

Knowledge document of the impact of priority wetland weeds

Part 1 – Selection of the priority wetland weeds

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Author

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Photo credit

Parrots Feather *Myriophyllum aquaticum*. Daniel Clements (Agriculture Victoria, DEDJTR)

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1. Introduction

There are a large number of weeds present in Victorian wetlands, which vary in their distribution, abundance and significance. Some weeds have a formal classification (e.g. National Alert weeds, Weeds of National significance, Victorian Noxious weeds etc), have been the subject of active management and research effort, and have guidance available regarding their management. Others have received far less attention, including regarding their impacts on the environment and how they can be effectively managed. It is often difficult for wetland managers to determine which wetland weeds should be the focus on their attention, in this context of limited knowledge as well as limited resources.

During a 2014 workshop of Victorian wetland managers, the investigation of the effectiveness of invasive species management in wetlands was identified as a priority issue. DELWP Water and Catchments subsequently funded work to prioritise wetland weeds, and collate information regarding their management, to support wetland managers.

This report presents the first part of a two part process to describe the impacts on wetlands of priority wetland weeds, including information about knowledge gaps. This report details the process for determining the priority wetland weeds and has been undertaken by Agriculture Victoria for DELWP Water and Catchments Group. Section 1 provides background to the project, its scope, and goals and objectives.

Part 2 of the project is provided in a second report:

Weiss, J. and Dugdale, T. (2017). Knowledge document of the impact of priority wetland weeds: Part 2 – Impacts of the priority weeds on wetlands. Report prepared for Department of Environment, Land, Water and Planning (DELWP) Water and Catchments Group by Agriculture Victoria.

These two steps (and associated reports) are the first Phase of a proposed three Phase project to develop a Wetland Weed Management Tool. This information will be used to inform two further phases of the project, which are described in Section 4.3 of (Weiss and Dugdale 2017).

1.1 Effectiveness of invasive species management in wetlands

1.1.1 Background

The project described in the previous section is a component of a large project entitled “Effectiveness of invasive species management in wetlands”.

The Victorian Waterway Management Strategy (VWMS) sets out policy direction on the management of invasive species in waterways in Chapter 16. Policy 16.3 states that the Victorian Government will support research that informs invasive species management in waterways. Action 12.5 of the VWMS relates to preparing guidance for landholders on sustainable use of wetlands. Regional waterway strategies include a range of activities to manage the threat to wetlands from invasive species.

Under the Victorian Waterway Management Program, there is considerable investment in management activities to manage the threats from invasive species to wetland condition and values. These activities include control or eradication of invasive species, or surveillance to detect the introduction of new species that have the potential to be invasive. Although there is a considerable amount of information on invasive species, much of this information is not specific to wetlands or presented in a form that is readily accessible to wetland planners or managers.

Wetland planners and managers require guidance to assist them in setting appropriate objectives for invasive species surveillance, control or eradication. These objectives need to be based on knowledge of the expected outcomes from a range of management activities to control invasive species. Wetland planners and managers also require consolidated and easily accessible information on effective and suitable techniques to manage invasive species in wetlands.

There are a large number of invasive species that currently impact on the condition and values of wetlands in Victoria. Benchmark descriptions for wetland ecological vegetation classes (EVCs) identify approximately 150 weeds that pose a high threat to wetland vegetation across Victoria (DEPI 2013). Some invasive species are widespread, impacting wetlands across Victoria, while others are more localised and are related to particular wetland landscapes, wetland types or land use settings.

1.1.2 Scope

The scope of this project relates to wetlands in inland and coastal situations (areas with standing or very slow flowing water), including coastal saltmarshes. Marine wetlands and those in the main body of estuaries are excluded. The focus of the project is the management of invasive species in naturally occurring wetlands, though the findings may also be of relevance to wetlands of human origin.

Given the large numbers of invasive species impacting on wetlands in Victoria, the project will need to focus on a select number of high priority wetland invasive species. The project focus should be on providing guidance on the effectiveness of managing these high priority invasive species in Victorian wetlands with the aims of improving wetland condition and protecting wetland values that are directly threatened by invasive species, for example native wetland fauna through predation or displacement.

Prioritisation of invasive species to select those for which guidance will be developed should focus on:

- the prevalence of various invasive species
- the level of risk to wetland condition and values from individual or particular groups of invasive species
- the likely effectiveness of control and
- the current state of knowledge and the feasibility of undertaking research to fill knowledge gaps within the budget and timeframe of the project.

The following factors may influence the level of risk of invasive species to wetland condition and values:

- pathways for the introduction or reintroduction of invasive species to wetlands
- landscape setting
- wetland type
- land use setting
- the condition of the wetland
- impact pathways and severity of impact on wetland components, processes and values and
- the likely influence of climate change on wetland attributes and the range of invasive species.

Factors related to the effectiveness of surveillance, control and eradication measures are likely to include the above factors and in addition:

- feasibility of eradication or control for different invasive species
- thresholds for effective control over the short and longer term
- suitable control techniques including any undesirable impacts of such techniques in wetlands
- effective surveillance strategies to guard against reintroduction or the introduction of new invasive species and
- monitoring requirements to support effective control.

1.1.3 Goals and objectives

The goal of this project is to improve the effectiveness of the management of high priority invasive species in Victoria's wetlands. It will do this by prioritising weeds present in Victorian wetlands and synthesizing existing information and management guidance for use by wetland planners and managers to enable them to set objectives and undertake effective actions for invasive species management with predictable outcomes. The objectives of the project are to:

- identify invasive species that pose a threat to Victoria's wetlands
- identify high priority invasive species for the development of guidance
- identify existing knowledge and knowledge gaps on the management of high priority invasive species.

1.2 Impact of priority wetland weeds

The project has three phases, two of which have not yet been commissioned:

Phase 1 – Develop a knowledge document of the impact of priority wetland weeds

The first step of Phase 1, (Part 1 report), includes the following steps:

- Arrange and conduct a voting and vetting system to determine the 30 wetland weed species
- Present the outcome to stakeholders to ensure they are satisfied with the outcome and that the species in the list makes intuitive sense.

The second step of Phase 1 (Part 2 report):

- Select the wetland values that the impact of the weeds will be considered against
- Conduct information reviews to provide further information
- Identify knowledge gaps and other issues identified in the above steps
- Produce a report which
 - documents the method used and outcomes of above
 - provides a knowledge document describing the impacts of each species on wetland values, including information about knowledge gaps.

Phase 2 – Create control guides for the priority species

This stage of the project has not yet been commissioned.

Phase 3 – Create Wetland Weed Management Tool

This stage of the project has not yet been commissioned.

2 Approach to prioritise weeds for the study

Within the scope of this project, it was necessary to develop an approach to reduce the large number of weeds under consideration. The approach is outlined below.

A workshop was held on January 8, 2016 to reduce the initial wetland weed list of 174 spp to between 50-70 species for a stakeholder survey. Present: Tony Dugdale, John Weiss, Doug Frood and Pam Clunie.

2.1 Methodology

2.1.1 Origin of list and cross-referencing

An initial list of 174 species of weeds occurring in wetlands, riparian zones and their buffer regions was compiled from several sources, including the EVC benchmarks for the DELWP Index of Wetland Condition, DSE's Advisory list of environmental weeds of aquatic habitats of Victoria (Adair *et al.* 2008), and a previous survey of aquatic water managers of actively managed wetland weeds. Some additional species were included, based on field observations by the workshop participants (*Tamarix aphylla*, *Tamarix ramosissima*, *Isolepis hystrix*, *Limonium hyblaëum*, *Limonium companyonis*). An additional three species were added during the meeting (*Arundo donax*, *Rosa canina*, and *Hypericum tetrapterum*).

Preliminary review of list

The weed list was then databased and cross-referenced with Victorian Noxious weeds categories, the Advisory list of environmental weeds of aquatic habitats of Victoria (Adair *et al.* 2008), Victorian Alert weeds, National Alert weeds, Weeds of National significance and Environmental Weeds of Victoria (Carr *et al.* 1992) (Appendix 1). We removed all names at the generic level where the possibilities were covered by the listings at the species level (e.g. *Xanthium* spp.).

We categorised context and habitat of all species (Table 1, Appendix 1). Of the 174 species, eight species were identified as native to Victoria (but are weedy in particular circumstances; Appendix 1). While *Utricularia gibba* and *Marsilea mutica* may be opportunistic at some locations, both are currently regarded by DELWP as native species. *U. gibba* is considered vulnerable in Victoria and *M. mutica* is considered inadequately known in Victoria on the DELWP Victorian Advisory List of rare or threatened plants.

It was agreed that the number of EVCs a species has the potential to invade may not be a good indicator for filtering. This is because a species could occur in a number of EVCs but have relatively minor impact in them, compared to another species that only occurs in one EVC, but has a major impact in that community.

2.1.2 Process for “weeding” out list (refer to flow diagram – Figure 1)

Step 1 – Remove State Prohibited Weeds

As responsibility for controlling, managing and eradicating State Prohibited Weeds (SPWs) in Victoria rests with DEDJTR, and there are existing management plans for these species, State Prohibited weeds were removed from the list. The other categories of noxious weeds, Regionally Prohibited and Regionally Controlled, are CMA specific, so they were not used as a filtering process.

