Review of recent plant naturalisations in South Australia and initial screening for weed risk

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Review of recent plant naturalisations in South Australia and initial screening for weed risk

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Summary

The State Herbarium of South Australia (State Herbarium) is the foremost authority on the State's plants, algae and fungi and contains a collection of about one million specimens. As many botanists and plant collectors seldom collect exotic plant taxa these are frequently under-represented in State Herbarium collections. Weeds have only interested plant collectors sporadically and as such are poorly represented in herbaria.

As exotic plants are often under-collected, there is lack of data on naturalised plants (also known as weeds) in the State Herbarium. Without more complete data on weedy taxa, publications produced by the State Herbarium will not accurately document the South Australian Flora nor will we be able to identify new and expanding threats. To improve the capacity of the State Herbarium to receive, identify and process weedy plants, a Weeds Botanist was employed for a five-month period from January 2009 with funding support from the State Natural Resources Management (NRM) Complementary Program.

A key aim of the project was to collate existing data for verified weedy species collected in South Australia that are held in the collection, and to prioritise for weed risk assessment.

A list of all naturalised or potentially naturalised South Australian plants was compiled from the Census of SA Plants, Algae and Fungi (Census). Data was also obtained from the State Herbarium's specimen record database ADHERB. Collection data regarding the number of specimens and the regions in which collected, were merged from both the census and ADHERB. The Census contained 2,975 names of naturalised or potentially naturalised plant species. Of these names, 1,427 were current species names and 1,548 names were synonyms.

Of the current species names, 1,216 were identified as naturalised, 166 as potentially naturalised and 45 had no unified status (i.e. both native and naturalised within different areas of the State). This list was filtered on the basis of taxa first collected since 1970, resulting in 394 different taxa of which 296 were naturalised, and 98 were potentially naturalised. 279 of the 394 taxa had 5 or less collections (Appendix 1). For taxa collected pre 1970 with 5 or less collections, there were 133 different taxa. There were 786 accepted weedy species first collected pre-1970 with 6 or more collections.

The filtered lists were then prioritised for future weed risk assessment by a panel of weed experts using criteria such as documented weediness elsewhere, life-form and life-history, and existence of con-generic weeds. To identify candidate 'Alert Weeds' a final detailed risk assessment of species in the priority list may be undertaken at a later date. Species designated as Alert Weeds in the future could be targeted for deliberate surveillance by the State Herbarium, NRM Boards and other weed managers to prevent their entry or establishment in South Australia.

The procedure developed for this project to extract weedy species data from the State Herbarium's specimen record database for the purpose of weed risk screening is described here.

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Introduction

Background

There are approximately 27,000 deliberately introduced alien plants in Australia, of which around 2,800 have successfully naturalised (Caley *et al.* 2008). In this study, the term naturalised plant is synonymous with the term weed. Richardson *et al.* (2006) broadly defined weeds as plants growing where they are not wanted. They categorised these plants as weeds of cultivation (agricultural weeds), environmental weeds and weeds of disturbed sites.

For the purpose of this study a weed is a plant that has originally been introduced by humans to an area deliberately or accidentally, then has self propagated without aid where it is not wanted, possibly spreading by natural means to new areas. In South Australia these weeds can be plants introduced from overseas as in the case of the European olive (*Olea europaea* subsp. *europaea*) and the European blackberries (*Rubus fruticosus* aggregate). Plants native to other states in Australia such as Sweet Pittosporum (*Pittosporum undulatum*) from New South Wales have been introduced to South Australia and become weedy, in this case in the Adelaide Hills. Plants native to one part of South Australia (e.g. *Acacia iteaphylla* in the Flinders Ranges) have become weedy in other parts of the State where they have been deliberately planted (http://www.flora.sa.gov.au/census.shtml). A native plant is a plant taxon that has evolved in a given area without human intervention, which may have subsequently spread to other areas from which it is native without any intentional or unintentional human intervention. For discussion on what plants are considered native and what are weeds and problems determining weed status see Bean (2007).

The State Herbarium of South Australia (State Herbarium) is the foremost authority on the State's plants, algae and fungi and contains a collection of about one million specimens. All named specimens including the naturalised or potentially naturalised South Australian plants are listed in the Census of SA Vascular Plants (Census) (Barker *et al.* 2005). The Census is now regularly updated online (http://www.flora.sa.gov.au/census.html) providing a summation of the current state of scientific knowledge of the flora of South Australia, as reviewed by the taxonomic botanists and research associates of the State Herbarium. The Census is based only on collection records deposited at the State Herbarium and the data is held in the State Herbarium's specimen record database ADHERB.

Plant naturalisations in Australia continue at an average rate of 10 species a year (Groves & Hosking 1997). In South Australia there are approximately 1,500 naturalised plants recorded in the Census (http://www.flora.sa.gov.au/census.html). Improving our knowledge of alien plants that have naturalised or could naturalise in South Australia is important as it has been estimated that weeds already established in agricultural areas cost Australian farmers around $1.5 billion a year in control activities and a further $2.5 billion a year in lost agricultural production. The cost of weeds to the environment is difficult to calculate, but it is expected that the cost would be similar to, if not greater than, that estimated for agricultural industries (http://www.weeds.gov.au/weeds/why/impact.html).

For a number of reasons, specimen collectors often ignore weeds and so these are frequently under-represented in the collections. The under-representation of weed collections within herbaria is not a phenomenon just of the State Herbarium, but is true of most herbaria (R. Barker, pers. comm.). The incompleteness of data on introduced plants in the State Herbarium may be due to the following reasons:

- Traditionally, weeds have been of lesser interest to plant collectors and botanists than native plants and as such are poorly represented in herbaria (Groves & Hoskings 1997).

- The perception that widespread and common plants will already be well represented in the State Herbarium.
- The perception that naturalised plants, particularly those well known and easily recognised, will not be of interest to the State Herbarium.
- Difficulties in determining whether exotic plants, particularly long-lived woody species, have become naturalised in the local flora.
- The perception that a seemingly well-known weed represents a single species.
- The specialised interests of most botanists and their shrinking numbers.
- Changing governance and attitudes with regard to weeds, where previously the only species of concern were agricultural and each council region within the State had their own weeds officer who carried out identifications and weed research. This was conducted by the Department of Agriculture, largely independent of the State Herbarium.
- The recognition of environmental weeds is a relatively new phenomenon, so very few have been collected.
- The present lack of knowledge of the State Herbarium and its functions.

Collections held by the State Herbarium are used to compile scientific publications on the Flora of South Australia. Two examples are the forthcoming revision of the 'Flora of South Australia' (5th edition), with treatments being produced by botanists from around Australia, and the ongoing 'Census of SA Plants, Algae and Fungi' (http://www.flora.sa.gov.au/census.html). With an under-representation of herbarium specimens for weed taxa, these publications will not necessarily accurately document the state of the naturalised flora of South Australia, as sight records are not included and cannot be scientifically verified.

South Australian herbarium specimen data is also accessed by the Australian Virtual Herbarium[1] (http://www.flora.sa.gov.au/avh/) and the South Australian Plant Distribution Mapper (http://www.flora.sa.gov.au/mapper.html), and is also used to underpin the South Australian Plant Census (http://www.flora.sa.gov.au/census.html), which informs the Australian Plant Census (http://www.anbg.gov.au/chah/apc/). These tools are used by a wide range of people including scientists and natural resource managers informing policy makers. The data can be used, for example, to track the introduction and spread of weeds by providing data on when and where plants were collected.

Caley *et al.* (2008) have used specimen data of naturalised plants and the known introduction dates of woody ornamentals introduced to South Australia to estimate the length of time it takes for alien species to become established in the environment. The statistical survival analysis estimated a modal time of 149 years for these woody ornamental species to become naturalised. The results suggest that future naturalisation of alien species will occur from some of those already introduced taxa not yet naturalised.

The importance of catalogued plant specimens held at the State Herbarium is that they provide a physical and permanent record that can be verified at any time. Any changes in the name of a plant can be accounted for by reference to these specimens. Anecdotal records on the other hand are difficult to verify and therefore have limited value in scientific studies. Herbarium-based specimen data, therefore, underpins our knowledge of the State's Flora, both native and introduced.

With funding obtained through the State Complementary Natural Resource Management Program 2008/2009, a weed botanist was employed in the State Herbarium for five months to July 2009, to strengthen the State Herbarium's capability to detect new weed threats to the State. A key task of the project was to screen the South Australian herbarium collection data for recently collected naturalised or potentially naturalised plants. Taxa identified by this process with a high potential to become weeds in this State can be further evaluated using the SA Weed Risk Management (WRM) System (Virtue 2005). The WRM System is a decision support tool developed by Biosecurity SA for prioritising weeds for control programs

based on weed risk. The WRM System provides quantitative estimates of both the likelihoods and magnitudes of threats posed by alien plants, based on biological and ecological information, their geographical origin and previous history of introduction. A scoring process is used to determine a score predicting the potential weediness of the plant being assessed. An assessment can be applied to various geographic scales and land uses.

Aims and Objectives

To review and screen SA Plant Census data and ADHERB specimen data to identify recent plant naturalisations for prioritisation for weed risk screening.

[1] The State Herbarium is a node in Australia's Virtual Herbarium (AVH). The AVH is an on-line botanical information resource which provides immediate access to some of the data, especially locality / special information, associated with plant specimens held in the State Herbarium.

Methodology

State Herbarium specimen records were filtered to identify and prioritise alien taxa for targeted collecting and for assessment of weed risk using the WRM System. The following method was used:

1. Records were selected from the Census and ADHERB on 12/2/2009, creating a source list. The source list included the following headings:

- Plant family.
- Current scientific names (taking account of synonymies) of naturalised and questionably naturalised vascular plants collected in South Australia.
- The number of specimen records held in the State Herbarium; the number of specimen records was assumed to be based on one plant record (also known as a plant collection) being stored on one herbarium sheet with a unique identifying herbarium sheet number. However, some plant collections require more than one herbarium sheet and more than one unique identifying herbarium sheet number. This is due to a plant collection being too large or bulky to be stored on one herbarium sheet to adequately represent the taxon. In this study unique identifying herbarium sheet numbers were counted as specimens, and although caution was taken to avoid counting more than a single plant collections represented by more than one herbarium sheet, errors may have occurred. In this study it was assumed that one specimen record represented one plant collection.
- First collection date in South Australia based on specimens held in the State Herbarium.
- Last collection date in South Australia based on specimens held in the State Herbarium.
- If plants are declared in South Australia.
- Plant status, in this case either naturalised (*), potentially naturalised (?*).

2. The source list was then considered in terms of the history of weed risk elsewhere in the world (weed status). The source list was annotated by Rod Randall (W.A. Department of Agriculture and Food) with information extracted from his online searchable database, (http://weeds.cbit.uq.edu.au/). This database, now known as the Introduced Flora of Australia and its Weed Status known as the Global Compendium of Weeds, is found at http://www.hear.org/gcw/ is a list of plant species (over 28,000 names) that have been cited in specific references (approximately 1,000) as weeds. An expert has assessed the status of the weed based on its context in each document. The following information was therefore added to the source list:

- Number of Weed References – the number of weed references listed for each scientific name. If no references were in the database the field is blank.

3. A further two categories were added to the amended sources list. These categories were:

- Priority for assessment. This is the criterion added by an expert panel to prioritise the weed species for assessment using the WRM System. Scores added were high, medium or low .based on the prioritisation criteria, outlined below in step 4.
- Problems with taxonomy. If the taxonomy of the group was not known to be resolved in South Australia comments could be made here.

