

Black Saturday Victoria 2009 – Natural Values fire recovery program









Post-fire Weeds Triage Manual

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Front Cover photograph: *Allium triquetrum* Three-angled Onion, on a roadside immediately east of Warburton (David Cheal).

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1. Post-fire Weeds Triage Manual Overview

1.1 Introduction and aims

The Post-fire Weeds Triage Manual collates information on weed responses to fire and fire operations, both from the published literature and previously unpublished local knowledge. The primary aim of the manual is to assist in prioritisation of weed species for funding/management after fire.

1.2 Context and audience

The Manual is intended for complementary use with the *Guidelines and Procedures for Managing Environmental Weeds* (www.dse.vic.gov.au), and aims to fit within the framework of the new *Biosecurity Strategy for Victoria* (ibid.).

The target audience for the Manual includes committees or individuals managing the distribution of funding for post-fire weed-related projects. This manual will assist prioritisation of projects, based on the target weed species. It has limited applicability for decisions on weed management for asset protection, where the nature of the threatened asset and the nature of the threat that weed(s) impose are site-specific. Funding decisions on weed management for asset protection should be based on the level of threat, considered in association with the value of the threatened asset (refer to *Guidelines and Procedures for Managing Environmental Weeds* ibid.).

Land managers are also a target audience for this manual. The priorities derived from this manual should assist decision-making in relation to post-fire actions. The manual should further assist in drafting funding applications, as it raises awareness of which species (or types of post-fire responses) are likely to gain funding for targeted control works and which are *prima facie* less likely to be consistent with current policy directions in management of environmental weeds.

Obligations to control noxious weeds are outlined under the *Catchment and Land Protection Act* (1994) (www.dpi.vic.gov.au).

1.3 How to use this manual

A typical user of the Manual should begin with a list of weed species and their site occurrences (each a potential 'weed project') under consideration for post-fire funding/management.

- The decision key for triage (or prioritisation) of weed species funding/management forms the first section of the manual. Assessment using this decision key will result in a score for each weed species at a site (ie. a 'weed project') and an associated post-fire funding/ management priority (i.e. low, medium, high or very high priority).
 - The Environmental Weeds and Fire (Victoria) table in Appendix 3, is to be used in association with the decision key. Weed species are placed in broad Weed Groups based on their ecology and fire responses.
- Background information for each step of the decision key is detailed in Appendix 1.
- General information on post-fire weed management is included in Appendix 2.

2. Post-fire Weeds Triage Decision Key

The aim of this section is to assist in triage (or prioritisation) of weed projects after fires. At the end of the decision key, each (proposed) weed project will have a score and associated funding/management priority. This prioritised list of weed projects can be used in development of a funding schedule or management plan.

The table *Environmental Weeds and Fire (Victoria)*, see Appendix 3, is required for decision key Step III. This is a list of all the known weed species in Victoria and their assigned Weed Group, based on fire responses and ecology

For further information about each step refer to Appendix 1.

Step I. Target plant

- 1. Are you sure that your plant is a weed, or is reasonably suspected to be a weed (i.e. growing where it's not wanted, or in a proportion or vigour that's not wanted)? Are you sure it's not a locally indigenous species growing within its normal ecological limits?
 - a. If you are sure it's a weed and not a locally indigenous species growing within normal ecological limits, go to 2.
 - b. If you're not sure, determine its species or genus, compare that with locally indigenous similar plants and then reassess, from the beginning, in **Step I**.
- 2. Is the identity of the plant/species known?
 - a. If 'yes', go to **Step II**
 - b. If 'no', go to 3.
- 3. Can the plant's identity be promptly determined?
 - a. If 'yes', get the plant identified and return to 1 (above).
 - b. If 'no', go to **Step III**, question 2.

Step II. New and Emerging

- 1. Have adequate surveys or searches been done to determine the distribution of the weed species? Are you confident that you know the distribution of the species in the bioregion, major catchment or minor catchment? Are you confident in assessing the species as new and emerging?
 - a. If 'yes', go to 2.
 - b. If 'no' score 0 and go to Step III.
- 2. Is the plant / species a new record for Victoria?
 - a. If 'yes', score 8 and go to Step III.
 - b. If 'no' go to 2.
- 3. Is the plant / species a new record for the bioregion?
 - a. If 'yes', score 5 and go to Step III.
 - b. If 'no', go to 3.

- 4. Is the plant / species a new record for the major catchment?
 - a. If 'yes', score 3 and go to Step III.
 - b. If 'no', go to 4.
- 5. Is the plant a new record for a minor catchment or reserve (parcel of land)?
 - a. If 'yes', score 2, and go to Step III.
 - b. If 'no', go to 5.
- The plant is not new and emerging; score 0 and go to Step III.