Step 2 – Remove native species of engineered waterways

Some of the native species are only weedy in artificial wetlands (dams), or in engineered waterways which are out of the scope of this project. All native species in context category of “N1: Native wetland species, potentially problematic in irrigation systems” were removed from the list. While *Azolla* spp., *Typha* spp. (other than the introduced *T. latifolia*), and *Phragmites australis* are native, these were retained on the list as they can be problematic for the management of some wetlands, largely due to the impacts of altered ecological processes.

Step 3 – Remove terrestrial species

The scope of this project defines the area of concern as “wetlands in inland and coastal situations (areas with standing or very slow flowing water) but excludes marine wetlands and those in the main body of estuaries but not coastal saltmarshes. Specifically, marine pests are excluded”. This definition removes plants that occur in the areas/buffers that surround wetlands. These buffer regions are encompassed by habitat classification of “TR: Primarily terrestrial species, to some extent tolerant of waterlogging and

potentially problematic on floodplains, or sometimes marginal to wetlands and managed within wetland reserves.” These species were removed from the list.

Step 4 – Keep species under existing weed management programs

As the project has strong end-user/stakeholder involvement, weed species that had already been identified as under active management by aquatic managers (previous survey) were prioritised to be kept on the list.

Step 5 – Remove species with minor impact

Many of the species still on the list were identified as having little or negligible impact on wetland values. It is understood that all weeds have a localised strong impact as competitors for light, water, nutrients etc., but at a larger scale specific weeds which occur at lower frequencies have minor impacts on wetland values. We did not take into account whether the weed had limited distribution but only on its potential impact on wetland values.

When making this decision, we used our knowledge of the species, as well as comparing to the DSE Advisory list and to Carr’s *et al.* (1992) risk categories. Thirteen species were removed as they were determined to have only small scale/minor impacts. An additional two species initially listed by DSE but currently considered to be native (*Utricularia gibba* and *Marsilea mutica*) were also omitted at this stage.

Step 6 – Remove species with very short lifecycle

Some of the species still on the list were identified as species that had rapid growth and reached maturity in a short time period (i.e. weeks to a couple of months). This short life span would make management of these species problematic as they most likely would have reproduced and set seed before control action could be implemented or be effective.

Step 7 – Remove ubiquitous species

Some of the species still remaining were identified as being very common and widespread both in and adjacent to wetlands. All species remaining on the list were classified as to whether they are ubiquitous, very common, widespread, beyond general intervention (or at habitat saturation), or otherwise. In terms of management, these particular weed species either cannot be realistically selectively controlled with the available resources, or if controlled in wetland areas, would quickly re-invade from adjacent areas, negating the usefulness of the control as well as increasing control costs (labour, herbicide etc.). Again, when making this decision, we used our knowledge of the species, as well as comparing to the DSE Advisory list and to Carr’s *et al.* (1992) risk categories.

Final step

All species (those of the 70 remaining species or those dropped off) were reviewed by the participants to ensure we were satisfied with the list and had not missed anything obvious. If in any of the steps, we were unsure of the category of the species and whether it should be dropped or not, the species were kept on the list. The final list of 70 species is shown in Table 2.

Table 1. Context and habitat definition used to classify wetland weeds.

Context
N1: Native wetland species, potentially problematic in irrigation systems.
N2: Native wetland species, excessive growth sometimes problematic in wetland systems, primarily as indicator of altered process.
IA: Opportunistic introduced annual (to biennial) grasses and forbs of drier phases of wetlands (or highly ephemeral/shallow wetland communities).
IE: Very small introduced ephemeral species, generally relatively minor weeds, sometimes competitive to other small plants in very shallow ephemeral wetland habitats.
IO: Introduced obligate wetland species.
IS: Introduced species of seasonal wetland habitats.
IT: Primarily terrestrial (at least short-lived) introduced perennial species, extending into at least margins of seasonal wetlands, generally very difficult to manage.
Habitat
AF: Surface floating aquatic.
AQ: At least substantially submerged aquatic, mostly attached.
AM: Amphibious / semi-aquatic species.
MH: Herbaceous species (forbs and grasses) expressing during drawdown phase (including 'mud herbs').
SM: Obligate (usually coastal) saltmarsh species. Note that species placed in other categories can also be relatively salt-tolerant.
BM: Bogs and moss beds
FR: Fringing or marginal species, tolerant of seasonal / intermittent shallow inundation or marginal wetland habitats.
TR: Primarily terrestrial species, to some extent tolerant of waterlogging and potentially problematic on floodplains, or sometimes marginal to wetlands and managed within wetland reserves.
RI: Riparian verges of streams

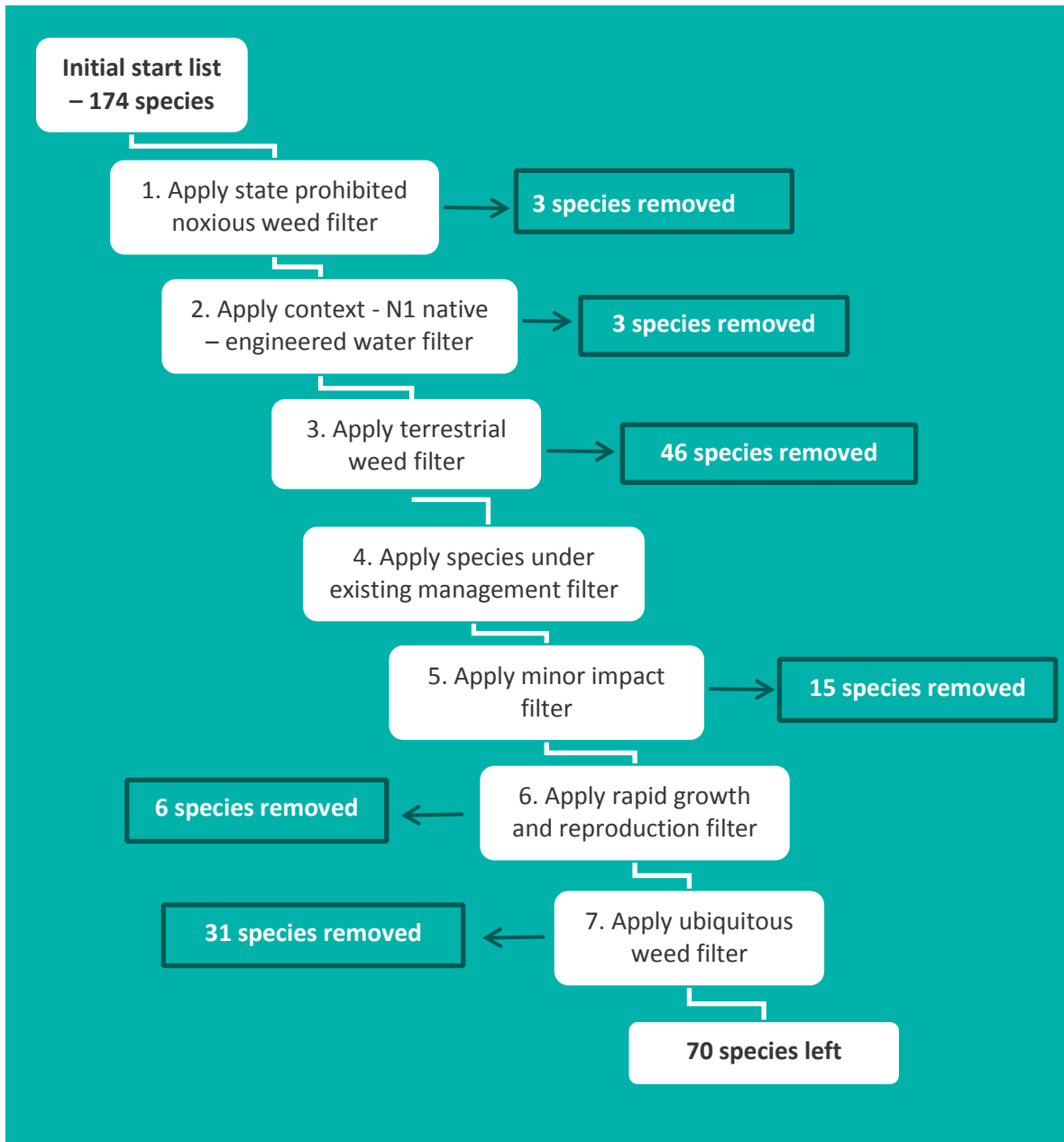


Figure 1. Flow chart of filtering process to reduce original list of 174 wetland weed species for stakeholder prioritisation survey.

Table 2. List of 70 priority species used for stakeholder weed prioritisation survey.