4. An expert panel of agency staff (including the authors) then determined and applied a set of criteria for the rapid prioritisation of taxa in the dataset for subsequent detailed evaluation of weed risk using the WRM System. Various publications were consulted during the panel's round-table assessment (e.g. Jessop *et al.* 2006, Jessop & Toelken 1986, Randall 2007, Richardson *et al.* 2006, http://www.flora.sa.gov.au/census.html). Other

information was also recorded, such as taxonomic issues. This work was completed on 6 May 2009. Each species in the screened list was assigned a category below based on the criteria described under each. The purpose was to determine the priority for further weed risk assessment.

Prioritisation criteria:

A = Already (previously) assessed for weed risk

no further assessment required.

H = High priority for weed risk assessment, i.e.:

- a known and documented serious weed (i.e. many published weed references), and
- few collections in the Adelaide Herbarium, and
- long-lived or perennial life history, and
- potential to invade undisturbed sites

or

a member of the plant families, Cactaceae, Ericaceae or Rosaceae,

or

a perennial grass.

M = Medium priority for weed risk assessment, i.e.:

- some references of weediness, or known con-generic weeds, and
- low number of collections in Adelaide Herbarium.

L = Low priority for weed risk assessment, i.e.

- few or no weed references and
- no known con-generic weeds and
- the life-history is typically a low weed threat, or the species is widespread, i.e.:
  - a short-lived annual, and/or
  - grows on highly disturbed sites, and/or
  - requires summer moisture, and/or
  - known to be widely distributed (e.g. many collections or widely grown in gardens or as a crop).

Although some aspects of the latter criterion (e.g. short-lived annual) do not necessarily pertain to a low weed threat, a particular species may be so common and widely distributed that the prospect of effective control is low or cost-prohibitive. In such cases a “low” priority was usually assigned to the species, particularly if it does not present a high environmental or social impact.

5. The amended source list was then filtered for taxa recently collected within the last four decades, (since 1970) to allow for a possible lag between introduction and naturalisation (Appendix 1).

6. The amended source list of taxa collected since 1970 was then filtered for taxa with limited collections, which, in the absence of any other information were inferred as having limited geographical distribution compared to taxa with many collections. Note that this assumption may bias the data when collections are not representative, however, the collections represent empirical evidence of their status as best known at the time. From this

list, taxa considered a high priority for weed risk assessment were selected (Appendix 2) for targeted collecting and assessment using the WRM System.

Results & Discussion

Of the 1,427 plant taxa recorded in the Census as naturalised or potentially naturalised in South Australia (as of 12th February 2009), 1,216 (85.2%) were naturalised, 166 (11.7%) were questionably naturalised and 45 (3.1%) were listed both as native and naturalised in the State (i.e. occurring naturally in at least one region, but naturalised in at least one other region). For example, *Acacia melanoxylon* R.Br. with 154 records occurs naturally in some regions of the State, but there is a single record for the Eyre Peninsula recorded as questionably naturalised. Hence, it is included in the list of naturalised or potentially naturalised taxa for South Australia.

The 1,427 taxa were then considered in terms of the number of collections of each, particularly where there were limited collections (i.e. five or less specimen records) held in the State Herbarium (Figure 1).

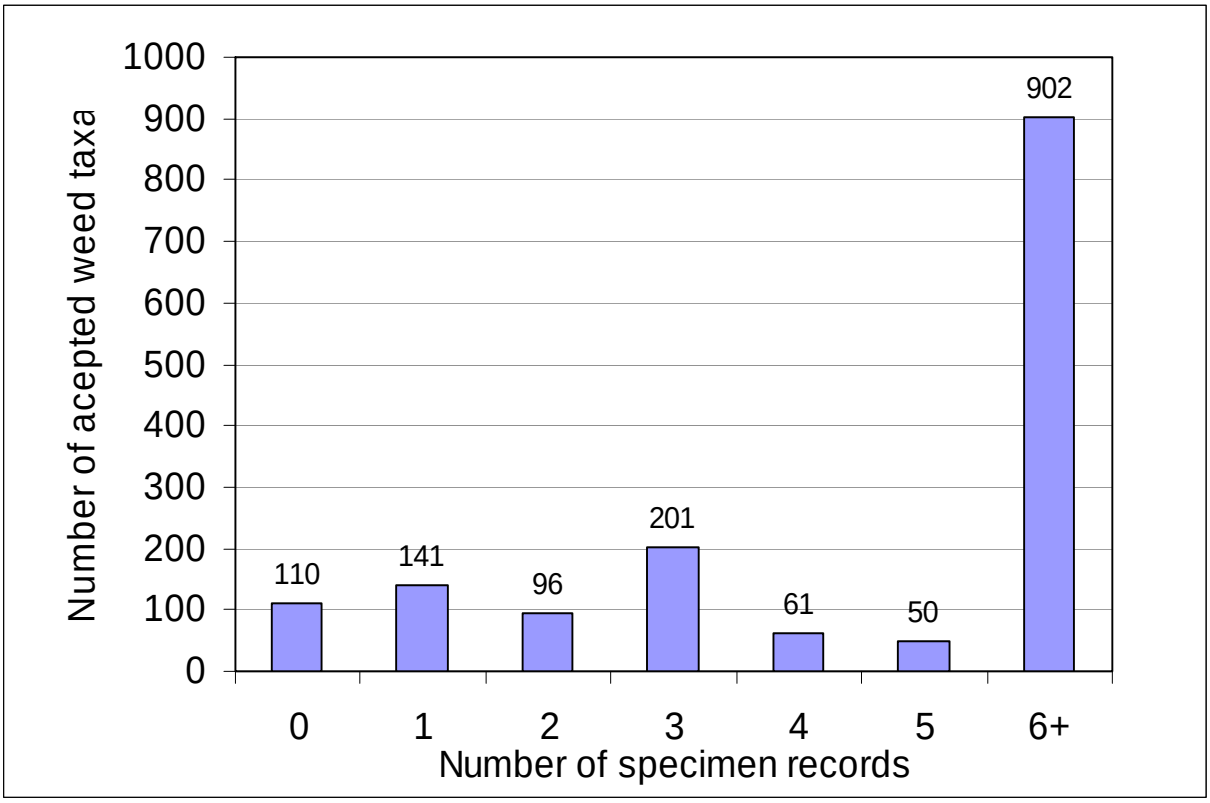

Figure 1. Numbers of accepted weed taxa held at the State Herbarium, based on number of specimen records

Of the 1,427 weedy taxa 110 are recorded as having no collections. This can be attributed to collections that have been made but the herbarium specimen is not accounted for due to several reasons not discussed here.

Collections since 1970

From the Census and ADHERB database, a total of 394 plant taxa first collected since 1970 were listed in SA (Appendix 1). Of these, 296 are naturalised and 98 are questionably naturalised.

The period of time since 1970 was assumed to represent a possible lag phase between introduction and naturalisation for the majority of exotic species. If plants have only recently become naturalised then collections are more likely to have been made in recent years (i.e.

the past 40 years) than over a longer period. A species newly introduced to the State may occupy an environment benignly for decades, but a sudden change in this environment (temperature, light levels etc) may allow them to regenerate unaided (Humphries, 1991). Aiko *et al*. (2010) have noted lag phases of 20 - 30 years for other plant groups based on herbarium records. Daehler (2009) noted that lag phases for 23 planted tropical invasive plants in Hawai'i, with average lag phases of 14 years for woody plants and 5 years for herbaceous plants. Lag phases are an area of considerable debate amongst scientists. Caley *et al.* (2008) estimated that some woody plant species may take up to 150 years to naturalise. As many taxa have been introduced into Australia in the last 200 years (Groves & Hosking, 1997), then naturalisations of woody taxa may still occur for the next 150 years, even if no further introductions into Australia were made (Caley *et al.* 2008). However, the lag phase will vary depending on the plant species and its life strategies - plants with short reproductive life cycles are potentially able to naturalise faster.

The number of exotic taxa first collected since 1970 and deposited in the State Herbarium was 394, representing 27% of the recorded naturalised flora of SA. This appears to be a consistent and constant rate of naturalisation in the 175 years of European colonisation in this regional Flora. The exotic taxa first collected since 1970 were assumed to represent recent naturalisations for the purpose of this study. The questions arise: are these taxa new naturalisations in SA, or were they already naturalised and only collected since 1970? Could these new naturalisations be attributed to a greater collecting effort during this period and therefore reflect under collection before 1970? Or alternatively, could any of these taxa be much more widespread, reflecting under collection of weeds before and after 1970?

Further examination of taxa that have recently naturalised – for example, what groups of plants (both taxonomic groups and the different types of life forms/life strategies) have naturalised, from where they originated, and what was the possible means of introduction – may help to explain the rate of naturalisations. Plant taxa identified in this study collected since 1970 could be used to direct future collecting trips and identify and target potential pathways of introduction. This information could be utilised to prevent further naturalisations. Of the 394 taxa first collected since 1970, the number of specimen records at the State Herbarium is shown in figure 2.

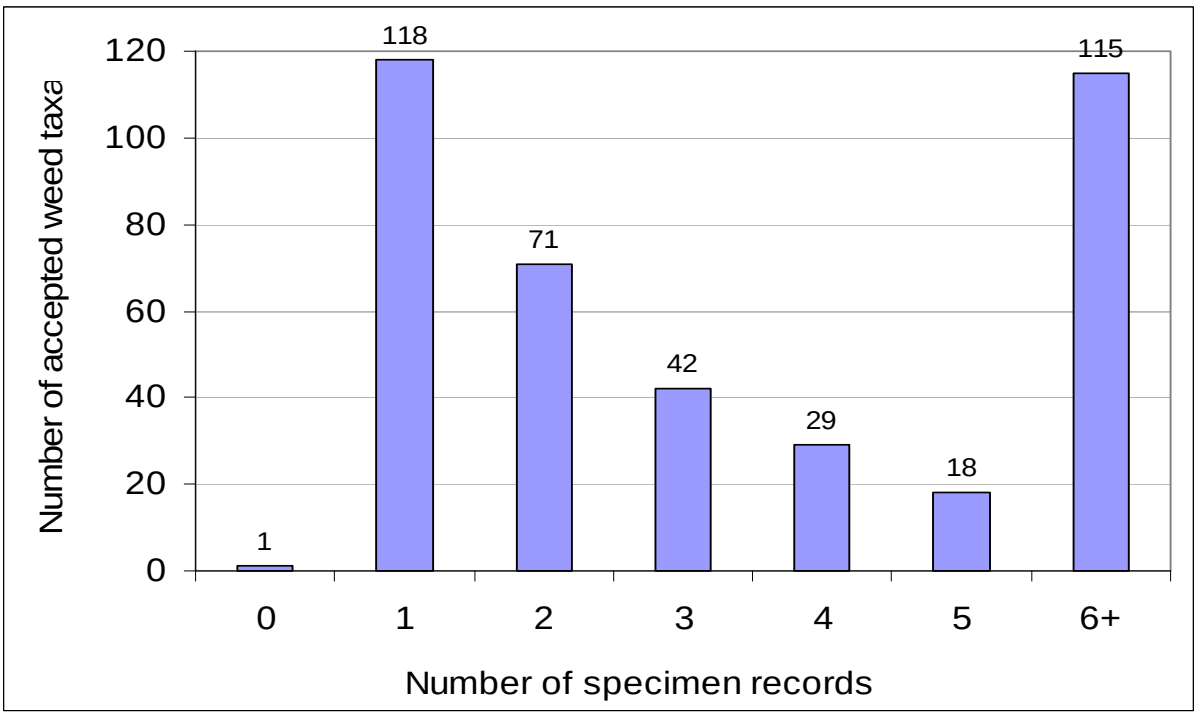

Figure 2. Numbers of accepted weed taxa first collected since 1970 held in the State Herbarium

Limited collections since 1970

The list of weedy taxa first collected since 1970 was screened for taxa with limited collections (i.e. five or less) is given in Figure 2 above.

