>Buddleja davidii</i>	Yes	Yes	1945			CIT; STL	AUK; GIS; NTL		CAN; OTA; WKO; WGN	DOC
<i>Calamintha nepeta</i>									HKB	
<i>Callistachys lanceolata</i>	Yes	No	1931	CAN			AUK; NTL			DOC
<i>Calluna vulgaris</i>	Yes	No	1909			STL	AUK	STL	BOP; CIT; STL; WKO; WTC	MPI; NPPA; DOC
<i>Calotis lappulacea</i>	No	Yes	1882		MGH	OTA	AUK; CAN			
<i>Calystegia silvatica</i>	Yes	No	1903				NTL	TAS	TAS; WGN	DOC
<i>Cardioscrinum giganteum</i>									TAS	
<i>Cardiospermum grandiflorum</i> ; <i>Cardiospermum halicacabum</i>	Yes	No	1982		AUK; NTL				WTC	NPPA

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Carduus nutans</i> ; <i>Carduus acanthoides</i>	No	Yes	1896		WTC	GIS; MWT	AUK; HKB; OTA; STL; TKI; TAS; WKO		CAN; WGN	
<i>Carduus tenuiflorus</i>									WKO	
<i>Carex divisa</i>	Yes	No	1871				AUK			DOC
<i>Carex divulsa</i>	Yes	Yes	1918				AUK			DOC
<i>Carex longibrachiata</i>	No	Yes	1902	CAN		GIS; HKB; MWT	AUK; GIS; WKO		TAS; WGN	DOC
<i>Carex pendula</i>									CAN; WTC	
<i>Carex scoparia</i>	Yes	No	1948		AUK		AUK			DOC
<i>Carpobrotus edulis</i>	Yes	No	1882			CIT	AUK		STL; WTC	MPI; NPPA; DOC
<i>Carthamus lanatus</i>	No	Yes	1931	GIS; MWT	TAS	HKB	AUK; CAN; MGH		WGN	
<i>Celastrus orbiculatus</i>	Yes	Yes	1978	NTL	GIS; MWT; MGH; TKI; TAS	AUK; BOP; WKO	BOP; WGN		HKB; WTC	MPI; NPPA; DOC
<i>Cenchrus macrourus</i>	Yes	Yes	1940	OTA	AUK; GIS; HKB; MWT; TAS; WKO; WTC	BOP; CAN; NTL	MGH		STL; WGN	MPI; NPPA; DOC
<i>Cenchrus purpurascens</i> ; <i>Cenchrus longisetus</i>	Yes	Yes	1880		GIS; MWT	TAS	AUK; MGH		WGN; WTC	MPI; NPPA; DOC
<i>Cenchrus setaceus</i>									WGN	
<i>Centaurea calcitrapa</i>	No	Yes	1843			GIS				
<i>Centranthus ruber</i>	Yes	No	1878				AUK		CAN	DOC
<i>Ceratophyllum demersum</i>	Yes	No	1969	AUK; BOP; CAN; OTA; TAS; WTC	BOP	BOP; GIS; MWT	AUK	AUK	HKB; STL; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Cestrum elegans</i> ; <i>Cestrum fasciculatum</i> ; <i>Cestrum nocturnum</i> ; <i>Cestrum aurantiacum</i> ; <i>Cestrum parqui</i>	Yes	No	1948		AUK; GIS		AUK; NTL		BOP; WKO; WTC	MPI; NPPA; DOC
<i>Chamaecytisus palmensis</i> ; <i>Cytisus proliferus</i>									CAN	
<i>Chondrilla juncea</i>	No	Yes	1979				AUK			MPI

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Chrysanthemoides monilifera</i>	Yes	Yes	1869	CIT; STL	AUK; TAS	BOP; GIS; MWT; OTA; WKO	AUK; CAN; MGH; WGN	AUK	HKB; NTL; TAS; WTC	MPI; NPPA; DOC
<i>Cinnamomum camphora</i>	Yes	No	1999				NTL			
<i>Cirsium arvense</i>	No	Yes	1878				AUK		STL; TAS; WKO	DOC
<i>Cirsium vulgare</i>	No	Yes	1867						STL; WKO	DOC
<i>Clematis flammula</i>	Yes	No	1961	AUK			AUK		WTC	MPI; NPPA; DOC
<i>Clematis vitalba</i>	Yes	Yes	1928	NTL	CIT	AUK; BOP; GIS; HKB; MWT; OTA; STL; WKO; WTC	BOP; CAN; TKI; TAS	CAN; WGN	TAS; WTC	MPI; NPPA; DOC
<i>Clerodendrum trichotomum</i>									WTC	
<i>Cobaea scandens</i>	Yes	No	1945		HKB; MWT; NTL; TAS; WKO; WTC	AUK	MGH	CAN; WGN	BOP; WTC	MPI; NPPA; DOC
<i>Collomia cavanillesii</i>	Yes	No							WKO	
<i>Colocasia esculenta</i>									CAN; STL	
<i>Conium maculatum</i>	Yes	Yes	1871				AUK		OTA; WKO	
<i>Convolvulus arvensis</i>									BOP	DOC
<i>Cornus capitata</i>	Yes	No	1916					WKO		
<i>Cortaderia jubata</i> ; <i>Cortaderia selloana</i>	Yes	Yes	1950			WKO; WTC	AUK; GIS; TKI	AUK	BOP; CIT; HKB; STL; TAS; WGN; WTC	MPI; NPPA; DOC
<i>Cotoneaster franchetii</i> ; <i>Cotoneaster glaucophyllus</i> ; <i>Cotoneaster horizontalis</i> ; <i>Cotoneaster lacteus</i> ; <i>Cotoneaster microphyllus</i> ; <i>Cotoneaster simonsii</i>	Yes	No	1946			STL	AUK; NTL	TAS	BOP; CAN; CIT; HKB; OTA; TAS; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Cotyledon orbiculata</i>	Yes	No	1952				AUK		CAN; WTC	MPI; NPPA; DOC
<i>Crassula multicava</i>	Yes	No	1957				AUK		WKO; WTC	MPI; NPPA; DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Crataegus monogyna</i>	Yes	No	1898				AUK; GIS	STL	CAN; OTA; STL; WKO; WGN	DOC
<i>Crocasmia x crocosmiiflora</i>	Yes	No	1929				AUK		STL; WGN	DOC
<i>Cyathea cooperi</i>	Yes	No					AUK		WTC	MPI; NPPA
<i>Cyperus rotundus</i>	Yes	Yes	1873	CAN	NTL		AUK; WKO		BOP; TAS	DOC
<i>Cytisus multiflorus</i>	No	Yes	1898				CAN	CAN		DOC
Broom (<i>Cytisus scoparius</i> ; <i>Calicotome spinosa</i> ; <i>Genista monspessulana</i> ; <i>Spartium junceum</i>)	Yes	Yes	1933	CAN	AUK; CIT; OTA	AUK; MWT; WTC	AUK; CAN; GIS; MGH; NTL; OTA; STL; TKI; TAS; WKO; WTC	CAN	HKB; STL; WGN	DOC
<i>Daphne laureola</i>	Yes	No	1957						CAN; STL	
<i>Datura stramonium</i>	No	Yes	1867				GIS		WKO	DOC
<i>Delairea odorata</i>	Yes	No	1869		STL		AUK; NTL		BOP; CAN; WGN	DOC
<i>Digitalis purpurea</i>	No	Yes								DOC
<i>Dipogon lignosus</i>	Yes	No	1870		WKO	AUK; NTL; WTC	AUK		BOP; WGN; WTC	MPI; NPPA; DOC
<i>Drosera capensis</i>	Yes	No	2001				AUK		WTC	MPI; NPPA
<i>Dryopteris filix-mas</i>	Yes	No					AUK		TAS	DOC
<i>Eccremocarpus scaber</i>	Yes	No	1940				AUK		CAN; WTC	MPI; NPPA; DOC
<i>Echium plantagineum</i>									WKO	
<i>Echium vulgare</i>	Yes	Yes	1869						CAN	DOC
<i>Egeria densa</i>	Yes	No	1946	BOP; GIS; OTA	AUK; CAN; TAS	BOP; MWT; WTC	AUK	AUK	STL; WTC	MPI; NPPA; DOC
<i>Ehrharta erecta</i>									CIT; OTA; TAS	
<i>Ehrharta villosa</i>									WGN; WTC	
<i>Eichhornia crassipes</i>	Yes	No	1913	GIS; TAS	NTL				WGN; WTC	MPI; NPPA
<i>Elaeagnus x reflexa</i>	Yes	No	1940			WTC	AUK; NTL		BOP; CAN; WKO; WGN	DOC
<i>Elodea canadensis</i>	Yes	Yes	1871	AUK; BOP			AUK; BOP			DOC
<i>Embothrium coccineum</i>									STL	
<i>Emex australis</i>	No	Yes	1882		GIS; HKB	BOP				MPI
<i>Eomecon chionantha</i>	Yes	No	1997				AUK		BOP; WTC	MPI; NPPA