Scientific name	Common name
<i>Agrostis stolonifera</i>	Creeping Bent
<i>Alisma lanceolatum</i>	Water Plantain
<i>Alopecurus geniculatus</i>	Marsh Fox-tail
<i>Alopecurus</i> spp.	Fox Tail
<i>Aponogeton distachyos</i>	Cape Pondlily
<i>Arundo donax</i>	Giant reed
<i>Azolla</i> spp.	Azolla
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba
<i>Cortaderia</i> spp.	Pampas Grass Text
<i>Cyperus eragrostis</i>	Drain Flat-sedge
<i>Egeria densa</i>	Egeria
<i>Elodea canadensis</i>	Canadian pondweed
<i>Festuca arundinacea</i>	Tall Fescue
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert ash
<i>Gymnocoronis spilanthoides</i>	Senegal tea
<i>Hydrocleys nymphoides</i>	Water Poppy
<i>Hypericum tetrapterum</i>	St Peter's Wort
<i>Iris pseudacorus</i>	Yellow Flag Iris
<i>Jacobaea vulgaris</i>	Ragwort
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush
<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush
<i>Juncus bulbosus</i>	Bulbous Rush
<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush
<i>Juncus microcephalus</i>	Tiny-headed Rush
<i>Leersia oryzoides</i>	Rice Cut-grass
<i>Lilaea scilloides</i>	Lilaea
<i>Limonium companyonis</i>	Sea Lavender
<i>Lonicera japonica</i>	Japanese Honeysuckle
<i>Lophopyrum ponticum</i>	Tall Wheat-grass
<i>Limonium hyblaeum</i>	Sea Lavender
<i>Ludwigia palustris</i>	Marsh Ludwigia
<i>Lycium ferocissimum</i>	African Box-thorn
<i>Lythrum junceum</i>	Mediterranean Loosestrife
<i>Mentha pulegium</i>	Pennyroyal
<i>Mimulus moschatus</i>	Musk Monkey-flower
<i>Myriophyllum aquaticum</i>	Parrot's Feather
<i>Nassella hyalina</i>	Cane Needle-grass
<i>Nasturtium officinale</i>	Watercress
<i>Nymphaea mexicana</i>	Waterlily
<i>Nymphaea</i> spp.	Waterlily
<i>Panicum coloratum</i>	Coolah Grass
<i>Paspalum distichum</i>	Water Couch
<i>Phalaris aquatica</i>	Toowoomba Canary-grass
<i>Phalaris arundinacea</i>	Reed Canary-grass

Scientific name	Common name
<i>Phragmites australis</i>	Common reed
<i>Phyla canescens</i>	Fog-fruit
<i>Polypogon viridis</i>	Water Bent
<i>Pontederia cordata</i>	Pickerel Weed
<i>Potentilla anserina</i>	Silverweed
<i>Psoralea pinnata</i>	Blue Psoralea
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh-grass
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rorippa palustris</i>	Marsh Yellow-cress
<i>Rubus anglocandicans</i>	Common Blackberry
<i>Rubus fruticosus</i> spp. agg.	Blackberry
<i>Sagittaria</i> spp.	Sagittaria
<i>Salix cinerea</i>	Grey Sallow
<i>Salix</i> spp.	Willow
<i>Sparganium erectum</i>	Branching Bur-reed
<i>Spartina</i> spp.	Cord Grass
<i>Tamarisk aphylla</i>	Athel pine
<i>Tamarisk ramosissima</i>	Salt Cedar
<i>Trifolium fragiferum</i> var. <i>fragiferum</i>	Strawberry Clover
<i>Typha latifolia</i>	Lesser Reed-mace
<i>Typha</i> spp.	Cumbungi
<i>Verbena bonariensis</i> s.l.	Purple-top Verbena
<i>Verbena supina</i>	Trailing Verbena
<i>Xanthium spinosum</i>	Bathurst Burr
<i>Xanthium strumarium</i> spp. agg.	Noogoora Burr species aggregate

3 Survey of wetland managers

3.1 Aim

Developing management guides for 174 weed species is not feasible and of little use. Therefore, the aim of the survey was to further shortlist the number of high priority wetland weed species to approximately 30.

A survey was chosen as the best method for eliciting information given time and resource limitations. A more formal, rigorous, weed prioritisation process for wetland weeds would take substantially more time and resources. The survey approach also allows wetland weed managers to have a say in the weeds that would be prioritized, and thus have weed management guides developed.

The impacts on wetland values of those 30 species will then be documented. This will form the knowledge basis to prioritise the wetland weed species for the management guides (in a subsequent project).

3.2 Methods

We formulated a survey consisting of seven questions: four asked to tick all species (of the shortlisted 70) that were relevant, and three entailed voting 10 points to particular species.

Questions:

1. Which are the introduced weeds you are PRESENTLY ACTIVELY controlling (within last 2 years) in natural wetlands? (tick/cross as many as are relevant)
2. What are the weeds that you FEEL CONFIDENT in controlling (have the relevant knowledge or techniques)? (tick/cross as many as are relevant)
3. What are the weeds that you feel LEAST confident in managing (either in knowledge or techniques)? (tick/cross as many as are relevant)
4. What are the weeds that you would like to control but don't have sufficient resources/time? (tick/cross as many as are relevant)
5. What weeds do you want more information on the BIOLOGY?
Voting – have 10 votes (Can vote multiple times for single weed or spread votes)
6. What weeds do you want more information on CONTROL OPTIONS?
Voting – have 10 votes (Can vote multiple times for single weed or spread votes)
7. What weeds do you not have at present in your area but think they will be your future priority weeds?
Voting – have 10 votes (Can vote multiple times for single weed or spread votes)

3.3 Survey respondents

A total of 155 individuals across Water Authorities, CMAs, Parks Victoria and Local Councils were emailed directly with the survey. Some of the email addresses were no longer valid and some of those contacted forwarded the survey to others in their organisation. In total, 14 emails were invalid, in which nine were on extended leave and five no longer worked for the organization.

Survey respondents were as follows:

- 1 local council
- 2 from Melbourne Water
- 2 from Goulburn-Murray Water
- 3 from Goulburn Broken CMA
- 2 from East Gippsland CMA
- 1 each from North East, West Gippsland, Port Phillip and Westernport, Corangamite, Wimmera, and North Central CMAs
- 1 contractor from West Gippsland.

Return rate was 17 from 127 (13%). This is an underestimate of the total respondents involved as sometimes only one person returned the survey from an organisation whilst indicating that they consulted across their organisation. The return rate from an organisation perspective was 22% (12 organisations replied from three Water Authorities, 10 CMAs, Parks Victoria, and 40 local councils

3.4 Results

The highly ranked wetland weed species for each question are shown in Appendix 2.

Of particular interest to the project were the survey questions that aimed to discover the gaps in the knowledge of wetland managers regarding how to control particular species and what they had least confidence in managing (Question 3), or where more information was needed (Questions 5 and 6). In addition, which wetland weeds they were aware of that could be future problems (Question 7).

To determine if questions were correlated, we undertook regression analysis to compare results of the species ranking from each of the questions to each other, and to final rankings (total and of only questions 3567) – Figure 2.

The only questions in which the resultant rankings were strongly correlated were Q1 with Q2, and Q5 with Q6. Q7 was the least correlated to any of the other questions. Q1 correlates with Q2 because Q1 lists the weeds that they are currently managing and Q2 lists the weeds that they are confident managing, we expect a high level of confidence for the weeds that are actively managed; Q5 correlates with Q6 because Q5 are the species for which they would like more information on the biology and Q6 is the species they would like more information on control methods, it is if they don't know much about a weed then they won't know much about biology or control; Q7 related to species that could be future priority weeds.

3.5 Summary

Questions 3, 5, 6 and 7 are the key selection factors in terms of addressing stakeholder needs for information on biology, impacts and control methods of present and future weeds. The highest ranked weeds according to these questions are shown in **Table 3**. Species down to and including *Phalaris aquatica* (ranked 28th equal) will be used to develop the impact on wetland values knowledge document.

We also ranked the species using only Question 5 and 6, and using Questions 3, 5, and 6. Regardless of the method, the species in the top 15 did not change (although their order did; **Table 4**). Differences did occur between position 15 and 28: three species were no longer in the top 28 when Questions 3, 5, and 6 were used; and eight species were moved out when Question 5 and 6 were used. These differences are minor, and so we are happy to use the original ranking (based on Question 3, 5, 6 and 7).

This list of 28 species was circulated to the same email list used in the initial survey. Participants were asked to provide feedback on the species list within two weeks. Two responses suggested that other species should be added.

The first was *Glyceria maxima*. Melbourne Water indicated that they had undertaken waterway improvement works costing \$20,000 to \$50,000 per annum over a 15-year period in areas east of Cardinia Creek. *G. maxima* is a weed of small waterways, wet and boggy areas and wetlands. It has the potential to invade and transform shallow waterbodies by accumulating biomass and sediments, filling the free water areas while overwhelming the native plants growing at the location (David Carew, Melbourne Water, personal communication). *Glyceria maxima* was not on the initial list of 174 weed species and was not added in subsequent steps. Based on the feedback above this species will be added to the shortlist for determining impacts.