A particular weed with limited collections may reflect a restricted geographical distribution in South Australia, in which case it may be able to be feasibly eradicated or contained. However, given the recognised under-representation of weeds in general within the State Herbarium collection, such an assumption should be treated with caution and it would therefore be prudent to collect more evidence to ascertain its true naturalisation status

With future targeted weed collecting it is hoped the following question can be answered; “are and to what extent are recent naturalisations underrepresented in the State Herbarium” and lead to an outcome where targeted weed collecting will provide a better indication of the extent to which limited collections indicate recent naturalisation.

Expert panel review

The final stage of the screening process involved the prioritisation of taxa by a panel of experts. Of the 394 weedy taxa collected since 1970, 91 were classed as a high priority for future assessment using the WRM System, 109 as medium priority and 149 as a low priority (see Figure 3). The tabulated results are given in Appendix 1.

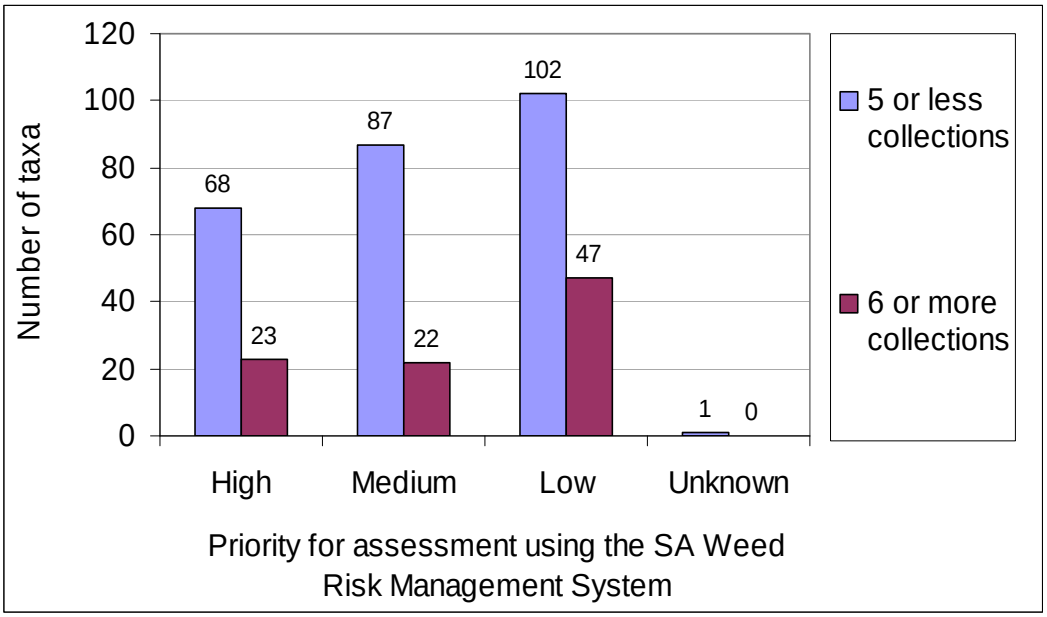

Figure 3. Prioritisation of 394 weedy taxa collected since 1970 for future assessment using the WRM System

25 of the taxa had previously been evaluated for weed risk using the WRM System at the State level and were therefore excluded from the weed risk screening. The results of the previously assessed taxa are shown in Table 1, with the exception of *Anethum gravolens* L. as data was not available.

New herbarium records, including those recently collected should be evaluated and prioritised by the weed risk screening method described in this document. Taxa that are assigned a high priority should be treated as candidates for further assessment using the WRM System.

Table 1. Exotic taxa first collected since 1970 that had previously been assessed using the SA Weed Risk Management System at the State level, with assessment results.[1] These taxa were precluded from the weed risk screening undertaken in the current study. With the exception of *Neurada procumbens* all are declared under the *NRM Act* 2004 and had been assessed as part of the declaration process.

Taxon assessed	Land-use assessed	Weed risk class (score)	Feasibility of containment class (score)[2]	Management action
Alternanthera pungens Khaki Weed	irrigated pastures	Medium (98)	Very high (1)	Contain spread
	vegetables	Low (13)	Very high (11)	Monitor
	perennial hort.	Low (34)	Very high (2)	Monitor
	urban	Low (25)	Very high (2)	Monitor
Asparagus asparagoides Bridal Creeper - Western Cape form	native vegetation	High (123)	Very high (2)	Destroy infestations
Cuscuta planiflora Red Dodder	irrigated pastures	High (135)	Very high (3)	Destroy infestations
	vegetables	Medium (84)	Very high (2)	Contain spread
Cuscuta suaveolens Chilean Dodder	irrigated pastures	High (182)	Very high (30)	Destroy infestations
	vegetables	Medium (84)	Very high (4)	Contain spread
Egeria densa Leafy Elodea	aquatic	Medium (51)	Very high (5)	Contain spread
Elodea canadensis Elodea	aquatic	Low (25)	High (16)	Monitor
Jarava plumosa Plumerillo	native vegetation	Low (13)	Very high (1)	Monitor
Nassella leucotricha Texas Needlegrass	native vegetation	Medium (79)	High (14)	Protect sites
Nassella neesiana Chilean Needlegrass	native vegetation	Medium (79)	High (14)	Protect sites
Neurada procumbens (Not declared)	grazing-rangeland	Negligible (0)	Very high (2)	Monitor
Olea europaea Olive *(including O. europaea* subsp. *cuspidata* African Olive)	native vegetation	Medium (91)	Negligible (121)	Manage sites
Opuntia robusta Wheel Cactus	grazing-rangeland	Medium (88)	High (14)	Protect sites

[1] Weed risk classes (score interval): Negligible (<13), Low (<39), Medium (<101), High (<192), Very High (192+) (Virtue et al 2005)

[2] Feasibility of containment classes (score interval): Negligible (113+), Low (< 113), Medium (< 56) High (< 31), Very High (< 14) (Virtue et al 2005)

Taxon assessed	Land-use assessed	Weed risk class (score)	Feasibility of containment class (score)[2]	Management action
	native vegetation	Low (38)	Very high (10)	Monitor
Orobanche ramosa Branched Broomrape	crop-pasture rotation	High (116)	Very high (11)	Destroy infestations
	grazing only - southern agricultural	Medium (56)	Very high (4)	Contain spread
	irrigated pastures	High (140)	Very high (2)	Destroy infestations
	vegetables	High (139)	Very high (3)	Destroy infestations
	native vegetation	Low (15)	Very high (3)	Monitor
Parkinsonia aculeata Parkinsonia	grazing-rangeland	Medium (84)	Very high (1)	Contain spread
	native vegetation	Low (32)	Very high (1)	Monitor
Ranunculus sceleratus subsp. *sceleratus* Poison Buttercup	aquatic	Low (38)	Very high (3)	Monitor
Reseda phyteuma Cutleaf Mignonette	crop-pasture rotation	High (162)	Medium (42)	Protect sites
	grazing only - southern agricultural	Low (29)	High (30)	Monitor
	grazing-rangeland	Negligible (2)	Very high (2)	Monitor
	Irrigated pastures	Low (29)	High (20)	Monitor
	vegetables	Low (25)	Medium (49)	Limited action
	perennial horticulture	Low (0)	High (23)	Monitor
Rubus fruticosus spp. agg. (including *R. phaeocarpus, R. riddelsdellii, R. ulmifolius*) Blackberries	grazing only - southern agricultural	Very high (278)	High (28)	Destroy infestations
	perennial horticulture	Low (22)	High (30)	Monitor
	forestry	Medium (77)	Medium (33)	Manage sites
	native vegetation	Medium (93)	Low (61)	Manage sites
	urban	Negligible (6)	Very high (2)	Monitor
Salix spp. Willows (for *S. alba*)	aquatic	High (126)	Very high (2)	Destroy infestations
Salvinia molesta Salvinia	aquatic	Medium (91)	Very high (2)	Contain spread
Tamarix aphylla Athel Pine	grazing-rangeland	Low (31)	Very high (10)	Monitor
	aquatic	High (124)	Very high (3)	Destroy infestations
Xanthium strumarium Noogoora Burr	Grazing only - southern agricultural	High (118)	High (18)	Contain spread
	grazing-rangeland	Low (21)	Very high (10)	Monitor
	irrigated pastures	Medium (88)	Very high (1)	Contain spread
	vegetables	Negligible (11)	Very high (1)	Monitor
	forestry	Negligible (0)	Very high (2)	Monitor

A total of 73 exotic taxa recorded as naturalised or potentially naturalised in SA with limited collections in the State Herbarium and first collected in the past 40 years were recognised as a potentially high weed risk and therefore a high priority for further using the WRM System. These are listed in descending order of the number of weed references in Appendix 2. The 73 taxa are represented by 30 families and 51 genera. The plant families Rosaceae, Cactaceae and Ericaceae are dis-proportionately represented, as membership of these families was considered sufficient for assigning a high priority without the need to consider other criteria (e.g. documented weed history).

Of the 73 high priority taxa, *Myriophyllum aquaticum* (Haloragaceae) had the highest number of citations (112). Those high priority taxa with 40 or more weed citations are listed in Table 2.

Table 2. Taxa first collected since 1970 with 40 or more weed references and recognised as a potentially high weed risk.

Plant family	**Taxa**	**No. of weed reference**
Haloragaceae	*Myriophyllum aquaticum*	112
Buddlejaceae	*Buddleja davidii*	91
Euphorbiaceae	*Euphorbia heterophylla*	81
Iridaceae	*Iris pseudacorus*	73
Leguminosae	*Gleditsia triacanthos*	72
Rosaceae	*Pyracantha angustifolia*	54
Polygonaceae	*Emex spinosa*	49
Berberidaceae	*Mahonia aquifolium*	48
Caprifoliaceae	*Leycesteria formosa*	47
Pontederiaceae	*Pontederia cordata*	45
Rosaceae	*Cotoneaster horizontalis*	41

Conclusions, Management Implications and Recommendations

The methodology described in this report is proposed as an efficient means of screening a large number of weed taxa for further risk assessment. In the case of this study 394 taxa, or 28%, of the State's recorded naturalised flora (n = 1,427 taxa; SA Plant Census at 12/2/09) have naturalised in the past 40 years and were considered candidates for weed risk screening. Given that 66% of the 2,779 introduced plant species now known to be established in the Australian environment are escaped garden plants (Groves 2005), invasive garden plants are likely to comprise at least half of the recorded naturalised flora of SA.

The robustness of the method used here may be tested by applying the WRM System assessment tool to a subset of taxa that includes the range of priority classes defined in this study. A positive correlation between screening results and assessed weed risk would encourage the application of the risk assessment tool to all taxa assigned a high priority through the screening process. In the meantime, it is suggested that all taxa screened as high priority in this study be considered as candidate alert weeds, particularly those with a high number of detections. Future collecting effort should initially focus on the 68 high priority taxa, to provide more evidence of their true naturalisation status and distribution. Limited collections may not necessarily infer actual naturalisation status, but rather, may reflect lack of collecting effort.

The collection of just over a quarter of the State's total recorded naturalised flora for the first time just in the past 40 years suggests a consistent and constant rate of naturalisations. If European colonisation is taken from the start of 1837 and an assumption is made that naturalisations commenced at that time, there have been 172 years of naturalisation history with 1,427 taxa naturalising; an average of 8.3 species per annum. If an average is calculated since 1970, a period of 39 years, 394 taxa or 10.1 species have naturalised per annum. Naturalisations in South Australia continue to occur at a similar, if not slightly higher, rate than the average over the period of European settlement. Although it is not possible to determine the true rate of naturalisations in any given period, it appears that since 1970 collectors have been more aware of weeds resulting in more collections of weeds.