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				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Equisetum arvense</i> ; <i>Equisetum hyemale</i>	Yes	Yes		BOP; WKO	NTL; STL	MWT; STL	AUK; MGH		BOP; CAN; WTC	MPI; NPPA; DOC
<i>Eragrostis curvula</i>	Yes	Yes	1959			CAN; OTA			WTC	MPI; NPPA; DOC
<i>Erica baccans</i>	Yes	No	1935				AUK			DOC
<i>Erica cinerea</i>	Yes	No	1940				CAN			MPIDOC
<i>Erica lusitanica</i>	Yes	Yes	1910				AUK	STL	CAN; OTA; STL; TAS; WGN	DOC
<i>Erigeron karvinskianus</i>	Yes	No	1940				AUK	GIS	WKO; WGN; WTC	MPI; NPPA; DOC
<i>Erigeron sumatrensis</i>									WKO	
<i>Eriobotrya japonica</i>	Yes	No	1956				AUK			DOC
<i>Erythranthe guttata</i>	Yes	No			NTL					DOC
<i>Euonymus europaeus</i>									STL	
<i>Euonymus japonicus</i>	Yes	No	1970				AUK		BOP; WGN; WTC	MPI; NPPA; DOC
<i>Euphorbia lathyris</i>									WKO	
<i>Euphorbia paralias</i>	Yes	No		NTL	WKO				CIT	MPI
<i>Fallopia japonica</i> ; <i>Reynoutria sachalinensis</i>	Yes	Yes	1932	NTL	CAN; MWT; TAS; WKO	AUK; BOP; WTC			BOP; OTA; STL; WGN; WTC	MPI; NPPA; DOC
<i>Fatsia japonica</i>	Yes	No	1978				AUK			DOC
<i>Ficus macrophylla</i>	Yes	No	1987				AUK			DOC
<i>Ficus microcarpa</i>	Yes	No					AUK			
<i>Ficus pumila</i>	Yes	No	1979				AUK		TAS	
<i>Ficus rubiginosa</i>	Yes	No	1980				AUK		WTC	MPI; NPPA
<i>Fraxinus excelsior</i>	Yes	No	1903						CAN	DOC
<i>Fuchsia boliviana</i>	Yes	No	1972				AUK		WTC	MPI; NPPA; DOC
<i>Furcraea foetida</i> ; <i>Furcraea parmentieri</i> ; <i>Furcraea selloa</i>	Yes	No	1956				AUK; NTL			DOC
<i>Galega officinalis</i>	No	Yes	1906	GIS	HKB		AUK		CAN	
<i>Geitonoplesium cymosum</i>	Yes	No	2000		AUK					MPI
<i>Glyceria fluitans</i>	Yes	No								DOC
<i>Glyceria maxima</i>	Yes	No	1906		AUK; CIT	GIS; MWT; STL; TAS	AUK; MGH	WKO	CAN; HKB; OTA	DOC
<i>Grevillea rosmarinifolia</i>	Yes	No						TAS		