The second was a list of nine weeds (*Paspalum distichum*, *Holcus lanatus*, *Aster subulatus*, *Plantain major*, *Polypogon spp.*, *Rumex crispus*, *Rumex conglomeratus*, *Cotula coronopifolia* and *Atriplex prostrata*), provided by Johnny Knowles (Wyndham City Council). Mr Knowles indicated "A large portion of my time in this industry (15 years) has been involved with maintaining wetlands and waterways all over Melbourne and extending to further rural sections of Victoria, and the species I have listed above are very common places". All of these species were on the list of 174 species. *Polypogon viridis* was on the list of 70 species included in the survey (**Table 2**) and was removed because not enough people voted for it. *Paspalum distichum* is ranked number 10 on the final shortlist (**Table 3**). The remaining species were removed at the first workshop stage, because they were ubiquitous (Step 7 – Page 4). We therefore do not recommend making any changes associated with these species.

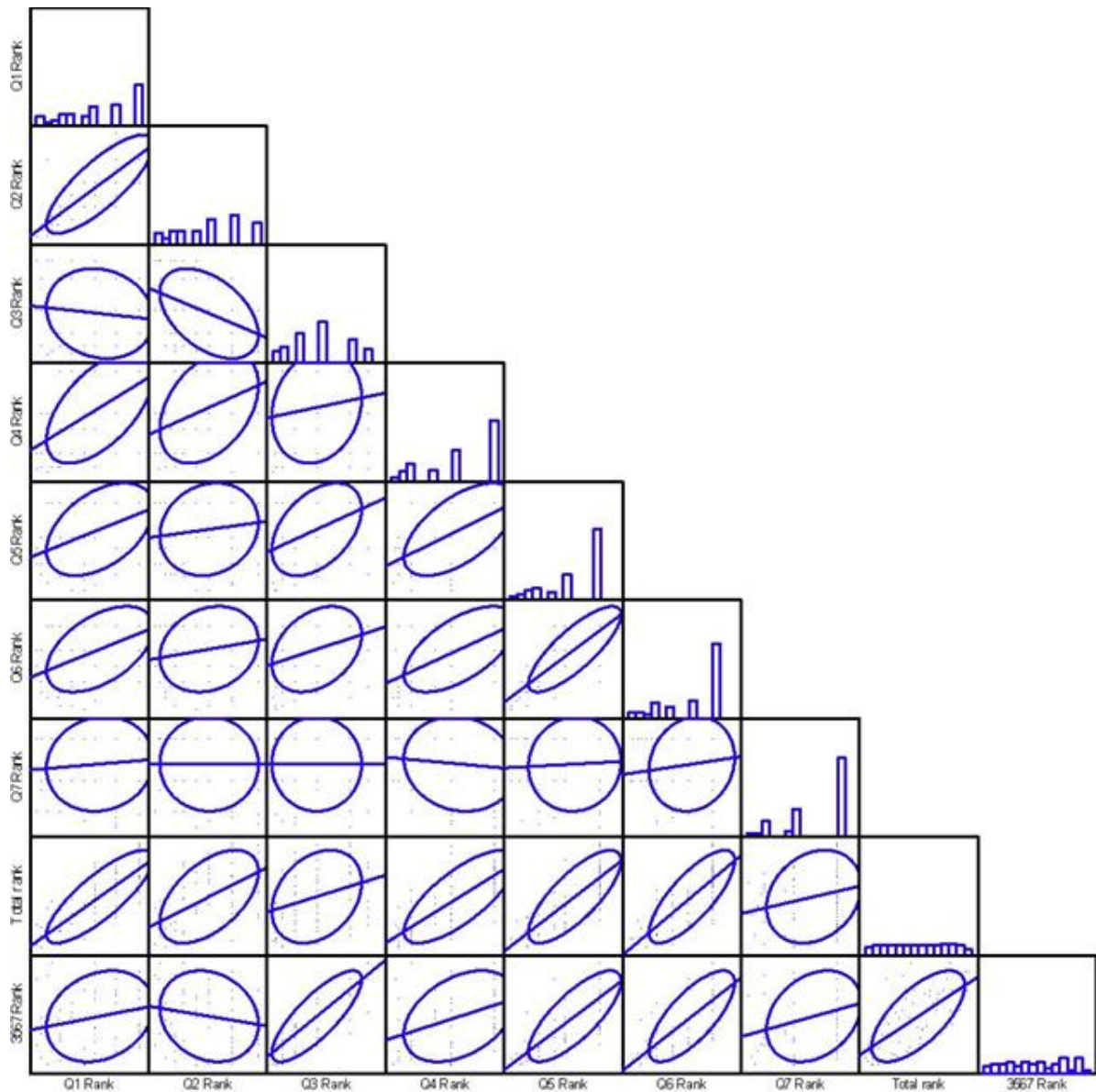


Figure 2. Scatter plot matrix comparing the relationship between each of the species ranks from 7 questions and the two final ranks.

Straight lines indicate linear regression, ovals gaussian distribution with \pm one standard deviation.

Table 3. The list of species ranked according to importance across Questions 3, 5, 6 and 7 (total list not shown).

Scientific name	Common name	3,5,6,7 rank
<i>Sagittaria</i> spp.	Sagittaria	1
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	2
<i>Myriophyllum aquaticum</i>	Parrot's Feather	2
<i>Cyperus eragrostis</i>	Drain Flat-sedge	4
<i>Spartina</i> spp.	Cord Grass	5
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	6
<i>Egeria densa</i>	Egeria	7
<i>Azolla</i> spp.	Azolla	8
<i>Limonium hyblaenum</i>	Sea Lavender	9
<i>Gymnocoronis spilanthoides</i>	Senegal tea	10
<i>Paspalum distichum</i>	Water Couch	10
<i>Phalaris arundinacea</i>	Reed Canary-grass	12
<i>Phyla canescens</i>	Fog-fruit	13
<i>Salix</i> spp.	Willow	14
<i>Elodea canadensis</i>	Canadian Pondweed	15
<i>Iris pseudacorus</i>	Yellow Flag Iris	16
<i>Phragmites australis</i>	Common reed	17
<i>Aponogeton distachyos</i>	Cape Pondlily	18
<i>Lilaea scilloides</i>	Lilaea	19
<i>Xanthium strumarium</i> spp. agg.	Noogoora Burr species aggregate	19
<i>Typha</i> spp.	Cumbungi	21
<i>Hydrocleys nymphoides</i>	Water Poppy	22
<i>Salix cinerea</i>	Grey Sallow	22
<i>Nassella hyalina</i>	Cane Needle-grass	24
<i>Ludwigia palustris</i>	Marsh Ludwigia	25
<i>Mentha pulegium</i>	Pennyroyal	26
<i>Nasturtium officinale</i>	Watercress	27
<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush	28
<i>Juncus microcephalus</i>	Tiny-headed Rush	28
<i>Phalaris aquatica</i>	Toowoomba Canary-grass	28
<i>Lonicera japonica</i>	Japanese Honeysuckle	31
<i>Arundo donax</i>	Giant reed	32
<i>Festuca arundinacea</i>	Tall Fescue	32
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert ash	32
<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush	32
<i>Cortaderia</i> spp.	Pampas Grass	36
<i>Lophopyrum ponticum</i>	Tall Wheat-grass	37
<i>Lythrum junceum</i>	Mediterranean Loosestrife	37
<i>Mimulus moschatus</i>	Musk Monkey-flower	37
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh-grass	37
<i>Sparganium erectum</i>	Branching Bur-reed	37

Table 4. Change in rankings when using Questions 3, 5,6 and 7 with either 5 and 6 or 3, 5 and 6.

Ranking numbers marked “*” indicate a species which falls below the top 28 when different questions are used for the ranking. “Initial invasive species management survey rank” refers to the rank of wetland weed species that are under active management based on a survey of invasive species management undertaken by ARI in the scoping stages of this project.

Scientific name	Common name	3567 rank	56 rank	356 rank	Initial invasive species management survey rank
<i>Sagittaria</i> spp.	Sagittaria	1	1	1	11
<i>Cabomba caroliniana</i>	Cabomba	2	8	7	19
<i>Myriophyllum aquaticum</i>	Parrot's Feather	2	4	3	5
<i>Cyperus eragrostis</i>	Drain Flat-sedge	4	4	4	14
<i>Spartina</i> spp.	Cord Grass	5	2	1	16
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	6	7	5	3
<i>Egeria densa</i>	Egeria	7	11	12	19
<i>Azolla</i> spp.	Azolla	8	15	10	22
<i>Limonium hyblaenum</i>	Sea Lavender	9	3	6	
<i>Gymnocoronis spilanthoides</i>	Senegal Tea	10	18	14	28
<i>Paspalum distichum</i>	Water Couch	10	10	7	10
<i>Phalaris arundinacea</i>	Reed Canary-grass	12	11	9	
<i>Phyla canescens</i>	Fog-fruit	13	16	10	
<i>Salix</i> spp.	Willow	14	16	17	1
<i>Elodea canadensis</i>	Canadian pondweed	15	*37	18	29
<i>Iris pseudacorus</i>	Yellow Flag Iris	16	21	15	22
<i>Phragmites australis</i>	Common reed	17	6	13	8
<i>Aponogeton distachyos</i>	Cape Pondlily	18	*31	18	29
<i>Lilaea scilloides</i>	Lilaea	19	*29	20	
<i>Xanthium strumarium</i> spp. agg.	Noogoora Burr	19	21	28	
<i>Typha</i> spp.	Cumbungi	21	19	16	5
<i>Hydrocleys nymphoides</i>	Water Poppy	22	*39*	25	
<i>Salix cinerea</i>	Grey Sallow	22	11	25	
<i>Nassella hyalina</i>	Cane Needle-grass	24	27	*33	
<i>Ludwigia palustris</i>	Marsh Ludwigia	25	*37	*43	
<i>Mentha pulegium</i>	Pennyroyal	26	30	21	
<i>Nasturtium officinale</i>	Watercress	27	*39	*35	
<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush	28	*31	22	
<i>Juncus microcephalus</i>	Tiny-headed Rush	28	*31	22	
<i>Phalaris aquatica</i>	Toowoomba Canary	28	*31	22	
<i>Lonicera japonica</i>	Jap. Honeysuckle	31	11	25	
<i>Arundo donax</i>	Giant reed	32	21	28	
<i>Festuca arundinacea</i>	Tall Fescue	32	21	28	
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert ash	32	21	28	8
<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush	32	21	28	
<i>Cortaderia</i> spp.	Pampas Grass	36	8	34	
<i>Lophopyrum ponticum</i>	Tall Wheat-grass	37	39	35	
<i>Lythrum junceum</i>	Med. Loosestrife	37	39	35	
<i>Mimulus moschatus</i>	Musk Monkey-flower	37	39	35	
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh	37	39	35	
<i>Sparganium erectum</i>	Branching Bur-reed	37	39	35	