Step III. Assigning a Weed Group

- 1. Check the plant's categorisation in Appendix 3 titled *Environmental Weeds and Fire (Victoria)* and assign the species to a Weed Group as per that file. Go to **Step IV**. *General information for each Weed Group can be found in Table 1 (at the end of this key).*
- 2. Using the plant's growth form characteristics, assign it to a group from among the 19 **Weed Groups** detailed in Table 1 (at the end of this key). Go to **Step IV.**

Weed g	group:				
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Step IV. **Tractablility** (how much effort is needed for control)

- 1. Is the plant a member of any of the following Weed Groups:
 - 'Small and Control impracticable'
 - 'Herbs in Cultivated ground'
 - 'Herbs in Disturbed ground'
 - 'Thistle' (excluding the 2 species marked as 'persistent', i.e. Cynara cardunculus Artichoke Thistle and Silybum marianum Variegated Thistle).
 - a. If 'yes' score negative 5 and go to Step V.
 - b. If 'no', score 0 and go to Step V.

Step V. **Population** (distribution, abundance)

- 1. Is the weed population at the statewide/bioregional/ major catchment – scale small enough or contained within a small discrete area, such that there is a reasonable likelihood of **eradication** given the proposed management actions and available resources, i.e. eradication, <u>not</u> merely reduction of the population(s)? a. If 'yes', score 5 and go to Step VI.
 - b. If 'no', go to 2.



- Is the weed population at the minor catchment/reserve/ 'parcel of land'-scale small enough or contained within a small discrete area, such that there is a reasonable likelihood of **eradication** given the proposed management actions and available resources, i.e. eradication, <u>not</u> merely reduction of the population(s)?
 a. If 'yes', score 2 and go to Step VI.
 b. If 'no' go to 3.
- 3. Is it likely that the proposed weed control measures will truly contain the population (prevent further spread)?a. If 'yes', score 2 and go to Step VI.b. If 'no', go to 4.
- 4. There is little practicable likelihood of weed control efforts either containing or eradicating the target weed species. It may be wise to overlook this species and situation for prioritised post-fire efforts and redirect attention to other species, or justify management action on the basis of asset protection: score 0 and proceed to Step VI.

Score:

Step VI. Post-fire Risks and Opportunities

- 1. Does the immediate post-fire environment offer a <u>uniquely favourable</u> opportunity for weed control, for example by enabling access in habitats that are otherwise difficult to access or by bringing all the plant's foliage within reach of simple techniques, such as spraying, or by killing many formerly mature individuals and thus exposing the few resprouts or seed regenerants to treatment?
 - a. If 'yes', score 3 and go to 2.
 - b. If 'no', score 0 and go to 2.
- 2. Is the immediate post-fire environment particularly favourable for the weed species, thus enabling mass establishment (substantial increase of the initial infestation), to a new level of infestation that is either maintained or further increased as the (burnt) vegetation ages?
 - a. If 'yes', add 3 to the score from the immediately preceding consideration and go to Step VII.
 - b. If 'no', score 0 and go to Step VII.

Total Score for Step VI (i.e. 6 or 3 or 0):

Step VII. Non-target Impacts

- 1. Is the weed in an area that includes resident rare or threatened plant or animal species or rare or threatened ecological communities¹, such that control efforts for the weed will likely adversely affect these rare or threatened assets?
 - a. If 'yes', reassess the weed control operations, considering the value of the rare and threatened asset(s) and the risk involved to those assets (by the proposed weed works) vs. the value of the weed control works and the likelihood of success. If this balanced consideration still favours the weed works, go to 2. If this balanced consideration does not favour the weed works, then choose a more defensible target for weed works and return to **Step I.**
 - b. If 'no', go to 2.
- 2. Is the weed in an aquatic, paludal (swampy) or riparian environment, i.e. with free, surface water?
 - a. If 'yes', go to 3.
 - b. If 'no', go to Step VIII.
- 3. Does the recommended control regime for the weed include chemical treatment?
 - a. If 'yes', score negative 4 and go to Step VIII.
 - b. If 'no', go to 4.
- 4. Does the recommended control regime include substantial soil disturbance (e.g. heavy vehicles or large equipment)?
 - a. If 'yes', score negative 2 and go to Step VIII.
 - b. If 'no', score 0 and go to Step VIII

Total Score for Step VII:

¹ particularly as listed under the Flora and Fauna Guarantee Act 1988 or the Environment Protection and Biodiversity Conservation Act 1999



Step VIII. Calculating the score (priority)

Add the following scores:

New and emerging score (Step II)	
Tractability score (Step IV)	
Population score (Step V)	
Post-fire risk/opportunity score (Step VI)	
Non-target impacts (Step VII)	

Total score

Low priority

Total score: < 1

Includes:

- species identified in Step IV as not amenable to standard control techniques,
- species which are so well-established in the wild as to be impracticable to eradicate or control, and
- species which are likely to decrease greatly in abundance as the post-fire vegetation matures, and
- species for which control may be effective, but control works would have unacceptable non-target effects.