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
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<i>Gunnera manicata</i> ; <i>Gunnera tinctoria</i>	Yes	No			CIT; MWT; NTL	WKO; WTC	AUK; TKI; TAS	GIS; OTA; STL	BOP; STL; WGN; WTC	MPI; NPPA; DOC
<i>Gymnocoronis spilanthoides</i>	Yes	No	1991	GIS; HKB; MGH; TAS	BOP; MWT; NTL; TKI; WKO; WGN	AUK			CAN; WTC	MPI; NPPA; DOC
<i>Hakea drupacea</i> ; <i>Hakea eriantha</i> ; <i>Hakea gibbosa</i> ; <i>Hakea salicifolia</i> ; <i>Hakea sericea</i>	Yes	Yes	1882		MGH		AUK; NTL		TAS; WKO	MPIDOC
<i>Hedera helix</i>	Yes	Yes	1872				AUK; NTL	GIS	BOP; STL; WKO	DOC
<i>Hedychium flavescens</i> ; <i>Hedychium gardnerianum</i>	Yes	No	1898		AUK; CIT	WKO; WTC	AUK; BOP; GIS; NTL; TKI; TAS	AUK	OTA; TAS; WGN; WTC	MPI; NPPA; DOC
<i>Helichrysum petiolare</i>	Yes	No								DOC
<i>Heracleum mantegazzianum</i>	Yes	Yes	1968	AUK; NTL					OTA; WGN; WTC	MPI; NPPA
<i>Hieracium lepidulum</i> ; <i>Pilosella caespitosa</i> ; <i>Pilosella officinarum</i> ; <i>Pilosella praealta</i>	Yes	Yes	1941	MWT			AUK		CAN; OTA; STL; WKO; WTC	MPI; NPPA; DOC
<i>Homalanthus populifolius</i>	Yes	No	1969		AUK; MWT		AUK; TAS		WTC	MPI; NPPA; DOC
<i>Houttuynia cordata</i>	Yes	No	2006	NTL		AUK			BOP; WGN; WTC	MPI; NPPA
<i>Humulus lupulus</i>									TAS	
<i>Hydrilla verticillata</i>	Yes	No	1963	WKO					WGN; WTC	MPI; NPPA; DOC
<i>Hydrocleys nymphoides</i>	Yes	No	1914	BOP; NTL	AUK; WKO				WTC	MPI; NPPA
<i>Hydrocotyle umbellata</i>	Yes	No					AUK			
<i>Hypericum androsaemum</i>	Yes	No	1869			MWT; WKO	AUK		STL; WTC	MPI; NPPA; DOC
<i>Hypericum perforatum</i>	Yes	Yes	1868						CAN	DOC
<i>Ilex aquifolium</i>	Yes	No	1901					TAS	CAN; STL; TAS; WKO	DOC
<i>Impatiens glandulifera</i>	Yes	No	1909		MWT; TAS				BOP; CAN; WKO	DOC
<i>Ipomoea indica</i>	Yes	No	1950			WTC	AUK	AUK; GIS	BOP; HKB; NTL; WKO; WGN; WTC	NPPA; DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Iris foetidissima</i>	Yes	No	1898						WGN	DOC
<i>Iris pseudacorus</i>	Yes	No	1878		NTL	BOP; WKO; WTC	AUK; TAS	GIS	CIT; WTC	MPI; NPPA; DOC
<i>Jacobaea vulgaris</i>	No	Yes	1892			CIT; MWT	AUK; BOP; GIS; HKB; OTA; STL; TKI; TAS; WKO; WTC		CAN; WGN	DOC
<i>Jasminum humile</i>	Yes	Yes	1942				AUK; TAS		WTC	MPI; NPPA; DOC
<i>Jasminum polyanthum</i>	Yes	No	1963				AUK; NTL	AUK	BOP; WKO	DOC
<i>Juglans ailantifolia</i>	Yes	No	1970				AUK	WKO	BOP; WTC	MPI; NPPA; DOC
<i>Juncus acutus</i>	Yes	No	1923	AUK			AUK; NTL	AUK		DOC
<i>Juncus gerardii</i>									OTA	
<i>Juncus squarrosus</i>	Yes	No	1910	MWT					OTA	DOC
<i>Kennedia rubicunda</i>	Yes	No	1945				AUK		WTC	MPI; NPPA; DOC
<i>Lagarosiphon major</i>	Yes	No	1950	AUK; BOP	GIS	BOP; MWT; STL; WTC	AUK; TAS	CAN; OTA	WGN; WTC	MPI; NPPA; DOC
<i>Lagunaria patersonia</i>	Yes	No					AUK	AUK		DOC
<i>Lamium galeobdolon</i>	Yes	No	1980				AUK		BOP; STL; WGN; WTC	MPI; NPPA; DOC
<i>Lantana camara</i>	Yes	Yes	1912		BOP; WKO	AUK; BOP; NTL	BOP		WTC	MPI; NPPA; DOC
<i>Leptospermum laevigatum</i>	Yes	No	1960		BOP					DOC
<i>Leucanthemum vulgare</i>	Yes	Yes	1867						WKO	DOC
<i>Leycesteria formosa</i>	Yes	No	1878			WTC	AUK; NTL		CAN; STL; WKO; WGN	DOC
<i>Leymus racemosus</i>	Yes	No	1940			STL				DOC
<i>Ligustrum sinense</i> ; <i>Ligustrum lucidum</i>	Yes	No	1957	WTC	AUK		AUK; HKB; NTL; WKO	AUK; GIS	BOP; CAN; TAS; WTC	MPI; NPPA; DOC
<i>Lilium formosanum</i>	Yes	No	1972				AUK	AUK	BOP; WTC	MPI; NPPA; DOC
<i>Lolium arundinaceum</i> subsp. <i>arundinaceum</i>	Yes	No								DOC
<i>Lonicera japonica</i>	Yes	No	1926			HKB; STL; WTC	AUK	AUK; GIS	BOP; OTA; WKO; WGN; WTC	MPI; NPPA; DOC

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<i>Lophospermum erubescens</i>	Yes	No	1939		AUK; BOP		AUK			DOC
<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Yes	No					AUK		WTC	MPI; NPPA; DOC
<i>Lupinus arboreus</i>	Yes	No	1898				AUK		CAN; OTA; STL	DOC
<i>Lupinus polyphyllus</i>	Yes	No	1945				CAN; OTA	TAS	STL; TAS	DOC
<i>Lycium ferocissimum</i>	Yes	Yes	1897		AUK; STL; TAS	GIS	AUK	AUK	CAN; CIT; OTA; WKO; WGN	DOC
<i>Lycopus europaeus</i>	Yes	No	1940		NTL		AUK			DOC
<i>Lythrum salicaria</i>	Yes	No	1954	GIS; NTL	BOP; HKB; MWT; STL	TAS; WGN; WTC	CAN; MGH		OTA; WTC	MPI; NPPA; DOC
<i>Macfadyena unguis-cati</i>	Yes	No	1945				AUK		NTL; WTC	MPI; NPPA; DOC
<i>Mahonia lomariifolia</i>	Yes	No					AUK			
<i>Marrubium vulgare</i>									CAN; HKB; OTA	
<i>Marsilea mutica</i>	Yes	No			NTL		AUK		CAN	
<i>Maytenus boaria</i>									CAN; WTC	
<i>Megathyrsus maximus</i>	No	Yes					AUK		WTC	NPPA
<i>Melaleuca quinquenervia</i>	Yes	No					AUK; NTL			
<i>Melianthus major</i>	Yes	No	1878				AUK; NTL		CAN; STL; WKO; WGN	DOC
<i>Menyanthes trifoliata</i>									WTC	
<i>Miscanthus nepalensis</i> ; <i>Miscanthus sinensis</i>	Yes	Yes	1945				NTL		WKO	DOC
<i>Moraea flaccida</i>	Yes	Yes	1944	TAS	GIS; NTL				WGN; WTC	MPI; NPPA; DOC
<i>Myoporum insulare</i>	Yes	No	1948				AUK	AUK	WTC	MPI; NPPA; DOC
<i>Myrica faya</i>									WTC	
<i>Myricaria germanica</i>	Yes	No	1986	OTA			AUK		CAN; WTC	MPI; NPPA; DOC
<i>Myriophyllum aquaticum</i>	Yes	Yes	1967	AUK	STL	GIS; WTC	AUK; MGH		BOP; CAN; CIT; HKB; TAS; WKO; WGN; WTC	MPI; NPPA; DOC