4 Part 2

The impacts of these priority wetland weeds on wetland values, including information about knowledge gaps, is provided in a second report:

Weiss, J. and Dugdale, T. (2017). Knowledge document of the impact of priority wetland weeds. Part 2 – Selection of the priority wetland weeds. Report prepared for Department of Environment, Land, Water and Planning (DELWP) Water and Catchments Group by Agriculture Victoria.

5 References

- Adair, R., Cheal, D. and White, M. (2008). Advisory list of environmental weeds in aquatic habitats of Victoria. in Department of Sustainability and Environment, V., (ed.), East Melbourne: The State of Victoria. pp. 16.
- Carr, G. W., Yugovic, J. V. and Robinson, K. E. (1992). *Environmental Weed Invasions in Victoria: Conservation and Management Implications*, Department of Conservation and Environment and Ecological Horticulture Pty Limited.
- Weiss, J. and Dugdale, T. (2017). Knowledge document of the impact of priority wetland weeds. Part 2 – Selection of the priority wetland weeds. Report prepared for Department of Environment, Land, Water and Planning (DELWP) Water and Catchments Group by Agriculture Victoria.

Appendix 1. List of original species and sorting classifiers

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Acetosella vulgaris</i>	Sheep Sorrel	IT	0	TR	1		0	1											5		medium herb	forb		o
<i>Agrostis capillaris</i>	Brown-top Bent	IT	0	TR	1		0	1											15		medium to small tufted graminoid	tussock grass		v
<i>Agrostis stolonifera</i>	Creeping Bent	IS	0	FR	0	n	0	1		n	n	n							8		medium to small tufted graminoid	tussock grass		v
<i>Alisma lanceolatum</i>	Water Plantain	IO	0	AQ/AM	0		0	1		n	n	n	medium risk	2					7	marsh	medium herb	forb		p
<i>Alopecurus geniculatus</i>	Marsh Fox-tail	IS	0	AM	0	n	0	1		n	n	n							2		medium to small tufted graminoid	tussock grass		s
<i>Alopecurus</i> spp.	Fox Tail	IS/IA	0	AM	0	n	0	1		n	n	n							8					o
<i>Alternanthera philoxeroides</i>	Alligator weed	IO	0	AQ	0		0		1				very high risk	3	SPW	1		1		marsh			11	o
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	IT	0	TR	1		0	1											12		medium to small tufted graminoid	tussock grass		o
<i>Apium graveolens</i>	Celery	IS/IA	0	FR/TR	0		0	1		y									1		large herb	forb		o
<i>Aponogeton distachyos</i>	Cape Pondlily	IO	0	AQ/AM	0		0	1	1	n	n	n	high risk	4					4	aquatic	medium herb	forb	0	o
<i>Arundo donax</i>	Giant Reed	IO/IS	0	AM	0					n	n	n							?					p
<i>Asparagus asparagoides</i>	Bridal creeper	IT	0	TR	1		0	1							R in all regions			1	1		scrambler or climber	vine		o

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Asphodelus fistulosus</i>	Onion weed	IT	0	TR	1		0	1							R and RC in diff. regions				1		large herb	forb		o
<i>Aster subulatus</i>	Aster-weed	IS/IA	0	FR/AM	0	n	0	1		n	y	n							5		large herb	forb		s
<i>Atriplex prostrata</i>	Hastate Orache	IA	0	FR/TR	0		0	1		n	y	n							8		medium herb	forb		s
<i>Azolla</i> spp.	Azolla	N2	0	AF	0		1		1	n	y*	y								aquatic			17	o
<i>Brassica fruticulosa</i>	Twiggy Turnip	IT	0	TR	1		0	1											3		medium herb	forb		p
<i>Bromus rubens</i>	Red Brome	IT	0	TR	1		0	1											8		medium to tiny non-tufted graminoid	other grass		o
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	IO	0	AQ	0		0	1	1	n	n	n	very high risk	5	R			1	2	aquatic	medium herb	forb	22	v
<i>Callitriche brutia</i> subsp. <i>brutia</i>	Thread Water-starwort	IO	0	AQ	0	n	0	1		n	n	y	lower risk (aka <i>hamulata</i>)	1					1		small or prostrate herb	forb		p
<i>Callitriche stagnalis</i>	Common Water-starwort	IO	0	AQ/MH	0	n	0	1		n	y	y	lower risk	1					9		small or prostrate herb	forb		s
<i>Carduus</i> spp.	Slender Thistle	IA	0	TR	1		0	1							<i>C. nutans</i> is SPW, <i>C. tenuiflorus</i> is R and RC in different regions				1					o
<i>Carpobrotus aequilaterus</i>	Angled Pigface	IT	0	TR	1		0	1											1		small or prostrate herb	forb		o
<i>Carrichtera annua</i>	Ward's Weed	IA	0	TR	1		0	1											4		medium herb	forb		o

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Cenchrus clandestinus</i>	Kikuyu	IT	0	TR	1		0	1											4		large non-tufted graminoid	other grass		o
<i>Chondrilla juncea</i>	Skeleton Weed	IA	0	TR	1		0	1							R, RC, RP in diff. regions				1		large herb	forb		o
<i>Chrysanthemoides monilifera</i>	Boneseed	IT	0	TR	1		0	1							RC, RP in diff. regions			1	1		medium shrub	shrub		v
<i>Cirsium vulgare</i>	Spear Thistle	IA	0	MH/TR	0		0	1		n	y	n			R, C in diff. regions				35		large herb	forb		s
<i>Conyza</i> spp.	Fleabane	IA	0	MH/TR	0		0	1		n	y	n							2		large herb	forb		s
<i>Conyza sumatrensis</i> var. <i>sumatrensis</i>	Tall Fleabane	IA	0	MH/TR	0		0	1		n	y	n							1		large herb	forb		s
<i>Cortaderia</i> spp.	Pampas Grass	IT	0	FR/TR	0		0	1		n	n	n							2					v
<i>Cotula bipinnata</i>	Ferny Cotula	IA	0	MH	0		0	1		n	y	n							4		medium herb	forb		s
<i>Cotula coronopifolia</i>	Water Buttons	IO	0	AQ/AM	0	n	0	1		n	y	n							16	marsh	medium herb	forb		s
<i>Crassula natans</i> var. <i>minus</i>	Water Crassula	IO	0	AQ/MH	0	n	0			n	n	y	high risk	4						marsh				o
<i>Crataegus monogyna</i>	Hawthorn	IT	0	TR	1		0	1							R and C in diff. regions				1		understorey tree or large shrub	tree		o
<i>Cuscuta campestris</i>	Field Dodder	IA/IT	0	TR	1		0	1							Cuscuta spp are R, C and P in diffons				3		scrambler or climber	vine		s
<i>Cynara cardunculus</i> subsp. <i>flavescens</i>	Artichoke Thistle	IT	0	TR	1		0	1							R, C and P in diff. regions				2		large herb	forb		s

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch	IS/IT	0	AM/FR	0	n	0	1		n	y	n							6		medium to tiny non-tufted graminoid	other grass		s
<i>Cyperus eragrostis</i>	Drain Flat-sedge	IS	0	AM/FR	0	n	0	1		n	y*	n							6	marsh	medium to small tufted graminoid	tussock grass	17	s
<i>Dactylis glomerata</i>	Cocksfoot	IT	0	TR	1		0	1											1		medium to tiny non-tufted graminoid	other grass		s
<i>Delairea odorata</i>	Cape Ivy	IT	0	TR	1		0	1											3		scrambler or climber	vine		v
<i>Dittrichia graveolens</i>	Stinkwort	IA	0	TR	1		0	1							R and C in diff. regions				1		large herb	forb		o
<i>Echium plantagineum</i>	Paterson's Curse	IA/IT	0	TR	1		0	1							R and C in diff. regions				1		large herb	forb		s
<i>Egeria densa</i>	Egeria	IO	0	AQ	0		0		1	n	n	n	very high risk	5						aquatic			17	v
<i>Ehrharta erecta</i> var. <i>erecta</i>	Panic Veldt-grass	IT	0	TR	1		0	1											2		medium to small tufted graminoid	tussock grass		v
<i>Eichhornia crassipes</i>	Water Hyacinth	IO	0	AF	0		0		1				very high risk	5	SPW	1		1		aquatic			17	v
<i>Eleocharis parvula</i>	Hairgrass	IO	0	AQ/AM	0	n	0			n	n	y												o
<i>Elodea canadensis</i>	Canadian Pond-weed	IO	0	AQ	0		0		1	n	n	n	very high risk	5						aquatic			0	v
<i>Festuca arundinacea</i>	Tall Fescue	IS	0	FR	0	n	0	1		n	n	n							7		large tufted graminoid	tussock grass		s