We did not consider naturalisations only observed at local or regional levels. Naturalisations continue in this State even though increased awareness and willingness to attempt to eradicate weeds exists among government agencies and stakeholders, as the negative effects of weeds are realised.

Accessions of new exotic taxa to the State Herbarium's catalogued collection should be screened for their potential weed risk on a regular basis. This would provide a key measure by which the State's capability for the early detection of and response to new weed threats can be improved. Accessions of high priority or high risk taxa ("alert" weeds) should also receive priority processing and the prompt notification of relevant weed managers.

The screening of the State Herbarium's database collection for weed risk has not been undertaken in a comprehensive manner prior to this study. Kloot (1986) prepared a checklist of the naturalised alien species of South Australia based on a review of published floras and the most recent checklist of the vascular plants of South Australia (Jessop 1984). The census by Kloot (1986) revealed that at December 1984 there were 904 naturalised species in the State. Data for each species included notes on the geographical origin, means of introduction, abundance and distribution, and its present significance in South Australia as a naturalised plant.

The formal screening of new collections for weed risk should be undertaken at least annually by the weeds botanist and expert panel using the method described here to ensure that

serious weed threats to the State can be dealt with as early as possible and therefore more cost effectively. A stronger focus on a range of important activities including field surveillance, weed collecting, receiving and processing specimens from stakeholders, efficient weed identification, as well as the screening of plant collections for weed risk would significantly enhance South Australia's ability to manage agricultural and environmental weeds.

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Appendix 1. Exotic taxa first collected since 1970 and held in the State Herbarium

The following taxa are recorded as naturalised or potentially naturalised in SA and were collected since 1970. Taxa are listed in order of priority for further weed risk assessment (refer Methodology above), and then by family in descending alphabetical order.

Priority for assessment	Family	Scientific name	Problems with Taxonomy (yes/no)	Number of Weed References	No. of specimen records in State Herbarium	SA First collection date yyyymmdd	SA Last collection date yyyymmdd	Declared in SA	Status
(assessed)	Amaranthaceae	Alternanthera pungens Kunth	No	68	16	19710407	20070403	Yes	*
(assessed)	Cactaceae	Opuntia robusta H.L.Wendl.	No	21	22	19821206	20070908	Yes	*
(assessed)	Compositae	Xanthium strumarium Greene	No	138	2	19850110	19870324		*
(assessed)	Convolvulaceae	Cuscuta planiflora Ten.	No	24	8	19821007	20020423	Yes	*
(assessed)	Convolvulaceae	Cuscuta suaveolens Ser.	No	42	4	19851120	19870306	Yes	*
(assessed)	Gramineae	Jarava plumosa (Spreng.) S.W.L.Jacobs & J.Everett	No	7	4	19941231	20010830	Yes	*
(assessed)	Gramineae	Nassella leucotricha (Trin. & Rupr.) R.W.Pohl	No	9	12	19881203	20051200	Yes	*
(assessed)	Gramineae	Nassella neesiana (Trin. & Rupr.) Barkworth	No	30	10	19881118	20031203	Yes	*
(assessed)	Hydrocharitaceae	Egeria densa Planch.	No	117	1	19970417	19970417	Yes	?e
(assessed)	Hydrocharitaceae	Elodea canadensis Michx.	No	115	1	20031030	20031030	Yes	*
(assessed)	Leguminosae	Parkinsonia aculeata L.	No	65	7	19850605	20060625	Yes	*
(assessed)	Liliaceae	Asparagus asparagoides (L.) Druce f. Western Cape (R.Taplin 1133)	No		13	20050831	20070305	Yes	*
(assessed)	Neuradaceae	Neurada procumbens L.	No	5	2	20040829	20040829		*
(assessed)	Oleaceae	Olea europaea L. subsp. cuspidata (Wall. ex G.Don) Cif.	No	14	2	19820514	19870114	Yes	*
(assessed)	Orobanchaceae	Orobanche ramosa L.	No	56	3	19951003	20000922	Yes	*
(assessed)	Ranunculaceae	Ranunculus sceleratus L. subsp. sceleratus	No	3	1	20021225	20021225	Yes	*
(assessed)	Resedaceae	Reseda phyteuma L.	No	28	5	19881019	19921027	Yes	*
(assessed)	Rosaceae	Rubus phaeocarpus W.C.R.Watson	No	2	27	19961121	20041200	Yes	*
(assessed)	Rosaceae	Rubus riddelsdellii Rilstone	No	2	35	19970107	20021226	Yes	*
(assessed)	Rosaceae	Rubus ulmifolius Schott var. anoplothyrsus Sudre	No	2	24	20050400	20050400	Yes	*
(assessed)	Rosaceae	Rubus ulmifolius Schott var. ulmifolius	No	5	6	19910903	20080409	Yes	*
(assessed)	Salicaceae	Salix alba L.	Yes	34	2	19941100	19961020	Yes	?e
(assessed)	Salviniaceae	Salvinia molesta D.S.Mitch.	No	99	1	19921024	19921024	Yes	?e
(assessed)	Tamaricaceae	Tamarix aphylla (L.) H.Karst.	No	43	29	19841130	20070705		*
(assessed)	Umbelliferae	Anethum graveolens L.	No	55	3	19831226	19960128		*
Check ID	Cruciferae	Lepidium perfoliatum L.	Yes	49	2	19720928	19720928		*
HIGH	Aceraceae	Acer negundo L.	No	77	6	19870115	20051100		*
HIGH	Amaranthaceae	Aerva javanica (Burm.f.) Juss. ex Schult.	No	17	1	19771015	19771015		*
HIGH	Asclepiadaceae	Calotropis procera (Aiton) R.Br. ex W.T.Aiton	No	46	6	19870616	20010422		*
HIGH	Berberidaceae	Mahonia aquifolium (Pursh) Nutt.	Yes	48	2	19880905	19951001		*
HIGH	Boraginaceae	Amsinckia lycopsoides (Lehm.) Lehm.	No	27	4	19750929	19981000		*
HIGH	Buddlejaceae	Buddleja davidii Franch.	No	91	4	19950102	19970102		*
HIGH	Buddlejaceae	Buddleja madagascariensis Lam.	No	36	3	19850527	20040500		*

* = A naturalised occurrence (an established introduction). ?e = A questionably established / naturalised; may be simply an escape arising from and still dependent on a cultivated source

Appendix 1. Exotic taxa first collected since 1970 and held in the State Herbarium

Priority for assessment	Family	Scientific name	Problems with Taxonomy (yes/no)	Number of Weed References	No. of specimen records in State Herbarium	SA First collection date yyyymmdd	SA Last collection date yyyymmdd	Declared in SA	Status
HIGH	Cactaceae	Cylindropuntia fulgida (Engelm.) F.M.Knuth var. mamillata (A.Schott) Backeb.	No		10	19840000	20061209		*
HIGH	Cactaceae	Cylindropuntia imbricata (Haw.) F.M.Knuth	No	11	2	19800428	19900608	Yes	*
HIGH	Cactaceae	Cylindropuntia kleiniae (DC.) F.M.Knuth	No	3	1	19800428	19800428		?e
HIGH	Cactaceae	Cylindropuntia prolifera (Engelm.) F.M.Knuth	No	2	3	20051124	20070300		*
HIGH	Cactaceae	Cylindropuntia rosea (DC.) Backeb.	No	4	7	20050717	20060402		*
HIGH	Cactaceae	Cylindropuntia spinosior (Engelm.) F.M.Knuth	No	4	4	20050800	20070405		*
HIGH	Cactaceae	Cylindropuntia tunicata (Lehm.) F.M.Knuth	No	7	2	19800800	20051216	Yes	*
HIGH	Cactaceae	Echinopsis oxygona Pfeiff. & Otto	No		3	20051101	2006000		*
HIGH	Cactaceae	Echinopsis spachiana (Lem.) Friedrich & G.D.Rowley	No	5	5	20050528	20070103		*
HIGH	Cactaceae	Opuntia aurantiaca Lindl.	No	37	1	20051119	20051119	Yes	*
HIGH	Cactaceae	Opuntia elatior Mill.	No	15	14	19801007	20060508		*
HIGH	Cactaceae	Opuntia engelmannii Salm-Dyck ex Engelm.	No	11	13	19800428	20070103		*
HIGH	Cactaceae	Opuntia linguiformis Griffiths	No	2	4	19800428	20060906	Yes	*
HIGH	Cactaceae	Opuntia microdasys (Lehm.) Pfeiff.	No	11	17	19800428	20061108	Yes	*
HIGH	Cactaceae	Opuntia polyacantha Haw. var. erinacea	No		2	20041206	20050720	Yes	*
HIGH	Cactaceae	Opuntia tomentosa Salm-Dyck	No	17	7	19800800	20051217	Yes	*
HIGH	Caprifoliaceae	Leycesteria formosa Wall.	No	47	5	19801228	19931229		*
HIGH	Compositae	Ageratina adenophora (Spreng.) R.M.King & H.Rob.	No	65	6	19711028	19961130		*
HIGH	Compositae	Centaurea eriophora L.	No	11	6	19841122	19961107		*
HIGH	Compositae	Onopordum illyricum L. subsp. illyricum	No	5	4	19750114	19750115		*
HIGH	Compositae	Onopordum tauricum Willd.	No	17	3	19780301	19780301		?e
HIGH	Compositae	Verbesina encelioides (Cav.) Benth. & Hook. ex A.Gray	No	46	6	19760200	20080511		*
HIGH	Crassulaceae	Bryophyllum delagoense (Eckl. & Zeyh.) Schinz	No	27	1	19890120	19890120		*
HIGH	Cyperaceae	Cyperus albostriatus Schrad.	No	13	2	19840315	19930221		?e
HIGH	Dennstaedtiaceae	Pteridium aquilinum (L.) Kuhn	No	50	13	19800400	19960725		*
HIGH	Ericaceae	Arbutus unedo L.	No	24	3	19970107	20021206		*
HIGH	Ericaceae	Daboecia cantabrica (Hudson) K.Koch	No	10	1	19970620	19970620		*
HIGH	Ericaceae	Erica caffra L.	No	8	1	19991006	19991006		?e
HIGH	Ericaceae	Erica canaliculata Andrews	No	2	7	19990123	20070904		*
HIGH	Ericaceae	Erica cinerea L.	No	14	2	19940201	20070802		*
HIGH	Ericaceae	Erica discolor Andrews	No	6	2	19941217	19970620		*
HIGH	Ericaceae	Erica glandulosa Thunb.	No		1	19940201	19940201		*
HIGH	Ericaceae	Erica hirta Thunb.	No	2	3	20070726	20080208		?e
HIGH	Ericaceae	Erica hirtiflora Curt.	Yes	50	10	19941217	20071010		*
HIGH	Ericaceae	Erica mauritanica L.	No	10	3	19981025	20041002		*
HIGH	Ericaceae	Erica melanthera Thunb.	No	2	1	19960608	19960608		?e
HIGH	Ericaceae	Erica peziza Lodd.	No	11	10	19970620	20071000		*
HIGH	Ericaceae	Erica quadrangularis Salisb.	No	2	16	19881020	20071000		*
HIGH	Ericaceae	Erica simulans Dulfer	No		7	19970620	20070904		*
HIGH	Ericaceae	Erica subulata J.C.Wendl.	No	2	1	19970620	19970620		*
HIGH	Ericaceae	Erica vestita Thunb.	No	1	12	19911201	20080208		*