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<i>Nassella neesiana</i> ; <i>Nassella tenuissima</i> ; <i>Nassella trichotoma</i>	Yes	Yes	1930	BOP; CIT; GIS; MWT; OTA; STL; TAS; WGN; WTC	AUK; BOP; MWT; NTL; WKO	HKB; OTA; TAS	CAN; HKB; MGH		WTC	MPI; NPPA; DOC
<i>Nasturtium officinale</i>									WGN	
<i>Navarretia squarrosa</i>	No	Yes	1870		GIS					
<i>Nephrolepis cordifolia</i>	Yes	No					AUK		BOP; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Nicandra physalodes</i>									WKO	
<i>Nuphar lutea</i>	Yes	No	1975		CAN; HKB		AUK		WTC	MPI; NPPA
<i>Nymphaea alba</i>	Yes	No								DOC
<i>Nymphaea mexicana</i>	Yes	No	1965	GIS			AUK	WKO	BOP; WTC	MPI; NPPA; DOC
<i>Nymphoides geminata</i>	Yes	No	1981	GIS; HKB; NTL; WKO	AUK; CAN; TAS				BOP; WTC	MPI; NPPA
<i>Nymphoides peltata</i>	Yes	No	1987	WKO					WTC	MPI; NPPA
<i>Ochna serrulata</i>	Yes	No	1997	AUK	NTL		AUK		WTC	MPI; NPPA; DOC
<i>Onopordum acanthium</i>	No	Yes	1879			HKB	MGH		OTA	
<i>Onopordum tauricum</i>	No	Yes								
<i>Opuntia monacantha</i>	Yes	No	1843				AUK		BOP	DOC
<i>Osmunda regalis</i>	Yes	No			NTL	AUK	AUK	AUK; WKO	BOP; WTC	MPI; NPPA; DOC
<i>Oxalis pes-caprae</i>									CAN	
<i>Panicum miliaceum</i>	No	Yes	1916	WKO						
<i>Paraserianthes lophantha</i>	Yes	Yes	1869				AUK; NTL		CIT; WKO; WGN	DOC
<i>Paspalum distichum</i>	Yes	No								DOC
<i>Paspalum vaginatum</i>	Yes	No	1841				AUK	AUK; WKO	BOP	DOC
<i>Passiflora apetala</i>	Yes	No		BOP; WKO	NTL				WTC	MPI; NPPA
<i>Persicaria chinensis</i>	Yes	No		NTL	WKO				BOP	MPI
<i>Persicaria microcephala</i>	Yes	No					AUK			
<i>Persicaria perfoliata</i>	Yes	No	2000				AUK			
<i>Persicaria polystachya</i>									STL	
<i>Persicaria wallichii</i>	Yes	No	1930					STL	STL	
<i>Phalaris arundinacea</i>									CAN; TAS	
<i>Phoenix canariensis</i>	Yes	No	1979				AUK; NTL	AUK; GIS	WKO	DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Phragmites australis</i>	Yes	No	1864	MWT; NTL; TAS	CAN; HKB				WGN; WTC	MPI; NPPA; DOC
<i>Phragmites karka</i>	Yes	No			AUK					DOC
<i>Phyllostachys aurea</i> ; <i>Phyllostachys nigra</i> ; <i>Pleioblastus auricomus</i> ; <i>Pleioblastus hindsii</i> ; <i>Pseudosasa japonica</i> ; <i>Chimonobambusa quadrangularis</i>	Yes	No	1993				AUK			DOC
<i>Pistia stratiotes</i>									WTC	
<i>Pithecoctenium crucigerum</i>	Yes	No	2003		GIS				WTC	MPI; NPPA; DOC
<i>Pittosporum undulatum</i>	Yes	No	1970	AUK; MWT			AUK		WTC	MPI; NPPA; DOC
<i>Plectranthus ciliatus</i>	Yes	No	1950				AUK		BOP; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Plectranthus ecklonii</i> ; <i>Plectranthus grandis</i>	Yes	No	1974				AUK		CAN	DOC
<i>Polygala myrtifolia</i>	Yes	No	1869				AUK		WGN; WTC	MPI; NPPA; DOC
<i>Polypodium vulgare</i>									CAN; WGN; WTC WGN	
<i>Populus alba</i>										
<i>Potamogeton crispus</i>	Yes	No								DOC
<i>Potamogeton perfoliatus</i>									WTC	
<i>Prunus campanulata</i>	Yes	No	1987		TAS		AUK; NTL		BOP	DOC
<i>Prunus laurocerasus</i>									STL; TAS	
<i>Prunus serrulata</i> ; <i>Prunus serotina</i>	Yes	No	1956		MWT		AUK	WKO	CAN; WTC	MPI; NPPA; DOC
<i>Psidium cattleianum</i>	Yes	No	1956				AUK			DOC
<i>Psidium guajava</i>	Yes	No	1964				AUK			DOC
<i>Psoralea pinnata</i>	Yes	Yes	1869				AUK		WKO	DOC
<i>Pteris cretica</i>									TAS	
<i>Pueraria montana</i>	Yes	No	1993	WKO	BOP		AUK			MPIDOC
<i>Pultenaea daphnoides</i>	Yes	No	1933			NTL				DOC
<i>Pyracantha angustifolia</i>	Yes	No	1954		NTL		AUK		WTC	MPI; NPPA; DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Ranunculus acris</i>	No	Yes	1871			STL	TKI; TAS; WTC		WKO	
<i>Ranunculus trichophyllus</i>	Yes	No								
<i>Rhamnus alaternus</i>	Yes	No	1940	AUK; BOP	NTL; WKO	AUK; BOP; MWT	AUK; MGH	AUK	WGN; WTC	MPI; NPPA; DOC
<i>Rhaphiolepis umbellata</i>	Yes	No	1966		AUK		AUK; NTL			DOC
<i>Rhododendron ponticum</i>	Yes	No	1951		WKO				WTC	MPI; NPPA; DOC
<i>Ribes sanguineum</i>	Yes	No	1903						CAN	DOC
<i>Ricinus communis</i>	Yes	Yes	1864				AUK		WKO	DOC
<i>Robinia pseudoacacia</i>									WKO	
<i>Roldana petasitis</i>	Yes	No	1952				AUK; NTL		BOP; WKO; WGN	DOC
<i>Rosa rubiginosa</i>	Yes	Yes	1867				AUK	GIS	CAN; CIT; OTA; STL	DOC
<i>Rubus fruticosus</i> agg.	Yes	Yes	1867			MWT	AUK; BOP; GIS; HKB; TAS		CAN; OTA; STL; WKO	
<i>Rumex sagittatus</i>	Yes	No	1934				AUK		BOP; WKO; WGN	DOC
<i>Sagittaria montevidensis</i> ; <i>Sagittaria platyphylla</i> ; <i>Sagittaria subulata</i>	Yes	No								MPI; NPPA
<i>Salix cinerea</i> ; <i>Salix x fragilis</i>	Yes	No	1879		AUK; CIT	MWT	AUK	STL	BOP; OTA; STL; WGN; WTC	MPI; NPPA; DOC
<i>Salpichroa organifolia</i>	Yes	No	1940				NTL			DOC
<i>Salvinia molesta</i>	Yes	No		GIS	NTL				WGN; WTC	MPI; NPPA; DOC
<i>Sambucus nigra</i>	Yes	No								DOC
<i>Saururus cernuus</i>	Yes	No	2005				AUK			
<i>Schefflera actinophylla</i>	Yes	No	2005				AUK			
<i>Schinus terebinthifolius</i>	Yes	No	1984				AUK; NTL		WTC	MPI; NPPA; DOC
<i>Schoenoplectus californicus</i>	Yes	No	1990	MWT			AUK	WKO	WGN; WTC	MPI; NPPA; DOC
<i>Sedum acre</i>									STL	