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Festuca rubra</i> s.l.	Red Fescue	IT	0	TR	1		0	1											1		medium to small tufted graminoid	tussock grass		o
<i>Foeniculum vulgare</i>	Fennel	IT	0	TR	1		0	1							R and C in diff. regions				1		medium herb	forb		s
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert Ash	IT	0	FR	0		0		1	n	n	n								margin			39	p
<i>Galium aparine</i>	Cleavers	IA	0	TR	1		0	1											2		scrambler or climber	vine		v
<i>Gazania linearis</i>	Gazania	IT	0	TR	1		0	1											1		medium herb	forb		o
<i>Genista linifolia</i>	Flax-leaf Broom	IT	0	TR	1		0	1							R, P and C in diff. regions				2		medium shrub	shrub		o
<i>Gymnocoronis spilanthoides</i>	Senegal Tea	IS	0	FR	0		0		1	n	n	n	very high risk	5			1			marsh			6	o
<i>Hedera helix</i>	English Ivy	IT	0	TR	1		0	1											1		scrambler or climber	vine		v
<i>Helminthotheca echioides</i>	Ox-tongue	IT	0	TR	1		0	1											10		large herb	forb		o
<i>Holcus lanatus</i>	Yorkshire Fog	IS/IT	0	FR	0	n	0	1		n	y	n							37		large non-tufted graminoid	other grass		v
<i>Hordeum glaucum</i>	Northern Barley-grass	IA	0	MH/TR	0		0	1		y									1		medium to small tufted graminoid	tussock grass		o
<i>Hordeum</i> spp.	Barley Grass	IA	0	MH/TR	0		0	1		y									19					o
<i>Hydrocleys nymphoides</i>	Water Poppy	IO	0	AQ	0		0			n	n	n	high risk	4						aquatic				p

SCI_NAME	COMM_NAME	CONTEXT	N1 = irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort	IT	0	FR/TR	0		0	1		y					R and C in diff. regions				1		large herb	forb		v
<i>Hypericum tetrapterum</i>	St Peter's Wort	IS	0	AM	0		0	1		n	n	n									large herb	forb		
<i>Iris pseudacorus</i>	Yellow Flag Iris	IO/IS	0	AM	0		0	1		n	n	n	lower risk	1					1	marsh	medium to small tufted graminoid	tussock grass	11	s
<i>Isolepis hystrix</i>		IE	0	EW	0					n	n	y							?					o
<i>Isolepis levynsiana</i>	Tiny Flat-sedge	IE	0	EW	0		0	1		n	y	y							1		tiny tufted graminoid	tussock grass		p
<i>Jacobaea vulgaris</i>	Ragwort	IT	0	FR/TR	0		0	1		n	n	n							1		large herb	forb		o
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	IS	0	AM/FR	0		0	1	1	n	n	n			Juncus acutus R and C in diff. regions				8	aquatic	large tufted graminoid	tussock grass	50	v
<i>Juncus articulatus</i> subsp. <i>articulatus</i>	Jointed Rush	IO/IS	0	AM	0	n	0	1		n	y*	n							28		medium to small tufted graminoid	tussock grass		s
<i>Juncus bulbosus</i>	Bulbous Rush	IO/IS	0	AM	0	n	0	1		n	y*	n							12		medium to small tufted graminoid	tussock grass		s
<i>Juncus capitatus</i>	Capitate Rush	IE	0	EW	0		0	1		y									1		medium to tiny non-tufted graminoid	other grass		p
<i>Juncus effusus</i> subsp. <i>effusus</i>	Soft Rush	IS	0	BM	0		0	1		n	n	n							6		large tufted graminoid	tussock grass		v
<i>Juncus microcephalus</i>	Tiny-headed Rush	IS	0	AM	0	n				n	n	n							?					s

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y**)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Lactuca serriola</i>	Prickly Lettuce	IA	0	MH/TR	0		0	1		n	y	n							1		large herb	forb		o
<i>Leersia oryzoides</i>	Rice Cut-grass	IO	0	RI/AM	0		0	1		n	n	n	high risk	4					1	marsh	medium to tiny non-tufted graminoid	other grass		v
<i>Lemna minor</i>	European Duckweed	IO	0	AF	0	n	0			y			lower risk	1						aquatic				o
<i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit	IS/IT	0	FR/TR	0	n	0	1		n	y	n							23		medium herb	forb		s
<i>Lilaea scilloides</i>	Lilaea	IS	0	AM	0		0	1		n	n	n	very high risk	5					13	marsh	medium herb	forb		p
<i>Limonium companyonis</i>	Sea Lavender	IS	0	SM	0		0			n	n	n												p
<i>Limonium hyblaenum</i>	Sea Lavender	IS	0	SM	0		0			n	n	n												o
<i>Limonium</i> spp.	Sea Lavender	IT	0	FR/TR	0		0	1		y									1					o
<i>Lolium perenne</i>	Perennial Rye-grass	IT	0	TR	1		0	1											4		medium to small tufted graminoid	tussock grass		s
<i>Lonicera japonica</i>	Japanese Honey-suckle	IS/IT	0	FR	0		0	1		n	n	n							6		scrambler or climber	vine		v
<i>Lophopyrum ponticum</i>	Tall Wheat-grass	IS	0	FR/TR	0		0	1		n	n	n							11		medium to small tufted graminoid	tussock grass		s
<i>Lotus corniculatus</i>	Bird's-foot Trefoil	IA	0	FR/TR	0		0	1		n	y	n							2		medium herb	forb		v

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug. Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Lotus subbiflorus</i>	Hairy Bird's-foot Trefoil	IA	0	FR/TR	0		0	1		n	y	n							2		medium herb	forb		s
<i>Lotus uliginosus</i>	Greater Bird's-foot Trefoil	IA	0	FR/TR	0		0	1		n	y	n							2		medium herb	forb		v
<i>Ludwigia palustris</i>	Marsh Ludwigia	IO	0	AQ	0		0			n	n	n								marsh				p
<i>Lycium ferocissimum</i>	African Box-thorn	IT	0	FR	0		0	1		n	n	n			C in all regions			1	2		medium shrub	shrub		s
<i>Lythrum junceum</i>	Mediterranean Loosestrife	IS	0	FR	0		0	1		n	n	n							1		medium herb	forb		s
<i>Marsilea mutica</i>	Smooth Nardoo	N2	0	AQ	0		0			y			lower risk	1						marsh				o
<i>Marrubium vulgare</i>	Horehound	IT	0	TR	1		0	1							R and C in diff. regions				1		small shrub	shrub		s
<i>Medicago minima</i>	Little Medic	IA	0	MH	0		0	1		n	y	n							3		small or prostrate herb	Forb		s
<i>Melilotus indicus</i>	Sweet Melilot	IA	0	FR/MH	0		0	1		n	y	n							1		large herb	forb		s
<i>Mentha pulegium</i>	Pennyroyal	IS	0	AM/FR	0		0	1		n	n	n							3		medium herb	forb		s
<i>Mesembryanthemum crystallinum</i>	Common Ice-plant	IA	0	MH/TR	0		0	1		n	y	n							1		small or prostrate herb	Forb		v
<i>Mesembryanthemum nodiflorum</i>	Small Ice-plant	IA	0	MH/TR	0		0	1		n	y	n							3		small or prostrate herb	Forb		o
<i>Mimulus moschatus</i>	Musk Monkey-flower	IS	0	AM/FR	0		0	1		n	n	n							3		medium herb	forb		p