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HIGH	Euphorbiaceae	Euphorbia heterophylla L.	No	81	1	19950417	19950417		*
HIGH	Fagaceae	Quercus ilex L.	No	20	4	19930118	20040500		*
HIGH	Fagaceae	Quercus palustris Muenchh.	No	11	1	20050400	20050400		*
HIGH	Flacourtiaceae	Dovyalis caffra (Hook.f. & Harv.) Hook.f.	No	6	1	20031000	20031000		*
HIGH	Gramineae	Aira praecox L.	No	28	5	19801113	19971109		*
HIGH	Gramineae	Phyllostachys aurea Riviere & C.Riviere	No	33	1	19960908	19960908		?e
HIGH	Gramineae	Thinopyrum elongatum (Host) D.R.Dewey	No	3	14	19810222	20080107		*
HIGH	Gramineae	Thinopyrum junceiforme (A.Love & D.Love) A.Love & D.Love	No	11	12	19830929	19980320		*
HIGH	Haloragaceae	Myriophyllum aquaticum (Vell.) Verdc.	No	112	2	20031107	20040411		*
HIGH	Iridaceae	Iris pseudacorus L.	Yes	73	2	19951201	19971116		*
HIGH	Labiatae	Lavandula stoechas L.	No	30	4	19731022	20031026		*
HIGH	Leguminosae	Bituminaria bituminosa (L.) C.H.Stirton	No	1	1	20040400	20040400		?e
HIGH	Leguminosae	Ceratonia siliqua L.	No	20	2	19920424	20020309		?e
HIGH	Leguminosae	Cercis siliquastrum L.	No	20	3	19920400	20050600		*
HIGH	Leguminosae	Gleditsia triacanthos L.	No	62	3	19760100	20040400		*
HIGH	Liliaceae	Asparagus densiflorus (Kunth) Jessop	No	36	2	19921221	19960104		?e
HIGH	Liliaceae	Asparagus plumosus Baker	No	29	8	19780923	20070503		*
HIGH	Liliaceae	Cordyline australis (G.Forst.) Endl.	No	23	2	20050518	20050800		?e
HIGH	Onagraceae	Ludwigia palustris (L.) Bayl.Ell.	No	38	1	19840114	19840114		*
HIGH	Pinaceae	Pinus canariensis C.Smith	No	18	3	19931200	19940719		*
HIGH	Pittosporaceae	Pittosporum crassifolium A.Cunn.	No	27	2	19950103	20071222		?e
HIGH	Pittosporaceae	Pittosporum tenuifolium Sol. ex Gaertn.	No	17	1	19960303	19960303		?e
HIGH	Polygonaceae	Emex spinosa (L.) Campd.	No	49	2	19800000	20051118		?e
HIGH	Pontederiaceae	Pontederia cordata L.	No	45	1	19930416	19930416		?e
HIGH	Rosaceae	Amelanchier laevis Wiegand	No	5	1	19960303	19960303		?e
HIGH	Rosaceae	Cotoneaster coriaceus Franch.	No	2	3	19960525	20080521		*
HIGH	Rosaceae	Cotoneaster dammeri C.K.Schneid.	No	6	1	19950507	19950507		*
HIGH	Rosaceae	Cotoneaster frigidus Wall. ex Lindl.	No	9	1	19990212	19990212		?e
HIGH	Rosaceae	Cotoneaster glaucophyllus Franch.	No	28	27	19771214	20061126		*
HIGH	Rosaceae	Cotoneaster horizontalis Decne.	No	41	1	19960126	19960126		?e
HIGH	Rosaceae	Cotoneaster microphyllus Lindl.	No	20	1	19991121	19991121		?e
HIGH	Rosaceae	Crataegus azarolus L.	No	9	21	19770502	20080300		*
HIGH	Rosaceae	Crataegus crus-galli L.	No	15	4	19930116	20050704		*
HIGH	Rosaceae	Crataegus phaenopyrum (L.f.) Medik.	No	3	2	19960210	19960303		*
HIGH	Rosaceae	Photinia serratifolia (Desf.) Kalkman	No	9	1	20031000	20031000		*
HIGH	Rosaceae	Pyracantha angustifolia (Franch.) C.K.Schneid.	Yes	54	3	19870118	20010400		*
HIGH	Rosaceae	Pyracantha coccinea M.Roem.	No	31	2	19950318	19950408		*
HIGH	Rosaceae	Pyracantha koidzumii (Hayata) Rehder	No	12	12	19831109	20060212		*
HIGH	Rosaceae	Pyracantha rogersiana (A.B.Jacks.) Coltm.-Rog.	No	13	3	19940601	20050500		?e
HIGH	Rosaceae	Pyrus amygdaliformis Vill.	No	1	1	19961217	19961217		?e
HIGH	Rosaceae	Pyrus calleryana Decne.	No	9	1	20050315	20050315		*
HIGH	Rosaceae	Rosa bracteata J.C.Wendl.	No	19	2	19981223	19981223		*

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HIGH	Rosaceae	Rosa chinensis Jacq.	No	8	1	19811124	19811124		?e
HIGH	Rosaceae	Rosa gallica L.	No	17	3	19771113	19981125		*
HIGH	Rosaceae	Rosa indica L.	No	2	1	19950612	19950612		*
HIGH	Rosaceae	Rosa luciae Franch. & Rochebr.	No	7	10	19880319	20071208		*
HIGH	Rosaceae	Rubus moluccanus L.	No	3	1	19960427	19960427		*
HIGH	Rosaceae	Sorbus aucuparia L.	No	29	1	19980408	19980408		?e
HIGH	Salicaceae	Populus alba L.	No	98	11	19731008	20050500		*
HIGH	Salicaceae	Populus nigra L.	No	37	4	19870117	20041200		*
HIGH	Salicaceae	Populus tremula L.	No	14	3	19960126	20050720		?e
HIGH	Ulmaceae	Ulmus procera Salisb.	No	21	10	19771027	20041030		*
MEDIUM	Agavaceae	Phormium tenax J.R.Forst. & G.Forst.	No	36	1	19880123	19880123		?e
MEDIUM	Agavaceae	Yucca gloriosa L.	No	18	3	19920606	20080800		?e
MEDIUM	Aizoaceae	Ruschia tumidula (Haw.) Schwantes	No	11	1	20061104	20061104		*
MEDIUM	Amaranthaceae	Gomphrena celosioides Mart.	No	63	2	19900107	19940122		*
MEDIUM	Anacardiaceae	Rhus typhina L.	Yes	32	1	19940213	19940213		?e
MEDIUM	Apocynaceae	Nerium oleander L.	No	55	15	19800222	20051200		*
MEDIUM	Araceae	Arum italicum Mill.	No	41	2	19940425	20061001		*
MEDIUM	Asclepiadaceae	Araujia sericifera Brot.	No	75	6	19720215	19930916		*
MEDIUM	Berberidaceae	Berberis darwinii Hook.	No	38	1	19970108	19970108		?e
MEDIUM	Betulaceae	Alnus jorullensis Kunth	Yes		1	20040700	20040700		?e
MEDIUM	Betulaceae	Betula pendula L.	No	24	2	19961214	19980212		?e
MEDIUM	Betulaceae	Carpinus caroliniana Walter	No	1	1	20050400	20050400		*
MEDIUM	Cannabaceae	Cannabis sativa L.	No	94	5	19930425	20030800		?e
MEDIUM	Celastraceae	Euonymus europaeus L.	No	19	2	19860330	19940107		?e
MEDIUM	Celastraceae	Euonymus japonicus Thunb.	No	25	1	19930600	19930600		?e
MEDIUM	Cistaceae	Cistus ladanifer L.	No	12	1	19960330	19960330		?e
MEDIUM	Compositae	Carthamus tinctorius L.	No	43	7	19860400	19940209		*
MEDIUM	Compositae	Centaurea nigrescens Willd. subsp. nigrescens	No	5	1	19990207	19990207		*
MEDIUM	Compositae	Gazania rigens (L.) Gaertn.	No	37	7	19831219	20000906		*
MEDIUM	Compositae	Ursinia anthemoides (L.) Poir.	No	8	3	20011103	20031017		*
MEDIUM	Crassulaceae	Aeonium arboreum (L.) Webb & Berthel.	No	28	7	19861203	20060913		*
MEDIUM	Crassulaceae	Aeonium haworthii Webb & Berthelot	No	15	3	20051231	20060911		*
MEDIUM	Crassulaceae	Bryophyllum fedtschenkoi (Raym.-Hamet & H.Perrier) Lauz.-March.	No	8	2	19920714	19981002		*
MEDIUM	Crassulaceae	Cotyledon orbiculata L. var. oblonga (Haw.) DC.	No	4	4	19750218	20070128		*
MEDIUM	Crassulaceae	Cotyledon orbiculata L. var. orbiculata	No	5	9	19870100	20060911		*
MEDIUM	Crassulaceae	Crassula ciliata L.	No	4	5	19811217	20010100		*
MEDIUM	Crassulaceae	Crassula multicava Lem. subsp. multicava	No	10	5	20010814	20050602		*
MEDIUM	Crassulaceae	Crassula spathulata Thunb.	No	5	4	19880220	20040400		*
MEDIUM	Crassulaceae	Sedum rupestre L.	No	22	1	19960119	19960119		*
MEDIUM	Cruciferae	Malcolmia africana (L.) R.Br. ex W.T.Aiton	No	27	2	19880923	19920916		*
MEDIUM	Cupressaceae	Cupressus macrocarpa Hartw. ex Gordon	No	34	12	19850527	19950410		*
MEDIUM	Euphorbiaceae	Euphorbia marginata Pursh	No	29	1	19981223	19981223		?e

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MEDIUM	Geraniaceae	Geranium purpureum Vill.	No	18	2	20021011	20070810		*
MEDIUM	Geraniaceae	Geranium robertianum L.	No	39	6	19811219	19991125		*
MEDIUM	Geraniaceae	Geranium sanguineum L.	No	8	1	19850320	19850320		?e
MEDIUM	Geraniaceae	Geranium sibiricum L.	No	28	1	19881100	19881100		?e
MEDIUM	Gramineae	Bromus lithobius Trin.	No	8	2	19940110	19941127		*
MEDIUM	Gramineae	Cenchrus echinatus L.	No	105	6	19811216	20010514		*
MEDIUM	Gramineae	Cenchrus pennisetiformis Hochst. & Steud. ex Steud.	No	7	6	19730520	19850609		*
MEDIUM	Gramineae	Cynodon nlemfuensis Vanderyst var. nlemfuensis	No	7	7	19880921	20051019		*
MEDIUM	Gramineae	Eragrostis superba Peyr.	No	20	1	19790503	19790503		*
MEDIUM	Gramineae	Melica ciliata L.	No	3	4	19880220	19911223		*
MEDIUM	Gramineae	Miscanthus sinensis Anders.	Check id	47	2	19860519	19880612		*
MEDIUM	Gramineae	Panicum antidotale Retz.	No	25	1	19940504	19940504		*
MEDIUM	Gramineae	Panicum buncei F.Muell. ex Benth.	No	4	1	19890323	19890323		*
MEDIUM	Gramineae	Panicum coloratum L.	No	20	1	19870125	19870125		*
MEDIUM	Gramineae	Panicum maximum Jacq. var. trichoglume Eyles ex Robyns	No	8	4	19880614	19890515		*
MEDIUM	Gramineae	Phalaris arundinacea L. var. arundinacea	No	7	4	19861220	19950103		*
MEDIUM	Gramineae	Phalaris arundinacea L. var. picta L.	No	17	2	19870117	19880212		*
MEDIUM	Gramineae	Spinifex longifolius R.Br.	Similar to Native species	2	1	19950727	19950727		?e
MEDIUM	Guttiferae	Hypericum calycinum L.	No	39	6	19870407	20051217		*
MEDIUM	Hippocastanaceae	Aesculus hippocastanum L.	No	42	3	19870118	20050400		?e
MEDIUM	Labiatae	Glechoma hederacea L.	No	59	2	19870117	19940220		*
MEDIUM	Labiatae	Lavandula canariensis Mill. var. canariae Upson & Andrews	No		0	19930713	19930713		*
MEDIUM	Leguminosae	Acacia fimbriata A.Cunn. ex G.Don	No	1	9	19940212	20050900		*
MEDIUM	Leguminosae	Acacia floribunda (Vent.) Willd.	No	13	7	19720807	20050900		*
MEDIUM	Leguminosae	Acacia howittii F.Muell.	No	3	7	19891020	20071204		?e
MEDIUM	Leguminosae	Acacia pulchella R.Br. var. glaberrima Meisn.	No	2	5	19891008	19981007		*
MEDIUM	Leguminosae	Anagyris foetida L.	No	5	1	19881210	19881210		*
MEDIUM	Leguminosae	Callistachys lanceolata Vent.	No	9	7	19791200	20011100		*
MEDIUM	Leguminosae	Cicer arietinum L.	No	19	2	19891103	19981212		*
MEDIUM	Leguminosae	Colutea arborescens L.	No	26	1	19950116	19950116		?e
MEDIUM	Leguminosae	Coronilla vaginalis Lam.	No	3	3	20020829	20040415		*
MEDIUM	Leguminosae	Coronilla varia L.	No	46	1	19981223	19981223		?e
MEDIUM	Leguminosae	Gastrolobium villosum Benth.	No	2	1	19981025	19981025		?e
MEDIUM	Leguminosae	Podalyria sericea R.Br.	No	17	1	19960518	19960518		?e
MEDIUM	Leguminosae	Senna multiglandulosa (Jacq.) Irwin & Barneby	No	18	1	19711202	19711202		*
MEDIUM	Leguminosae	Sesbania cannabina (Retz.) Poir. var. cannabina	No	2	3	19920424	20040500		
MEDIUM	Leguminosae	Wisteria sinensis (Sims) DC.	No	31	1	20030100	20030100		*
MEDIUM	Lentibulariaceae	Utricularia gibba L.	No	22	1	19950408	19950408		*
MEDIUM	Liliaceae	Agapanthus praecox Willd. subsp. orientalis	No	18	2	19730115	19880212		?e