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Selaginella kraussiana</i>	Yes	No				CIT	AUK	STL	NTL; STL; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Selaginella martensii</i> ; <i>Selaginella moellendorffii</i> ; <i>Selaginella uncinata</i>	Yes	No					AUK			DOC
<i>Senecio angulatus</i>	Yes	No	1940		WTC	OTA	AUK; NTL		CAN; WKO; WGN	DOC
<i>Senecio elegans</i>	Yes	No	1934			AUK			HKB	DOC
<i>Senecio glastifolius</i>	Yes	No	1963	NTL		GIS	AUK		HKB; WGN	DOC
<i>Senecio skirrhodon</i>	Yes	No	1914				NTL			DOC
<i>Senna septemtrionalis</i>	Yes	No	1956				AUK		WKO	DOC
<i>Sesbania punicea</i>	Yes	No		AUK			AUK			
<i>Setaria palmifolia</i>	Yes	No	1974	CAN			AUK		WKO	DOC
<i>Setaria pumila</i>	No	Yes	1864		CAN	MWT; WTC	AUK; HKB; TAS		OTA; TAS; WKO	DOC
<i>Silybum marianum</i>	No	Yes	1868		WKO	BOP; GIS; MWT; TAS	AUK; GIS; HKB; TKI		CAN; WGN	DOC
<i>Solanum carolinense</i>	No	Yes	1934		BOP; GIS; WKO					MPI
<i>Solanum laxum</i>	Yes	No								DOC
<i>Solanum linnaeanum</i>	No	Yes	1882		GIS	BOP; HKB			WGN	DOC
<i>Solanum marginatum</i>	Yes	Yes	1882	WTC	AUK; BOP; GIS; HKB	OTA; TAS	MGH	CAN	WGN; WTC	MPI; NPPA; DOC
<i>Solanum mauritianum</i>	Yes	Yes	1882	CAN	AUK; MWT; WGN; WTC	BOP; GIS; HKB; WKO	AUK; BOP; MGH; NTL; TAS	AUK	TAS; WTC	MPI; NPPA; DOC
<i>Solanum torvum</i>	Yes	Yes	1991		AUK					
<i>Sorbus aucuparia</i>	Yes	No	1903					TAS	CAN; OTA; STL; TAS	DOC
<i>Sorghum halepense</i>	No	Yes	1922	TAS					WGN	MPI
<i>Spartina alterniflora</i> ; <i>Spartina anglica</i> ; <i>Spartina x townsendii</i>	Yes	Yes	1923	HKB; WTC	BOP; MWT; MGH; NTL; STL; TAS; WKO; WGN	AUK; GIS; OTA	AUK	CAN	CIT	DOC
<i>Syzygium smithii</i>	Yes	No	1967				AUK	AUK	BOP; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Themeda triandra</i>	No	Yes	1864	CAN			MGH			
<i>Thinopyrum ponticum</i>	Yes	No					MGH			