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list	
<i>Myriophyllum aquaticum</i>	Parrot's Feather	IO	0	AQ	0	n	0	1	1	n	n	n	very high risk	5					5	marsh	medium herb	forb	56	v	
<i>Myriophyllum</i> spp.	Water Milfoil - native spp.	N1	1	AQ	0		1		1		n	n								aquatic			17	v	
<i>Nassella hyalina</i>	Cane Needle-grass	IS/IT	0	FR/TR	0		0	1		n	n	n							1		medium to small tufted graminoid	tussock grass		s	
<i>Nassella neesiana</i>	Chilean Needle-grass	IT	0	FR/TR	0		0	1		y					R in all regions			1	7		medium to small tufted graminoid	tussock grass		v	
<i>Nassella trichotoma</i>	Serrated Tussock	IT	0	TR	1		0	1							P and C in diff. regions			1	1		medium to small tufted graminoid	tussock grass		v	
<i>Nasturtium officinale</i>	Watercress	IO	0	AQ	0		0	1		u	n	n							2	margin	medium herb	forb		o	
<i>Nymphaea mexicana</i>	Waterlily	IO	0	AQ	0		0	1	1	n	n	n	mod high risk	3							aquatic			33	s
<i>Nymphaea</i> spp.	Waterlily	IO	0	AQ	0		0	1	1	u	n	n	<i>n. alba</i> (lower risk)	1					6		aquatic			11	s
<i>Olea europaea</i>	Olive	IT	0	TR	1		0	1											2		understorey tree or large shrub	tree		s	
<i>Opuntia</i> spp.	Prickly pear	IT	0	TR	1		0	1							4 sp have R, P and C classifications				1						s
<i>Oxalis pes-caprae</i>	Soursob	IT	0	TR	1		0	1							R in all regions				1		medium herb	forb		v	
<i>Panicum coloratum</i>	Coolah Grass	IS/IT	0	FR/RI	0	n	0	1		u	n	n							2		large non-tufted graminoid	other grass		p	

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Parapholis incurva</i>	Coast Barb-grass	IA	0	FR/MH	0		0	1		n	y	n							5		medium to small tufted graminoid	tussock grass		s
<i>Parapholis</i> spp.	Barb Grass	IA	0	FR/MH	0		0	1		n	y	n							5					s
<i>Paspalum distichum</i>	Water Couch	IO/IS	0	AM/FR	0	n	0	1	1	n	y*	n							33	marsh	medium to tiny non-tufted graminoid	other grass	33	v
<i>Paspalum</i> spp.	Paspalum	IS/IT	0	AM/FR	0	n	0	1		n	y	n							7					v
<i>Phalaris aquatica</i>	Toowoomba Canary-grass	IS/IT	0	FR	0	n?	0	1		n	y*	n							30		large tufted graminoid	tussock grass		v
<i>Phalaris arundinacea</i>	Reed Canary-grass	IS	0	AM/FR	0		0	1		n	n	n							2		large non-tufted graminoid	other grass		v
<i>Phragmites australis</i>	Common reed	N2	0	AM/FR	0		1		1	n	Y*	n								marsh			33	o
<i>Phyla canescens</i>	Fog-fruit	IS/IT	0	FR	0	n	0	1		n	y*	n							9		medium herb	forb		o
<i>Pinus radiata</i>	Radiata Pine	IT	0	TR	1		0	1											1		understorey tree or large shrub	tree		v
<i>Pittosporum undulatum</i>	Sweet Pittosporum	IT	0	TR	1		0	1											1		understorey tree or large shrub	tree		v
<i>Plantago coronopus</i>	Buck's-horn Plantain	IS/IT	0	FR/TR	0	n	0	1		n	y	n							17		medium herb	forb		s
<i>Plantago lanceolata</i>	Ribwort	IT	0	FR/TR	0		0	1		n	y	n							7		large herb	forb		s
<i>Plantago major</i>	Greater Plantain	IT	0	FR/TR	0		0	1		n	y	n							1		medium herb	forb		p

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Poa annua</i>	Annual Meadow-grass	IA	0	FR/MH	0		0	1		y									1		medium to small tufted graminoid	tussock grass		o
<i>Poa pratensis</i>	Kentucky Blue-grass	IT	0	FR/TR	0		0	1		n	y	n							3		medium to tiny non-tufted graminoid	other grass		s
<i>Polypogon monspeliensis</i>	Annual Beard-grass	IA	0	FR/MH	0		0	1		n	y	n							2		medium to small tufted graminoid	tussock grass		s
<i>Polypogon viridis</i>	Water Bent	IS	0	AM/FR	0	n				u	n	n							?					o
<i>Pontederia cordata</i>	Pickereel Weed	IO	0	AQ	0		0			u	n	n	lower risk	1							aquatic			p
<i>Potamogeton spp.</i>	Pond-weeds	N1	1	AQ	0		1		1		n	n									aquatic		11	o
<i>Potentilla anserina</i>	Silver-weed	IS	0	FR	0		0	1		n	n	n							4		medium herb	forb		o
<i>Prunella vulgaris</i>	Self-heal	IT	0	FR/TR	0		0	1		y									3		medium herb	forb		o
<i>Psoralea pinnata</i>	Blue Psoralea	IT	0	FR	0		0	1		u	n	n							2		medium shrub	shrub		v
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh-grass	IS	0	FR	0	n	0	1		n	n	n							4		medium to small tufted graminoid	tussock grass		s
<i>Pyracantha crenatoserrata</i>	Broad-leaf Firethorn	IT	0	TR	1		0	1											1		small shrub	shrub		v
<i>Ranunculus repens</i>	Creeping Buttercup	IS	0	AM/FR	0	n	0	1		n	n	n							4	?	medium herb	forb		s
<i>Rorippa palustris</i>	Marsh Yellow-cress	IS/IA	0	FR/MH	0	n	0	1		n	n	n							2	?	large herb	forb		s

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Rosa canina</i>	Dog Rose	IT	0	TR	1														?					o
<i>Rosa rubiginosa</i>	Sweet Briar	IT	0	TR	1		0	1							R and C in diff. regions				3		medium shrub	shrub		s
<i>Rubus anglo-candicans</i>	Common Blackberry	IS/IT	0	FR/TR	0		0	1	1	n	n	n							11	margin	scrambler or climber	vine	56	v
<i>Rubus fruticosus</i> spp. agg.	Blackberry	IS/IT	0	FR/TR	0		0	1	1	n	n	n			R and C in diff. regions			1	4	margin	scrambler or climber	vine	61	v
<i>Rumex conglomeratus</i>	Clustered Dock	IS	0	FR/TR	0	n	0	1		n	y	n							17		large herb	forb		s
<i>Rumex crispus</i>	Curled Dock	IS	0	FR/TR	0	n	0	1		n	y	n							18		large herb	forb		s
<i>Sagittaria</i> spp.	Sagittaria	IO	0	AQ	0		0	1	1	n	n	n	very high risk	5	P and C in diff. regions				6	marsh			33	v
<i>Salix cinerea</i>	Grey Sallow	IS	0	BM/FR	0		0	1		n	n	n			R?				6	?	understorey tree or large shrub	tree		v
<i>Salix</i> spp.	Willow	IS/IT	0	FR/RI	0		0	1		n	n	n			R in all regions			1	2	margin			83	v
<i>Salvinia molesta</i>	Salvinia	IO	0	AF	0		0	1	1				very high risk	5	SPW	1		1	3	aquatic	small or prostrate herb	forb	6	o
<i>Schismus barbatus</i>	Arabian Grass	IA	0	MH/TR	0		0	1		y									2		medium to small tufted graminoid	tussock grass		s
<i>Setaria</i> spp. (naturalised)	Pigeon Grass	IT	0	TR	0		0	1		n	n	n							1					o
<i>Silybum marianum</i>	Vari-gated Thistle	IT	0	TR	1		0	1											1		large herb	forb		s
<i>Sisymbrium</i> spp.	Mustard	IA	0	TR	1		0	1											1					o

SCI_NAME	COMM_NAME	CONTEXT	N1 = irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Solanum nigrum</i> s.s.	Black Nightshade	IA	0	MH/TR	0		0	1		y									4		large herb	forb		s
<i>Solanum pseudocapsicum</i>	Madeira Wintercherry	IT	0	TR	1		0	1											1		medium shrub	shrub		v
<i>Sonchus</i> spp.	Sow Thistle	IA	0	TR	1		0	1											1					s
<i>Sparganium erectum</i>	Branching Bur-reed	IO	0	AQ/AM	0		0			n	n	n	medium	2						marsh				o
<i>Spartina</i> spp.	Cord Grass	IO	0	AQ/SM	0		0	1		n	n	n	very high risk (<i>anglica</i> , <i>x townsendii</i>)	5					5	marsh				v
<i>Suaeda baccifera</i>	Berry Seablite	IA	0	MH/TR	0		0	1		n	y	n							5		medium herb	forb		p
<i>Tamarisk aphylla</i>	Athel pine	IT	0	RI/TR	0		0			u	n	n			R in all regions									o
<i>Tamarisk ramosissima</i>	Salt Cedar	IS/IT	0	FR	0		0			n	n	n												o
<i>Tradescantia fluminensis</i>	Wandering Jew	IT	0	TR	1		0	1	1										2	margin	scrambler or climber	vine	17	v
<i>Trifolium fragiferum</i> var. <i>fragiferum</i>	Strawberry Clover	IS/IT	0	FR/TR	0	n	0	1		n	n	n							7		medium herb	forb		p
<i>Trifolium repens</i> var. <i>repens</i>	White Clover	IT	0	FR/TR	0		0	1		n	y	n							15		small or prostrate herb	forb		s
<i>Typha latifolia</i>	Lesser Reed-mace	IO	0	AQ/AM	0		0	1		n	n	n	very high risk	5					6	marsh	large herb	forb	6	v
<i>Typha</i> spp.	Cumbungi	N2	0	AQ/AM	0		1		1	n	Y*	n	very high risk	5						marsh			44	v