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		(F.M.Leight.) F.M.Leight.							
MEDIUM	Liliaceae	Aloe maculata All.	No	10	1	20050715	20050715		*
MEDIUM	Liliaceae	Alstroemeria aurantiaca D.Don	No	2	1	19900217	19900217		?e
MEDIUM	Liliaceae	Asparagus scandens Thunb.	No	30	15	19911223	20061004		*
MEDIUM	Liliaceae	Lachenalia aloides (L.f.) Pers. ex Engl.	No	10	7	19700809	20060730		*
MEDIUM	Liliaceae	Lachenalia bulbifera (Cirillo) Engl.	No	12	3	19840820	19960824		?e
MEDIUM	Liliaceae	Tulbaghia violacea Harvey	No	6	2	19890108	19900200		?e
MEDIUM	Martyniaceae	Proboscidea louisianica (Mill.) Thell.	No	43	2	19861100	19971227		*
MEDIUM	Myrtaceae	Callistemon viminalis (Sol. ex Gaertn.) G.Don	No	7	2	19991106	19991229		?e
MEDIUM	Myrtaceae	Eucalyptus conferruminata D.J.Carr & S.G.M.Carr subsp. conferruminata	No		2	19990516	19990516		*
MEDIUM	Myrtaceae	Eucalyptus sideroxylon A.Cunn. ex Woolls	No	11	3	19950514	20050400		?e
MEDIUM	Myrtaceae	Melaleuca armillaris (Sol. ex Gaertn.) Sm. subsp. armillaris	No	2	19	19780403	20061029		*
MEDIUM	Myrtaceae	Melaleuca hypericifolia Sm.	No	12	4	19870117	19970530		*
MEDIUM	Myrtaceae	Myrtus communis L.	No	6	8	19870115	20040300		*
MEDIUM	Onagraceae	Oenothera drummondii Hook. subsp. drummondii	No	4	2	19891225	19990517		*
MEDIUM	Orchidaceae	Disa bracteata Sw.	No	7	62	19880410	20071030		*
MEDIUM	Orobanchaceae	Orobanche minor L.	No	64	9	19921105	20021104	Yes	*
MEDIUM	Palmae	Chamaerops humilis L.	No	5	2	20000326	20000326		*
MEDIUM	Palmae	Phoenix canariensis Hort. ex Chabaud	No	36	7	19920606	20021121		*
MEDIUM	Palmae	Washingtonia filifera H.Wendl.	No	25	2	19880614	19880614		*
MEDIUM	Plumbaginaceae	Plumbago auriculata Lam.	No	20	1	19880319	19880319		?e
MEDIUM	Polemoniaceae	Navarretia squarrosa (Eschsch.) Hook. & Arn.	No	24	1	19820408	19820408		*
MEDIUM	Proteaceae	Grevillea dimorpha F.Muell.	No		2	19960910	19970620		?e
MEDIUM	Proteaceae	Grevillea juniperina R.Br. subsp. juniperina	No	1	2	20040108	20040908		*
MEDIUM	Proteaceae	Grevillea manglesii (Graham) Planch. subsp. manglesii	No		3	19870120	20010201		?e
MEDIUM	Proteaceae	Grevillea sericea (Sm.) R.Br. subsp. sericea	No	1	3	19961005	20050316		*
MEDIUM	Proteaceae	Grevillea vestita (Endl.) Meisn. subsp. vestita	No		1	19870114	19870114		?e
MEDIUM	Proteaceae	Hakea bucculenta C.A.Gardner	No	1	1	19940500	19940500		?e
MEDIUM	Proteaceae	Hakea cucullata R.Br.	No	2	1	19990605	19990605		*
MEDIUM	Proteaceae	Hakea drupacea (C.F.Gaertn.) Roem. & Schult.	No	16	6	19861107	20041029		*
MEDIUM	Proteaceae	Hakea prostrata R.Br.	No	2	2	19950103	19970525		*
MEDIUM	Proteaceae	Hakea salicifolia (Vent.) B.L.Burtt subsp. salicifolia	No	3	9	19930509	20050600		?e
MEDIUM	Proteaceae	Hakea sericea Schrad. & J.C.Wendl.	No	48	2	20050300	20050530		?e
MEDIUM	Proteaceae	Hakea teretifolia (Salisb.) Britten	No	1	1	20050400	20050400		?e
MEDIUM	Proteaceae	Hakea undulata R.Br.	No	2	5	19951210	20050600		*
MEDIUM	Rosaceae	Potentilla argentea L.	No	5	1	19951201	19951201		?e
MEDIUM	Rosaceae	Potentilla crantzii (Crantz) Beck ex Fritsch	No	4	1	19920119	19920119		?e
MEDIUM	Rosaceae	Potentilla indica (Andrews) Th.Wolf	No	35	4	19840110	20060100		?e
MEDIUM	Rosaceae	Potentilla supina L.	No	1	2	19970708	19970708		*
MEDIUM	Rosaceae	Prunus salicina Lindl.	No	6	7	19741014	19811217		*
MEDIUM	Rutaceae	Agathosma crenulata (L.) Pillans	No	1	1	19891005	19891005		?e

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MEDIUM	Rutaceae	Coleonema pulchellum I.Williams	No	7	15	19831219	20060905		*
MEDIUM	Rutaceae	Ruta graveolens L.	No	34	1	19870426	19870426		*
MEDIUM	Scrophulariaceae	Hebe parviflora (Vahl) Cockayne & Allan	No	2	1	19870118	19870118		?e
MEDIUM	Scrophulariaceae	Hebe speciosa (A.Cunn.) Cockayne & Allan	No	9	1	19710120	19710120		*
MEDIUM	Tiliaceae	Tilia europaea L.	No	2	1	19940227	19940227		*
MEDIUM	Tremandraceae	Platytheca galioides Steetz	No	1	1	19750800	19750800		?e
LOW	Amaranthaceae	Amaranthus caudatus L.	No	58	15	19880504	20050400		*
LOW	Amaranthaceae	Amaranthus cruentus L.	No	55	7	19840319	19970525		*
LOW	Amaranthaceae	Amaranthus hybridus L.	Yes	114	1	19980413	19980413		*
LOW	Amaryllidaceae	Narcissus jonquilla L.	No	11	3	20040800	20050828		*
LOW	Amaryllidaceae	Narcissus pseudonarcissus L.	No	40	1	19860902	19860902		*
LOW	Amaryllidaceae	Sternbergia lutea (L.) Ker Gawl. ex Spreng. subsp. lutea	No	2	1	20070402	20070402		*
LOW	Apocynaceae	Catharanthus roseus (L.) G.Don	No	56	1	19930407	19930407		?e
LOW	Araliaceae	Hedera helix L. subsp. helix	No	9	2	20060202	20060402		*
LOW	Bignoniaceae	Tecoma alata DC.	No	1	2	19880229	19950904		*
LOW	Boraginaceae	Borago officinalis L.	No	55	10	19830913	20060100		*
LOW	Boraginaceae	Myosotis discolor Pers. subsp. discolor	No	2	7	19911122	20051000		*
LOW	Callitrichaceae	Callitriche brutia Petagna var. brutia	No		3	19731200	19900100		*
LOW	Campanulaceae	Lobelia laxiflora Kunth	No	6	1	19890312	19890312		*
LOW	Cannabaceae	Humulus lupulus L.	No	32	4	19870208	19950313		*
LOW	Caryophyllaceae	Silene armeria L.	No	39	5	19890200	19990414		?e
LOW	Caryophyllaceae	Silene longicaulis Pourr. ex Lag.	No	9	3	19850925	19921003		?e
LOW	Caryophyllaceae	Silene pseudoatocion Desf.	No		7	19701004	19960922		?e
LOW	Caryophyllaceae	Spergularia rubra (L.) J. & C.Presl	Yes	51	51	19741109	20041104		*
LOW	Caryophyllaceae	Stellaria pallida (Dumort.) Crep.	No	27	5	20030913	20060709		*
LOW	Chenopodiaceae	Suaeda baccifera Pall.	No	10	18	19840310	20080130		*
LOW	Commelinaceae	Murdannia graminea (R.Br.) G.Bruckn.	No	1	1	19840524	19840524		?e
LOW	Commelinaceae	Tradescantia cerinthoides Kunth	No	6	2	19950508	20050400		?e
LOW	Compositae	Arctotheca populifolia (P.J.Bergius) Norl.	No	14	15	19770120	20060920		*
LOW	Compositae	Centaurea cineraria L.	No	7	7	19741006	20071105		?e
LOW	Compositae	Crepis dioscoridis L.	No	2	1	19721105	19721105		*
LOW	Compositae	Euchiton limosus (D.G.Drury) Holub	No		2	19891212	19901118		?e
LOW	Compositae	Gaillardia grandiflora Pursh	No	15	1	20050200	20050200		?e
LOW	Compositae	Gamochaeta pensylvanica (Willd.) Cabrera	No	27	1	19881130	19881130		?e
LOW	Compositae	Gazania linearis (Thunb.) Druce	No	23	32	19801008	20060913		*
LOW	Compositae	Mauranthemum paludosum (Poir.) Vogt & Oberpr.	No	6	5	19781018	19950903		*
LOW	Compositae	Osteospermum fruticosum (L.) Norl.	No	15	17	19720616	20060913		*
LOW	Compositae	Scorzonera laciniata L.	No	21	7	19921022	20051100		*
LOW	Compositae	Soliva anthemifolia (Juss.) R.Br. ex Less.	No	36	2	19850919	19850919		*
LOW	Compositae	Tagetes minuta L.	No	106	4	19800500	20040600		*
LOW	Compositae	Taraxacum cygnorum Hand.-Mazz.	Yes		1	19751010	19751010		*
LOW	Compositae	Taraxacum pseudocalocephalum Soest	Yes	2	4	19820100	19820202		*