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Thunbergia alata</i>	Yes	No	1985				NTL			DOC
<i>Thymus vulgaris</i>	Yes	Yes	1926					CAN	OTA	DOC
<i>Toxicodendron succedaneum</i>	Yes	No	1984				AUK; NTL			DOC
<i>Trachycarpus fortunei</i>	Yes	No	1959				AUK	AUK	BOP; TAS; WKO	DOC
<i>Trachycarpus papyrifer</i>									WKO	
<i>Tradescantia fluminensis</i>	Yes	No	1916				AUK	OTA	BOP; CIT; STL; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Tropaeolum speciosum</i>	Yes	No	1945	BOP	CIT; WKO		AUK	OTA	CAN; HKB; WGN; WTC	MPI; NPPA; DOC
<i>Tussilago farfara</i>	Yes	No	1975	WTC			AUK; CAN			MPI; NPPA; DOC
<i>Typha latifolia</i>	Yes	No			AUK				WTC	MPI; NPPA
<i>Ugni molinae</i>	Yes	No	1959				CIT		STL	DOC
<i>Ulex europaeus</i>	Yes	Yes	1867			GIS; MWT	AUK; BOP; CAN; CIT; GIS; HKB; MGH; NTL; OTA; STL; TKI; TAS; WKO; WTC	CAN	WGN	DOC
<i>Urtica dioica</i>	No	Yes	1869			OTA	AUK		CAN; WGN	
<i>Utricularia arenaria</i> ; <i>Utricularia gibba</i> ; <i>Utricularia livida</i> ; <i>Utricularia sandersonii</i>	Yes	No	2001	GIS; MWT			AUK		WTC	MPI; NPPA; DOC
<i>Vallisneria australis</i>	Yes	No		AUK; WKO	NTL; WKO	MWT	AUK; MGH; WGN		STL; WTC	MPI; NPPA; DOC
<i>Vinca major</i>	Yes	No	1869				AUK; NTL	GIS	BOP; OTA; STL; WKO; WGN	DOC
<i>Watsonia bulbifera</i>	Yes	No								DOC
Wilding conifers (<i>Larix decidua</i> ; <i>Pinus contorta</i> ; <i>Pinus mugo</i> ; <i>Pinus muricata</i> ; <i>Pinus nigra</i> ; <i>Pinus pinaster</i> ; <i>Pinus ponderosa</i> ; <i>Pinus radiata</i> ; <i>Pinus sylvestris</i> ;	Yes	Yes	1919			BOP; CAN; HKB; MWT; OTA; STL; WKO; WGN	AUK; BOP; NTL	GIS; TAS; WKO	CIT; HKB; TAS; WTC	MPI; NPPA; DOC

Taxon name	Biodiversity	Production	Discovery Year	Regional Pest Management Plan Programme Type						Listed weed
				Exclusion	Eradication	Progressive Containment	Sustained Control	Site-led	Organism of Interest	
<i>Pinus uncinata</i> ; <i>Pseudotsuga menziesii</i>)										
<i>Xanthium spinosum</i>	No	Yes	1867		TAS		AUK; GIS; HKB; MGH; NTL		CAN	
<i>Xanthium strumarium</i>	No	Yes	1893	CAN; GIS; HKB; MWT; NTL	BOP; WKO	AUK			WGN	
<i>Zantedeschia aethiopica</i>	Yes	No	1869				AUK		BOP; WKO; WGN; WTC	MPI; NPPA; DOC
<i>Zizania latifolia</i>	Yes	No	1906	MWT	WKO	NTL			WGN; WTC	MPI; NPPA; DOC

COUNCIL SURVEY – SELECTED ONLINE QUESTIONNAIRE RESPONSES

Responses from regional council staff on the importance of a list of factors for deciding which weeds were added to each regions' RPMP. There were five options for responses, from 1 (not important) to 5 (very important).

Factor	Northland	Auckland	Waikato	Bay of Plenty	Gisborne	Hawkes Bay	Taranaki	Manawatu-Wanganui	Wellington	Tasman	Nelson	Marlborough	Canterbury	West Coast	Otago	Southland	Chatham Islands	Mean
Weeds early in their spread that can be affordably eradicated now	5	4	4	5	5	4	5	5	5	4	5	3	5	4	4	4	5	4.47
Weeds early in their spread with high impacts that can be slowed	4	4	4	5	5	4	5	5	5	4	4	5	5	4	4	4	5	4.47
Excluding weeds that are absent from your region but are a problem in other regions	5	3	5	5	5	4	2	5	5	4	4	5	4	4	4	3	5	4.24
Weeds that require regional leadership/co-ordination for effective management	3	5	5	4	5	3	3	5	5	4	4	4	5	4	3	5	4	4.18
Weed risk assessment process – identification of high risk/impact weeds	5	5	4	5	4	4	3	1	5	5	5	4	2	4	3	5	4	4.00
Weeds listed in the previous Regional Pest Management Strategy or Plan	5	5	5	3	5	5	5	5	1	3	4	4	4	3	3	4	3	3.94
Cost-benefit analysis results	4	3	2	4	4	2	4	3	4	4	5	4	5	3	4	4	4	3.71
Reducing impacts of established weeds on native biodiversity and the environment	3	5	4	3	5	2	5	2	2	4	4	2	4	4	4	4	5	3.65
Responding to ratepayers' concerns about particular weeds	3	3	4	3	5	3	3	5	4	4	3	3	2	3	4	2	4	3.41
Reducing impacts of established weeds on primary production	3	3	3	3	4	2	5	3	1	4	3	2	4	4	3	4	5	3.29
Reducing impacts of established weeds on human health/well-being	4	2	3	3	5	2	2	1	2	3	2	2	4	3	3	3	3	2.76

Council responses to the questions, “Is there a formal process (e.g. five-yearly review) to add new weed species or change the type/s of management programme for existing species during the lifespan of your RPMP?” and “Has the process been used by your council before?”

Region	Is there a formal process (e.g. five-yearly review) to add new weed species or change the type/s of management programme for existing species during the lifespan of your RPMP?	Has the process been used by your council before?	Does your RPMP list “Organisms of Interest” (or equivalent)
Northland	No	N/A	No
Auckland	Yes	No	No
Waikato	Yes	No	Yes
Bay of Plenty	Yes	Yes	Yes
Gisborne	No	No	No
Hawkes Bay	Yes	No	Yes
Taranaki	Yes	Yes	No
Manawatu-Wanganui	Yes	No	No
Wellington	Yes	No	Yes
Tasman	Yes	No	Yes
Nelson	No	No	Yes
Marlborough	Yes	Yes	No
Canterbury	Yes	Yes	Yes
West Coast	No	No	No
Otago	No	No	Yes
Southland	Yes	No	No
Chatham Islands	Yes	Yes	Yes

Responses from councils on which methods they use to monitor the extent (distribution and abundance) of weeds in their regions.

Region	Field data – general weed surveillance (to detect new weed species or infestations in the region)	Field data - weeds surveys at specific sites (e.g. high biodiversity- value sites)	Field data - targeted surveys of individual weed species	Field data - monitoring the outcomes of weed control operations	Field data - weeds observed during surveys for other purposes (e.g. biodiversity programmes, SNA surveys)	Aerial imagery	iNaturalist NZ distribution data	Reports by members of the public
Northland	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auckland	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Waikato	Yes	No	Yes	No	Yes	No	Yes	Yes
Bay of Plenty	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gisborne	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Hawkes Bay	No	No	Yes	Yes	Yes	No	No	Yes
Taranaki	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manawatu-Wanganui	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Wellington	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tasman	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Nelson	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Marlborough	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Canterbury	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
West Coast	Yes	Yes	Yes	Yes	No	No	No	Yes
Otago	Yes	Yes	Yes	No	Yes	No	No	Yes
Southland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chatham Islands	Yes	Yes	Yes	Yes	Yes	No	No	Yes

Council responses to the question, "Which council staff enter weed occurrence data into council databases?"