SCI_NAME	COMM_NAME	CONTEXT	N1 = Irrigation exclude	HABITAT	Terrestrial	CONTROL	Native	Doug Flood List	Tony Dugdale List	Minor weeds (Y, U, N)	Ubiquitous (Y, N, Y*)	Rapid (Y, N)	DSE aquatic weed list	DSE aquatic weed numeric	CALP status	Vic Alert Weed	National Alert Weed	WONS	No. wetland EVCs mentioned	Habitat	VIC_LF	NVIS_GF	Ranking from questionnaire (%)	Carr's list
<i>Ulex europaeus</i>	Gorse	IT	0	TR	1		0	1							R, P and C in diff. regions			1	1		medium shrub	shrub		v
<i>Utricularia gibba</i>	Floating Bladderwort	N2	0	AF	0		0			y			medium risk	2						aquatic				o
<i>Vallisneria australis</i>	Ribbonweed	N1	1	AQ	0		1		1		n	n								aquatic			11	o
<i>Verbena bonariensis</i> s.l.	Purple-top Verbena	IA/IT	0	MH	0		0	1		n	n	n							1		large herb	forb		o
<i>Verbena supina</i>	Trailing Verbena	IA	0	MH	0		0	1		n	n	n							1		medium herb	forb		o
<i>Vinca major</i>	Blue Periwinkle	IT	0	TR	1		0	1											1	margin	scrambler or climber	vine	17	v
<i>Vulpia bromoides</i>	Squirrel-tail Fescue	IA	0	TR	1		0	1											4		medium to small tufted graminoid	tussock grass		v
<i>Vulpia</i> spp.	Fescue	IA	0	TR	1		0	1											2					o
<i>Xanthium spinosum</i>	Bathurst Burr	IA	0	MH	0		0	1		n	n	n			R and C in diff. regions				1		large herb	forb		s
<i>Xanthium strumarium</i> spp. agg.	Noogoora Burr species aggregate	IA	0	MH	0		0	1		n	n	n			R, P and C in diff. regions				2		large herb	forb		o

Appendix 2. Summary of responses to survey questions

Q1. Which are the introduced weeds you are PRESENTLY ACTIVELY controlling (within last 2 years) in natural wetlands?

Scientific name	Common name	Count	Rank
<i>Rubus fruticosus</i> spp. agg.	Blackberry	13	1
<i>Salix</i> spp.	Willow	13	1
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert Ash	11	3
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	11	3
<i>Salix cinerea</i>	Grey Sallow	11	3
<i>Lycium ferocissimum</i>	African Box-thorn	10	6
<i>Myriophyllum aquaticum</i>	Parrot's Feather	10	6
<i>Paspalum distichum</i>	Water Couch	8	8
<i>Rubus anglocandicans</i>	Common Blackberry	8	8
<i>Xanthium spinosum</i>	Bathurst Burr	8	8
<i>Lonicera japonica</i>	Japanese Honeysuckle	7	11

Q2. What are the weeds that you FEEL CONFIDENT in controlling (have the relevant knowledge or techniques)?

Scientific name	Common name	Count	Rank
<i>Salix</i> spp.	Willow	13	1
<i>Lycium ferocissimum</i>	African Box-thorn	13	1
<i>Rubus fruticosus</i> spp. agg.	Blackberry	11	3
<i>Fraxinus angustifolia</i> var. <i>angustifolia</i>	Desert Ash	9	4
<i>Salix cinerea</i>	Grey Sallow	9	4
<i>Rubus anglocandicans</i>	Common Blackberry	9	4
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	7	7
<i>Xanthium spinosum</i>	Bathurst Burr	7	7
<i>Lonicera japonica</i>	Japanese Honeysuckle	7	7
<i>Cortaderia</i> spp.	Pampas Grass	6	10
<i>Phalaris aquatica</i>	Toowoomba Canary-grass	6	10

Q3. What are the weeds that you feel LEAST confident in managing (either in knowledge or techniques)?

Scientific name	Common name	Count	Rank
<i>Myriophyllum aquaticum</i>	Parrot's Feather	8	1
<i>Spartina</i> spp.	Cord Grass	6	2
<i>Elodea canadensis</i>	Canadian Pondweed	5	3
<i>Paspalum distichum</i>	Water Couch	5	3
<i>Phyla canescens</i>	Fog-fruit	5	3
<i>Sagittaria</i> spp.	Sagittaria	5	3
<i>Aponogeton distachyos</i>	Cape Pondlily	4	7
<i>Azolla</i> spp.	Azolla	4	7
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	4	7
<i>Cyperus eragrostis</i>	Drain Flat-sedge	4	7
<i>Hydrocleys nymphoides</i>	Water Poppy	4	7
<i>Iris pseudacorus</i>	Yellow Flag Iris	4	7
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	4	7
<i>Phalaris arundinacea</i>	Reed Canary-grass	4	7

Q4. What are the weeds that you would like to control but don't have sufficient resources/time?

Scientific name	Common name	Count	Rank
<i>Myriophyllum aquaticum</i>	Parrot's Feather	8	1
<i>Rubus fruticosus</i> spp. agg.	Blackberry	7	2
<i>Cyperus eragrostis</i>	Drain Flat-sedge	5	3
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	5	3
<i>Lonicera japonica</i>	Japanese Honeysuckle	5	3
<i>Paspalum distichum</i>	Water Couch	5	3
<i>Ranunculus repens</i>	Creeping Buttercup	5	3
<i>Azolla</i> spp.	Azolla	4	8
<i>Nassella hyalina</i>	Cane Needle-grass	4	8
<i>Phalaris arundinacea</i>	Reed Canary-grass	4	8
<i>Phragmites australis</i>	Common reed	4	8
<i>Rubus anglocandicans</i>	Common Blackberry	4	8
<i>Salix cinerea</i>	Grey Sallow	4	8
<i>Salix</i> spp.	Willow	4	8
<i>Spartina</i> spp.	Cord Grass	4	8
<i>Typha</i> spp.	Cumbungi	4	8

Q5. What weeds do you want more information on the BIOLOGY?

Scientific name	Common name	Count	Rank
<i>Sagittaria</i> spp.	Sagittaria	13	1
<i>Spartina</i> spp.	Cord Grass	13	1
<i>Limonium hyblaenum</i>	Sea Lavender	10	3
<i>Myriophyllum aquaticum</i>	Parrot's Feather	9	4
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	6	5
<i>Phragmites australis</i>	Common reed	5	6
<i>Azolla</i> spp.	Azolla	4	7
<i>Cortaderia</i> spp.	Pampas Grass	4	7
<i>Cyperus eragrostis</i>	Drain Flat-sedge	4	7
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	4	7
<i>Egeria densa</i>	Egeria	3	11
<i>Paspalum distichum</i>	Water Couch	3	11
<i>Phalaris arundinacea</i>	Reed Canary-grass	3	11
<i>Phyla canescens</i>	Fog-fruit	3	11
<i>Salix cinerea</i>	Grey Sallow	3	11
<i>Salix</i> spp.	Willow	3	11

Q6. What weeds do you want more information on CONTROL OPTIONS?

Scientific name	Common name	Count	Rank
<i>Sagittaria</i> spp.	Sagittaria	13	1
<i>Cyperus eragrostis</i>	Drain Flat-sedge	11	2
<i>Spartina</i> spp.	Cord Grass	11	2
<i>Limonium hyblaenum</i>	Sea Lavender	9	4
<i>Lonicera japonica</i>	Japanese Honeysuckle	7	5
<i>Myriophyllum aquaticum</i>	Parrot's Feather	7	5
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush	5	7
<i>Phragmites australis</i>	Common reed	5	7
<i>Cortaderia</i> spp.	Pampas Grass	4	9
<i>Paspalum distichum</i>	Water Couch	4	9
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	3	11
<i>Egeria densa</i>	Egeria	3	11
<i>Nassella hyalina</i>	Cane Needle-grass	3	11
<i>Nymphaea mexicana</i>	Waterlily	3	11

<i>Phalaris arundinacea</i>	Reed Canary-grass	3	11
<i>Salix cinerea</i>	Grey Sallow	3	11

Q7. What weeds do you not have at present in your area but think they will be your future priority weeds?

Scientific name	Common name	Count	Rank
<i>Tamarisk ramosissima</i>	Salt Cedar	10	1
<i>Egeria densa</i>	Egeria	9	2
<i>Cabomba caroliniana</i> var. <i>caroliniana</i>	Cabomba	6	3
<i>Gymnocoronis spilanthoides</i>	Senegal Tea	5	4
<i>Elodea canadensis</i>	Canadian pondweed	4	5
<i>Jacobaea vulgaris</i>	Ragwort	3	6
<i>Limonium complanatum</i>	Sea Lavender	3	6
<i>Ludwigia palustris</i>	Marsh Ludwigia	3	6
<i>Lycium ferocissimum</i>	African Box-thorn	3	6
<i>Salix</i> spp.	Willow	3	6
<i>Tamarisk aphylla</i>	Athel Pine	3	6
<i>Xanthium strumarium</i> spp. agg.	Noogoora Burr species aggregate	3	6