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LOW	Compositae	Tragopogon brevirostris DC. subsp. longifolius (Heldr. & Sart. ex Boiss.) I.Richardson	No		1	19990307	19990307		?e
LOW	Compositae	Tragopogon hybridus L.	No	8	3	19870106	19941117		?e
LOW	Convolvulaceae	Ipomoea cairica (L.) Sweet	No	60	3	19740929	19930407		*
LOW	Convolvulaceae	Ipomoea carnea Jacq.	No	17	1	19890123	19890123		*
LOW	Convolvulaceae	Merremia dissecta (Jacq.) Hallier f.	No	17	2	19850515	19940120		*
LOW	Cruciferae	Brassica fruticulosa Cirillo	No	18	1	19821212	19821212		*
LOW	Cruciferae	Calepina irregularis (Asso) Thell.	No	17	7	19861016	19930917		*
LOW	Cruciferae	Cardamine flexuosa With.	No	36	12	19760923	20040900		*
LOW	Cruciferae	Diplotaxis muralis (L.) DC. var. muralis	No	2	3	20080226	20080226		*
LOW	Cruciferae	Erysimum cheiri (L.) Crantz	No	34	4	19740912	19741010		*
LOW	Cruciferae	Erysimum suffruticosum Spreng.	No		1	19980215	19980215		?e
LOW	Cruciferae	Heliophila pusilla L.f.	No	8	1	19921200	19921200		*
LOW	Cruciferae	Lepidium bonariense L.	No	58	8	19770524	20040400		*
LOW	Cruciferae	Malcolmia flexuosa (Sibth. & Sm.) Sibth. & Sm.	No	6	2	19931200	19950318		*
LOW	Cruciferae	Rapistrum rugosum (L.) All. subsp. rugosum	No	8	45	19770729	20041102		*
LOW	Cruciferae	Rorippa sylvestris (L.) Besser subsp. sylvestris	No	2	1	19911000	19911000		*
LOW	Cucurbitaceae	Cucurbita pepo L.	No	33	4	19781006	19940426		*
LOW	Cyatheaceae	Cyathea cooperi (Hook. ex F.Muell) Domin	No	20	1	19971202	19971202		*
LOW	Cyperaceae	Isolepis hystrix (Thunb.) Nees	No	14	14	19751122	20051100		*
LOW	Euphorbiaceae	Chamaesyce hyssopifolia (L.) Small	No	18	1	20020109	20020109		*
LOW	Euphorbiaceae	Chamaesyce maculata (L.) Small	No	41	20	19760305	20080215		*
LOW	Fumariaceae	Fumaria capreolata L.	No	46	23	19770812	20060910		*
LOW	Geraniaceae	Geranium molle L. var. molle	No	3	25	19820929	20040831		*
LOW	Gramineae	Bromus alopecuros Poir.	Yes	12	1	19961111	19961111		*
LOW	Gramineae	Chloris inflata Link	No	18	1	19970706	19970706		*
LOW	Gramineae	Digitaria ischaemum (Schreb.) Schreb. ex Muhl.	No	69	5	19780302	19930403		*
LOW	Gramineae	Echinochloa crus-pavonis (Kunth) Schult.	No	38	4	19760222	20040525		*
LOW	Gramineae	Echinochloa esculenta (A.Braun) H.Scholz	No	24	3	19920329	20050430		*
LOW	Gramineae	Echinochloa pyramidalis (Lam.) Hitchc. & Chase	No	18	2	19880612	19920400		*
LOW	Gramineae	Eragrostis pilosa (L.) P.Beauv.	yes	70	8	19880217	20050500		*
LOW	Gramineae	Gaudinia fragilis (L.) P.Beauv.	No	24	1	19960103	19960103		*
LOW	Gramineae	Glyceria declinata Breb.	No	23	7	19760500	20030400		*
LOW	Gramineae	Holcus setosus Trin.	No	6	5	19861102	19941200		*
LOW	Gramineae	Hordeum glaucum Steud.	No	14	170	19830916	20071008		*
LOW	Gramineae	Hordeum marinum Huds.	No	32	41	19921021	20070223		*
LOW	Gramineae	Melinis repens (Willd.) Zizka	No	36	14	19840629	20020427		*
LOW	Gramineae	Tribolium obliterum (Hemsl.) Renvoize	No	6	13	19771213	20021226		*
LOW	Hydrophyllaceae	Phacelia tanacetifolia Benth.	No	45	3	19801002	19831102		*
LOW	Iridaceae	Chasmanthe floribunda (Salisb.) N.E.Br. var. duckittii G.J.Lewis ex L.Bolus	No	1	1	19880820	19880820		*
LOW	Iridaceae	Chasmanthe floribunda (Salisb.) N.E.Br. var. floribunda	No	1	27	20020930	20020930		*
LOW	Iridaceae	Crocosmia crocosmiiflora (Lemoine ex E.Morren)	No	9	1	19970213	19970213		*

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		N.E.Br.							
LOW	Iridaceae	Dietes iridoides Sweet	No	5	1	19900105	19900105		?e
LOW	Iridaceae	Freesia cultivar	No		8	19940912	20061127		*
LOW	Iridaceae	Iris albicans Lange	No	13	8	19720914	19851011		*
LOW	Iridaceae	Iris foetidissima L.	No	28	1	19920312	19920312		*
LOW	Iridaceae	Iris monnieri DC.	No		1	19991000	19991000		*
LOW	Iridaceae	Iris orientalis Mill.	No	16	3	19781031	20021115		*
LOW	Iridaceae	Tritonia crocata (L.) Ker Gawl.	No	15	6	19881010	20001024		*
LOW	Labiatae	Cedronella canariensis (L.) Webb & Berthel.	No	14	2	19841220	19870117		*
LOW	Labiatae	Mentha longifolia (L.) Huds.	No	20	2	19860210	20050403		?e
LOW	Labiatae	Ocimum basilicum L.	No	31	5	19860421	20000115		?e
LOW	Lauraceae	Laurus nobilis L.	No	21	3	20050400	20050704		?e
LOW	Leguminosae	Acacia sp. Winged (C.R.Alcock 4936) Maslin	No		19	19990913	20080730		
LOW	Leguminosae	Lathyrus odoratus L.	No	38	5	19871221	20051200		*
LOW	Leguminosae	Lathyrus sphaericus Retz.	No	18	2	19790314	20001028		*
LOW	Leguminosae	Lupinus luteus L.	No	31	2	19891024	19941103		*
LOW	Leguminosae	Lupinus polyphyllus Guss.	No	64	1	19911223	19911223		?e
LOW	Leguminosae	Medicago rugosa Desr.	No	14	5	19771016	19960915		*
LOW	Leguminosae	Ornithopus compressus L.	No	33	6	19861102	20071000		*
LOW	Leguminosae	Pisum sativum L.	No	43	5	19920900	20040916		*
LOW	Leguminosae	Trifolium micranthum Viv.	No	10	2	19891126	19930107		*
LOW	Leguminosae	Trifolium nigrescens Viv.	No	10	4	19901130	20051100		*
LOW	Leguminosae	Trifolium pilulare Boiss.	No	5	2	19921028	19921030		*
LOW	Leguminosae	Trifolium pratense L. var. pratense	No	1	1	19770921	19770921		*
LOW	Leguminosae	Trifolium resupinatum L. var. majus Boiss.	No	12	8	19821222	19941215		*
LOW	Leguminosae	Trifolium vesiculosum Savi var. vesiculosum	No	4	2	19930203	19950409		*
LOW	Leguminosae	Vicia cracca L.	No	44	8	19841030	20040400		*
LOW	Limoniaceae	Limonium perezii (Stapf) F.T.Hubb.	No	3	1	20071019	20071019		*
LOW	Linaceae	Linum strictum L. subsp. strictum	No	6	25	19940912	20041104		*
LOW	Malvaceae	Malva assurgentiflora (Kellogg) M.F.Ray	No	2	7	19761212	19780807		?e
LOW	Malvaceae	Pavonia coccinea Cav.	No	1	1	19850226	19850226		?e
LOW	Nymphaeaceae	Nymphaea alba L.	No	29	4	19760215	19991228		*
LOW	Orchidaceae	Serapias lingua L.	No	2	2	19971106	19981018		*
LOW	Oxalidaceae	Oxalis corniculata L. subsp. corniculata	No	5	1	20070211	20070211		*
LOW	Papaveraceae	Papaver somniferum L.	No	58	2	19841110	19841110		*
LOW	Papaveraceae	Romneya coulteri Harv.	No	5	2	19900413	19931225		?e
LOW	Passifloraceae	Passiflora caerulea L.	No	44	6	19790219	20061122		?e
LOW	Passifloraceae	Passiflora edulis Sims	No	62	1	19821101	19821101		?e
LOW	Passifloraceae	Passiflora tarminiana Coppens & V.Barney	No	17	3	19940719	20080217		*
LOW	Plantaginaceae	Plantago australis Lam.	No	16	2	19780410	19910104		*
LOW	Plantaginaceae	Plantago lanceolata L. var. dubia (L.) Wahlenb.	No	1	2	19890326	20060130		*
LOW	Plantaginaceae	Plantago lanceolata L. var. lanceolata	No	2	27	19861022	20070109		*
LOW	Polemoniaceae	Gilia tricolor Benth.	No	5	1	19860210	19860210		*

* = A naturalised occurrence (an established introduction). ?e = A questionably established / naturalised; may be simply an escape arising from and still dependent on a cultivated source

Appendix 1. Exotic taxa first collected since 1970 and held in the State Herbarium

Priority for assessment	Family	Scientific name	Problems with Taxonomy (yes/no)	Number of Weed References	No. of specimen records in State Herbarium	SA First collection date yyyymmdd	SA Last collection date yyyymmdd	Declared in SA	Status
LOW	Polygonaceae	Persicaria capitata (Buch.-Ham. ex D.Don) H.Gross	No	27	3	19861225	20080406		?e
LOW	Portulacaceae	Talinum paniculatum (Jacq.) Gaertn.	No	40	3	19880607	19990327		*
LOW	Punicaceae	Punica granatum L.	No	35	2	19940426	20010326		*
LOW	Ranunculaceae	Anemone hortensis L.	No		1	20031000	20031000		*
LOW	Ranunculaceae	Aquilegia sp.	No		1	19910201	19910201		*
LOW	Ranunculaceae	Clematis flammula L.	No	25	14	19701227	20010100		?e
LOW	Ranunculaceae	Nigella damascena L.	No	36	1	19920700	19920700		*
LOW	Ranunculaceae	Ranunculus flammula L.	No	19	1	19950409	19950409		*
LOW	Ranunculaceae	Ranunculus ophioglossifolius Vill.	No	12	2	19881119	20041100		*
LOW	Ranunculaceae	Ranunculus undosus Melville	No		1	19920103	19920103		*
LOW	Rosaceae	Prunus avium L.	No	31	4	19701031	19971210		*
LOW	Rosaceae	Prunus domestica L. subsp. domestica	No	10	10	19810708	19941208		*
LOW	Rosaceae	Prunus domestica L. subsp. insititia (L.) Kirschner	No	11	7	19811208	20011000		*
LOW	Rubiaceae	Galium palustre L.	No	15	6	19930116	19960324		*
LOW	Scrophulariaceae	Linaria pelisseriana (L.) Mill.	No	17	1	20011116	20011116		*
LOW	Scrophulariaceae	Nemesia strumosa Benth.	No	14	1	19971001	19971001		?e
LOW	Solanaceae	Lycopersicon esculentum Mill.	No	52	8	19781003	20020103		?e
LOW	Solanaceae	Petunia axillaris (Lam.) Britton, Sterns & Poggenb.	No	14	1	19950409	19950409		*
LOW	Solanaceae	Physalis angulata L.	No	74	4	19890403	19980403		*
LOW	Solanaceae	Solanum aviculare G.Forst.	No	13	6	19720113	20000318		*
LOW	Solanaceae	Solanum chenopodioides Lam.	No	29	1	19970213	19970213		*
LOW	Solanaceae	Solanum melongena L.	No	26	1	19880614	19880614		?e
LOW	Solanaceae	Solanum orbiculatum Dunal subsp. macrophyllum Symon	No	1	2	20000629	20020426		*
LOW	Solanaceae	Solanum pseudocapsicum L.	No	71	7	19830803	20060920		*
LOW	Umbelliferae	Coriandrum sativum L.	No	65	6	19810805	19931223		*
LOW	Umbelliferae	Oenanthe pimpinelloides L.	No	21	7	19711220	19720201	Yes	*
LOW	Umbelliferae	Tordylium apulum L.	No	8	3	19800930	19810924		*
LOW	Umbelliferae	Torilis arvensis (Huds.) Link subsp. purpurea (Ten.)	No	2	3	19991120	19991216		*
LOW	Valerianaceae	Centranthus ruber (L.) DC. subsp. ruber	No	13	4	20050310	20060417		*
LOW	Verbenaceae	Verbena bonariensis L.	Yes	88	2	20020103	20030216		*
LOW	Verbenaceae	Verbena officinalis L.	No	69	9	19840229	20070926		*
LOW	Verbenaceae	Verbena supina L. var. supina	No	1	72	19941106	19941106		*