Region	Biosecurity Officers	Biodiversity Officers	Park Rangers	Other
Northland	Yes	Yes	No	
Auckland	Yes	Yes	Yes	
Waikato	Yes	No	No	
Bay of Plenty	Yes	Yes	No	Biosecurity Contractors
Gisborne	Yes	No	No	
Hawkes Bay	Yes	Yes	No	
Taranaki	Yes	Yes	No	
Manawatu-Wanganui	Yes	No	No	
Wellington	Yes	No	No	
Tasman-Nelson	Yes	No	No	
Marlborough	Yes	No	No	
Canterbury	Yes	No	No	
West Coast	Yes	Yes	No	
Otago	Yes	No	No	
Southland	Yes	No	No	Administration staff
Chatham Islands	Yes	Yes	No	

Council responses to the question, "Which council staff use weed occurrence data?" Council responses to the question, "Approximately what percentage (%) of the total RPMP budget for weeds is allocated to monitoring and surveillance? "

Region	Biosecurity Officers	Biodiversity Officers	Park Rangers	Other
Northland	Yes	No	No	
Auckland	Yes	Yes	Yes	
Waikato	Yes	Yes	No	
Bay of Plenty	Yes	Yes	No	Biosecurity Contractors, Biosecurity Manager and Team Leader
Gisborne	Yes	No	No	
Hawkes Bay	Yes	Yes	No	
Taranaki	Yes	Yes	No	
Manawatu-Wanganui	Yes	No	No	
Wellington	Yes	Yes	Yes	
Tasman-Nelson	Yes	No	No	
Marlborough	Yes	Yes	Yes	

Canterbury	Yes	No	No	Building and Resource Consent planners
West Coast	Yes	Yes	No	
Otago	Yes	No	No	
Southland	Yes	No	No	
Chatham Islands	Yes	Yes	No	

Council responses to the question, “Have any pathways for weed invasion been identified for your region?”. The last column quotes council responses to the question, “please name the pathways and describe how they are being managed.”

Region	Pathways identified	Pathways and their management
Northland	Yes	Not sure if this question is in relation to official pathway management rules in Regional Pest Plans? If so, we only have pathway management rules in place for Marine species. We do however work to manage known pathways for weed invasion e.g. Velvet leaf - targeting information to farmers purchasing maize and contractors with harvest machinery used for maize.
Auckland	Yes	Can't list them all here, but some key pathways include: Birds/wind - managed through site-led programmes with 500m buffers, and by prioritizing geographically remote offshore islands.; Trade, mainly ornamental - managed by regulating trade of >200 taxa. ; Human movement of ornamentals - managed through education and inspections at departure points to offshore islands. ; Traditional medicines/vegetables - managed (inadequately) as part of eradication programmes through education and compliance. Currently investing in resourcing outreach to Asian communities. Freshwater users e.g. contaminant of discarded aquariums, or on boats/equipment - managed through advocacy. Contaminant on vehicles, footwear, equipment - advice and advocacy.
Waikato	Yes	Don't know where to start - we have a massive programme. Some high risk - low incidence programme have reasonably well managed pathways other no so much. ; Numerous e.g., alligator weed coming from northland in silage/animal feed during drought and velvetleaf coming into and going out of regions and within region in maize, maize silage, maize grain, dirty machinery. We are managing velvetleaf = good programme.
Bay of Plenty	Yes	Movement of machinery, transports, animals, feed, rail. Managed using various tools e.g. engagement, direction, education, restricted place notice. Tailored to the pathway and audience.
Gisborne	No	
Hawkes Bay	Yes	Hay, machinery, soil, contaminated seed.
Taranaki	Yes	transport links and movement of risk goods, working on a pathway programme right now.
Manawatu-Wanganui	Yes	Stock movement, Feed, Diggers (soils engaging machinery, cultivation equipment etc.) nursery plant stock, cultivar seed.; Managed by alerting the receivers of what to look out for, communication about how contractors can use audit tools to show they can “keep it clean” between farms. No interventions into the dispersal vector systems as yet. We have recently drafted a Notice of Direction to the management agency that maintains drains within PNCC to effect process to eliminate the dispersal of alligator weed.
Wellington	Yes	For exclusion species in the Wairarapa we progressed in identifying farms that receive stock etc. from infested farms in neighbouring regions, plus encourage machinery hygiene procedures, etc. in contractors and staff.

Region	Pathways identified	Pathways and their management
Tasman-Nelson	Yes	Intention is to develop Pathway Management Plans for roads and quarries/aggregate as well as marine pathways.
Marlborough	No	
Canterbury	Yes	Not all pathways have been identified in a dedicated manner. However, at an operational level, one such pathway or concern has been the inter-regional livestock and hay movement. The Marlborough Saleyards receives high volumes of livestock having a 'rest' and also shipments of hay. This site is visited on a much higher frequency. It is also the site of a low incidence RPMP pest species so the higher number of visits also assists in that management programme.
West Coast	Yes	These are multiple and complex. Primarily through human activity.
Otago	No	
Southland	No	
Chatham Islands	Yes	Pathways are not currently being managed (e.g. stock and feed, machinery, household items such as pot plants).

Council responses to the question, "Approximately what percentage (%) of the total RPMP budget for weeds is allocated to monitoring and surveillance?"

Region	Approximately what percentage (%) of the total RPMP budget for weeds is allocated to monitoring and surveillance?
Northland	
Auckland	10
Waikato	10
Bay of Plenty	50
Gisborne	45
Hawkes Bay	5
Taranaki	
Manawatu-Wanganui	5
Wellington	40
Tasman-Nelson	55
Marlborough	50
Canterbury	
West Coast	10
Otago	15
Southland	45
Chatham Islands	

Responses from regional council staff on the importance of a list of factors as “barrier(s) to effective weed management in your region”. There were five options for responses, from 1 (not important) to 5 (very important).

Factor	Northland	Auckland	Waikato	Bay of Plenty	Gisborne	Hawkes Bay	Taranaki	Manawatu-Wanganui	Wellington	Tasman	Nelson	Marlborough	Canterbury	West Coast	Otago	Southland	Chatham Islands	Mean
Funding and staff time	5	2	5	5	5	4	3	5	4	5	5	4	5	5	4	5	5	4.47
Accurate and up-to-date information on weed distributions	5	5	5	4	3	4	4	5	3	4	4	3	5	2	3	5	5	4.06
Public knowledge of and support for weed management	2	5	3	4	3	4	5	3	3	4	4	3	4	3	2	3	5	3.53
Identification and management of pathways for weed invasion	3	4	5	3	4	3	3	5	2	3	2	3	5	2	4	4	5	3.53
Control methods and technology	3	2	4	5	4	4	3	4	3	3	2	5	5	1	2	4	4	3.41
Clear, well-promoted processes for on-farm biosecurity	3	1	4	3	3	3	4	2	3	3	2	1	3	3	3	3	4	2.82
Staff training/expertise	2	2	3	4	4	2	2	2	1	2	2	4	5	1	3	3	5	2.76
Collaboration/co-ordination with other councils and agencies	3	2	3	3	3	1	2	4	2	1	2	1	2	1	3	4	5	2.47
Effective information exchange among councils	3	2	2	3	3	2	2	2	3	1	3	1	3	1	2	3	3	2.29
Health and safety	2	2	4	4	3	2	2	2	1	4	2	1	1	1	1	2	4	2.24
Clear and prompt identification of which organisation and/or staff members are responsible for managing particular weeds in the region	2	2	3	4	1	1	4	3	1	1	2	1	1	1	2	2	5	2.12

Responses from regional council staff on their investment in a list of factors relating to weed management. There were five options for responses, from 1 (inadequate investment) to 5 (adequate investment).

Factor	Northland	Auckland	Waikato	Bay of Plenty	Gisborne	Hawkes Bay	Taranaki	Manawatu-Wanganui	Wellington	Tasman	Nelson	Marlborough	Canterbury	West Coast	Otago	Southland	Chatham Islands	Mean
Health and safety	4	5	5	4	5	4	5	5	5	4	4	5	5	5	5	3	5	4.59
Staff training/expertise	3	3	5	4	2	4	4	5	4	4	4	4	3	4	3	2	5	3.71
Clear and prompt identification of which organisation and/or staff members are responsible for managing particular weeds in the region	5	5	2	3	1	4	3	4	4	1	4	5	5	4	3	3	5	3.59
Collaboration/co-ordination with other councils and agencies	3	3	3	4	3	4	4	3	4	1	4	4	4	5	4	2	5	3.53
Control methods and technology	2	3	4	3	3	3	4	5	4	3	4	4	1	4	4	3	5	3.47
Effective information exchange among councils	3	3	4	3	2	3	4	3	2	1	4	4	4	5	4	3	4	3.29
Public knowledge of and support for weed management	3	3	4	4	3	2	4	3	3	4	3	2	3	4	3	2	5	3.24
Clear, well-promoted processes for on-farm biosecurity	4	2	5	2	2	3	3	2	2	3	4	4	5	3	1	2	4	3.00
Funding and staff time	2	3	4	4	1	2	4	2	4	2	2	3	3	3	3	2	5	2.88
Accurate and up-to-date information on weed distributions	2	1	4	4	1	2	4	3	3	3	3	5	1	5	3	1	4	2.88
Identification and management of pathways for weed invasion	3	3	5	2	2	3	4	2	3	2	3	3	2	2	1	2	5	2.76

Council responses to the question, “Are there any major differences between the approaches to weed management stated in your RPMP and the actual practices on-the-ground?”

Region	Major differences in RPMP and practices on-the-ground	Explanation
Northland	No	Capacity can have effect on delivery of objectives, but approach remains same
Auckland	No	But note I have answered here and throughout in relation to our new RPMP which is to be made operative this year. There was certainly slippage in relation to our previous RPMS, with loss of consistent alignment to clearly set out outcomes. We hope to avoid that this time by having introduced more formal project management and decision making tools, plus a partial plan review at c.5 years to address any operational issues that may become evident.
Waikato	Yes	Variable: we have had to prioritise what we do as we are not resourced to implement the full plan/programme e.g., some species are so far gone (distribution) - tutsan that there is virtually no way of managing them yet it's total control.
Bay of Plenty	No	
Gisborne	Yes	Due to restructuring at management and staff level unable to meet and be effective at delivering fully on the ground weed programmes.
Hawkes Bay	No	
Taranaki	No	
Manawatu-Wanganui	No	
Wellington	No	
Tasman	Yes	Generally the RPMP makes the landowner responsible for control. In practice it is often more efficient for staff to control small infestations.
Nelson	No	
Marlborough	No	
Canterbury	No	
West Coast	No	
Otago	No	
Southland	No	
Chatham Islands	Yes	The Chatham Islands Council has acted promptly on professional advice when required if the proposal can show immediate benefit

Council responses to the question, “How many council staff (FTEs) are part of the following teams?”

Region	Biodiversity	Biosecurity	Parks and Recreation
Northland	6	10+	0
Auckland	10+	10+	10+
Waikato	7	10+	0
Bay of Plenty	6	10+	0
Gisborne	1	2	4
Hawkes Bay	2	4	1
Taranaki	6	8	-
Manawatu-Wanganui	6	7	-
Wellington	10+	10+	10+
Tasman-Nelson	0	4	7
Marlborough	4	1	1
Canterbury	1	6	6
West Coast	10+	10+	9
Otago	1	2	0
Southland	-	9	-
Chatham Islands	1	10+	-

Council responses to the question, “What proportion of the weed management undertaken by council (staff and external contractors) in your region is done on regional/unitary council land versus privately-owned land?”

Region	Proportion council weed management on private land
Northland	
Auckland	0.5
Waikato	90% on private
Bay of Plenty	95% Private land vs 5% Regional/unitary land
Gisborne	No contractors used for Biosecurity weed control programmes. Unsure about Parks and reserves.
Hawkes Bay	95% private
Taranaki	
Manawatu-Wanganui	10% \$166 vs \$1.8M
Wellington	90% private land
Tasman-Nelson	Almost impossible to know. As a weed is a plant out of place and we are both a regional and a district council we have extensive reserves networks and commercial assets such as forestry. Of the weed management undertaken by Council staff (as opposed to contractors) probably over 50% of it would be on council land
Marlborough	65% Council land; 35% private land

Canterbury	The proportion undertaken on Council land is estimated to be <5% of the total. Budget or financial information is unable to be generated for such a split. Note the figure for #26 is for the Biosecurity section only. Such information was not able to be extracted for other parts of Council.
West Coast	Unknown
Otago	90% private land
Southland	0 (ORC does not own land that requires weed management).
Chatham Islands	Unknown



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