* = A naturalised occurrence (an established introduction). ?e = A questionably established / naturalised; may be simply an escape arising from and still dependent on a cultivated source

Appendix 2. Recently collected exotic taxa considered high priority for weed risk assessment *with limited collections*

The following exotic taxa recorded as naturalised or potentially naturalised in SA with 5 or less collections in the State Herbarium were first collected since 1970, and were considered to be a potentially high weed risk and therefore a high priority for further weed risk assessment. The 73 taxa are listed in descending order of the number of weed references.

Family	Scientific name	Problems with taxonomy	Number of Weed References	Total no. specimen records in SH	First Year of collection	Most recent	Declared in SA (NRM Act)	Status
Haloragaceae	Myriophyllum aquaticum (Vell.) Verdc.		112	2	2003	2004		naturalised
Buddlejaceae	Buddleja davidii Franch.		91	4	1995	1997		naturalised
Euphorbiaceae	Euphorbia heterophylla L.		81	1	1995	1995		naturalised
Iridaceae	Iris pseudacorus L.	Yes	73	2	1995	1997		naturalised
Leguminosae	Gleditsia triacanthos L.		62	3	1976	2004		naturalised
Rosaceae	Pyracantha angustifolia (Franch.) C.K.Schneid.	Yes	54	3	1987	2001		naturalised
Polygonaceae	Emex spinosa (L.) Campd.		49	2	1980	2005		Questionably naturalised
Berberidaceae	Mahonia aquifolium (Pursh) Nutt.	Yes	48	2	1988	1995		naturalised
Caprifoliaceae	Leycesteria formosa Wall.		47	5	1980	1993		naturalised
Pontederiaceae	Pontederia cordata L.		45	1	1993	1993		Questionably naturalised
Rosaceae	Cotoneaster horizontalis Decne.		41	1	1996	1996		Questionably naturalised
Onagraceae	Ludwigia palustris (L.) Bayl.Ell.		38	1	1984	1984		naturalised
Salicaceae	Populus nigra L.		37	4	1987	2004		naturalised
Cactaceae	Opuntia aurantiaca Lindl.		37	1	2005	2005	Yes	naturalised
Buddlejaceae	Buddleja madagascariensis Lam.		36	3	1985	2004		naturalised
Liliaceae	Asparagus densiflorus (Kunth) Jessop		36	2	1992	1996		Questionably naturalised
Gramineae	Phyllostachys aurea Riviere & C.Riviere		33	1	1996	1996		Questionably naturalised
Rosaceae	Pyracantha coccinea M.Roem.		31	2	1995	1995		naturalised
Labiatae	Lavandula stoechas L.		30	4	1973	2003		naturalised
Rosaceae	Sorbus aucuparia L.		29	1	1998	1998		Questionably naturalised
Gramineae	Aira praecox L.		28	5	1980	1997		naturalised
Pittosporaceae	Pittosporum crassifolium A.Cunn.		27	2	1995	2007		Questionably naturalised
Crassulaceae	Bryophyllum delagoense (Eckl. & Zeyh.) Schinz		27	1	1989	1989		naturalised
Boraginaceae	Amsinckia lycopsoides (Lehm.) Lehm.		27	4	1975	1998		naturalised
Ericaceae	Arbutus unedo L.		24	3	1997	2002		naturalised
Liliaceae	Cordyline australis (G.Forst.) Endl.		23	2	2005	2005		Questionably naturalised
Fagaceae	Quercus ilex L.		20	4	1993	2004		naturalised
Rosaceae	Cotoneaster microphyllus Lindl.		20	1	1999	1999		Questionably naturalised
Leguminosae	Cercis siliquastrum L.		20	3	1992	2005		naturalised
Leguminosae	Ceratonia siliqua L.		20	2	1992	2002		Questionably naturalised
Rosaceae	Rosa bracteata J.C.Wendl.		19	2	1998	1998		naturalised
Pinaceae	Pinus canariensis C.Smith		18	3	1993	1994		naturalised
Rosaceae	Rosa gallica L.		17	3	1977	1998		naturalised

Appendix 2. Naturalised or potentially naturalised taxa collected naturalised in SA considered high priority for weed risk assessment with limited collections

Family	Scientific name	Problems with taxonomy	Number of Weed References	Total no. specimen records in SH	First Year of collection	Most recent	Declared in SA (NRM Act)	Status
Pittosporaceae	Pittosporum tenuifolium Sol. ex Gaertn.		17	1	1996	1996		Questionably naturalised
Compositae	Onopordum tauricum Willd.		17	3	1978	1978		Questionably naturalised
Amaranthaceae	Aerva javanica (Burm.f.) Juss. ex Schult.		17	1	1977	1977		naturalised
Rosaceae	Crataegus crus-galli L.		15	4	1993	2005		naturalised
Salicaceae	Populus tremula L.		14	3	1996	2005		Questionably naturalised
Ericaceae	Erica cinerea L.		14	2	1994	2007		naturalised
Rosaceae	Pyracantha rogersiana (A.B.Jacks.) Coltm.-Rog.		13	3	1994	2005		Questionably naturalised
Cyperaceae	Cyperus albostriatus Schrad.		13	2	1984	1993		Questionably naturalised
Fagaceae	Quercus palustris Muenchh.		11	1	2005	2005		naturalised
Cactaceae	Cylindropuntia imbricata (Haw.) F.M.Knuth		11	2	1980	1990	Yes	naturalised
Ericaceae	Erica mauritanica L.		10	3	1998	2004		naturalised
Ericaceae	Daboecia cantabrica (Hudson) K.Koch		10	1	1997	1997		naturalised
Rosaceae	Pyrus calleryana Decne.		9	1	2005	2005		naturalised
Rosaceae	Photinia serratifolia (Desf.) Kalkman		9	1	2003	2003		naturalised
Rosaceae	Cotoneaster frigidus Wall. ex Lindl.		9	1	1999	1999		Questionably naturalised
Rosaceae	Rosa chinensis Jacq.		8	1	1981	1981		Questionably naturalised
Ericaceae	Erica caffra L.		8	1	1999	1999		Questionably naturalised
Cactaceae	Cylindropuntia tunicata (Lehm.) F.M.Knuth		7	2	1980	2005	Yes	naturalised
Ericaceae	Erica discolor Andrews		6	2	1994	1997		naturalised
Flacourtiaceae	Dovyalis caffra (Hook.f. & Harv.) Hook.f.		6	1	2003	2003		naturalised
Rosaceae	Cotoneaster dammeri C.K.Schneid.		6	1	1995	1995		naturalised
Compositae	Onopordum illyricum L. subsp. illyricum		5	4	1975	1975		naturalised
Cactaceae	Echinopsis spachiana (Lem.) Friedrich & G.D.Rowley		5	5	2005	2007		naturalised
Rosaceae	Amelanchier laevis Wiegand		5	1	1996	1996		Questionably naturalised
Cactaceae	Cylindropuntia spinosior (Engelm.) F.M.Knuth		4	4	2005	2007		naturalised
Rosaceae	Rubus moluccanus L.		3	1	1996	1996		naturalised
Cactaceae	Cylindropuntia kleiniae (DC.) F.M.Knuth		3	1	1980	1980		Questionably naturalised
Rosaceae	Crataegus phaenopyrum (L.f.) Medik.		3	2	1996	1996		naturalised
Rosaceae	Rosa indica L.		2	1	1995	1995		naturalised
Cactaceae	Opuntia linguiformis Griffiths		2	4	1980	2006	Yes	naturalised
Ericaceae	Erica subulata J.C.Wendl.		2	1	1997	1997		naturalised
Ericaceae	Erica melanthera Thunb.		2	1	1996	1996		Questionably naturalised
Ericaceae	Erica hirta Thunb.		2	3	2007	2008		Questionably naturalised
Cactaceae	Cylindropuntia prolifera (Engelm.) F.M.Knuth		2	3	2005	2007		naturalised
Rosaceae	Cotoneaster coriaceus Franch.		2	3	1996	2008		naturalised
Rosaceae	Pyrus amygdaliformis Vill.		1	1	1996	1996		Questionably naturalised
Leguminosae	Bituminaria bituminosa (L.) C.H.Stirton		1	1	2004	2004		Questionably naturalised
Cactaceae	Opuntia polyacantha Haw. var. erinacea			2	2004	2005	Yes	naturalised
Ericaceae	Erica glandulosa Thunb.			1	1994	1994		naturalised
Cactaceae	Echinopsis oxygona Pfeiff. & Otto			3	2005	200		naturalised

Glossary

ADHERB: the database of the State Herbarium of South Australia containing individual specimen records and associated information.

Agricultral weed: A non-native plant species that has become naturalised and is spread in agricultural systems.

Environmental weed: A naturalised weed that colonises natural ecosystems.

Exotic: A plant growing outside of it natural range, usually from another part of Australia or another country but not always naturalised.

Habitat: The natural place or type of site in which an animal or plant, or communities of plants and animals, lives.

Introduced plant: A non-native plant to the particular geographic region it was introduced.

Invasive: Any non-native plant that is expanding its range and populations through sexual reproduction or vegetative reproduction over many life cycles and is able to do this over large distances therefore having potential to spread. Invasive plants are recognised as major threatening process to natural ecosystems or agricultural systems. The greater the invasiveness of a plant the faster it will expand it distributional range.

Native species (a native plant or taxa): A taxa that has evolved in that given area with out human intervention that may have subsequently spread to other areas from which it is native without any intentional or unintentional human intervention.

Natural Resources Management (NRM): All activities that involve the use or development of natural resources and/or that impact on the state and condition of natural resources, whether positively or negatively administered by the South Australian State Government.

Naturalised: A non-native taxon that is successfully reproducing while maintaining or increasing its population without aid.

Questionably naturalised species: are those for which there is insufficient information to establish whether they are naturalised.

subsp.: Subspecies.

Stakeholder: Any organisation, land managers or individuals with an interest financial or otherwise in weeds in the environment for either increasing their knowledge base on the flora, or the deleterious effects of weeds on ecosystem or agricultural systems.

Synonym: A previously used or old name for a plant species.

Weed: a plant that has originally been introduced by humans to an area deliberately or accidentally, then has self propagated without aid where it is not wanted, possibly spreading by natural means to new areas. In South Australia these weeds can be plants introduced from overseas or another region in Australia Intra or interstate.

Weeds of disturbed sites: An unwanted or ephemeral plant not necessarily a weed as defined here.

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