Note that weed control efforts for Low Priority species may still be justified by reason of asset protection (i.e. a valuable asset is being threatened by the weed's persistence or spread <u>and</u> control efforts in or around the identified asset will either remove or substantially reduce those threats).

Medium pr	iority
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Total score: 1 to 4.

High priority

Total score: 5 to 9.

Very high priority

Total score: 10 or more.



If you have scored multiple potential weed projects, you may wish to compare these (with each other or with projects elsewhere), using the table below.

Using the priority score

Example prioritisation table

Weed Project	Score	Priority	

3. Table 1. Weed groups

This table outlines 19 broad Weed Groups, developed for use with this Manual. Groups are based on weed ecology and post-fire response. A list of Victoria's known weed species, along with their Weed Group, can be found in the table *Environmental Weeds and Fire (Victoria)*, in Appendix 3. These broad Weed Groups were formulated because there are over 1500 weed species in Victoria and observational data on the post-fire responses of many of these species are lacking. The Weed Groups assist users of the decision key to prioritise weed projects where specific information is wanting.

Weed group name and example

Herbs in cultivated ground



e.g. Eschscholzia californica. Californian Poppy.

PHOTO COURTESY STEVE PLATT.

Weed group general ecological and post-fire response information

- Mostly herbs (also some grasses), often short-lived, but frequently and often regularly renewed due to on-going agricultural activities
- Mainly in current or recently-past grazed or cropped areas, high nutrient soils, with frequent soil disturbance
- Shade intolerant, unlikely to be competitive or persistent in native vegetation
- More likely to be introduced to an area postfire, often in imported fodder
- Likely to fairly rapidly decrease to local disappearance as the (native) vegetation ages.
- Post-fire response: short-term increase via seed germination.

Examples – *Alhagi maurorum* Camel Thorn, *Lepidium draba* Hoary Cress, *Pastinaca sativa* Parsnip

Herbs in disturbed ground



e.g. Euphorbia peplus Petty Spurge

- Vigorous, robust herbs (also some grasses); often 'boom-and-bust' life histories
- Mainly on roadsides, oldfields and in other (seminatural) disturbed situations
- Somewhat shade and competition tolerant, but rely on continuing disturbance (sometimes frequent fire or flooding) for persistence
- Site management intervention (i.e. the soil disturbance associated with the construction or maintenance of mineral earth firebreaks) may facilitate persistence
- Usually, permitting or encouraging maturation of the native vegetation is one of the most effective means of control
- Post-fire response: short-term increase via seed germination.

Examples – *Datura ferox* Long-spine Thorn-apple, *Lotus corniculatus* Bird's-foot Trefoil, *Salpichroa origanifolia* Pampas Lily-of-the-valley



Weed group general ecological and post-fire response information

Herbs in native vegetation



e.g. *Bellis perennis* English Daisy (yellow flowers from *Taraxacum officinale* spp. agg. Dandelion)

- May be herbs or subshrubs, monocots or dicots
- Competitive and persistent in open (semi-natural) bush environments
- Shade and competition tolerant or somewhat tolerant
- Small populations responsive to standard weed control measures
- Seed banks accumulate moderately slowly
- **Post-fire response:** Commonly increase in the post-fire environment, by seed or vegetative means. Likely to successfully compete with indigenous species, and be persistent in the recovering bush (resprout and seed).

Examples – *Echium plantagineum* Patersons Curse, *Hypochaeris radicata* Cat's Ear, *Salvia verbenaca* Wild Sage

Perennial grass



e.g. Ehrharta calycina Perennial Veldt-grass

- Perennial grasses
- Mature plants survive most fires (although may be killed by severe fire)
- Commonly introduced post-fire in fodder
- Post-fire response: Resprout or vigorous resprout Post-fire seed germination usually common to abundant; likely to spread dramatically post-fire bush (resprout and seed)
- High priority (new populations); Low priority (pre-fire, established populations).

Examples – Cortaderia selloana Pampas Grass, Lolium perenne Perennial Rye-grass, *Phalaris aquatica* Toowoomba Canary Grass

Small; control impracticable



e.g. Ranunculus muricatus Sharp Buttercup.

PHOTO COURTESY STEVE SINCLAIR.

Weed group general ecological and post-fire response information

- Mostly diminutive annual herbs (including grasses), sometimes short-lived perennials
- May occupy little-disturbed native vegetation
- Low total biomass, even when at moderately high densities
- Usually weeds of open vegetation (not common in heathland, scrub nor rainforests)
- Mature plants killed by fire or present in the soil seed bank when the vegetation burns
- Control efforts usually a low priority as impacts are often perceived as low (even in dense stands) and standard techniques for weed control have little effect
- Elimination only possible for the smallest stands (less than 1 ha)
- Post-fire response: Abundant seed germination in the first season post-fire and may be very common until the vegetation develops further and light at ground level is reduced.

Examples – *Cerastium glomeratum* Common Mouseear Chickweed, *Poa annua* Annual Meadow-grass, *Trifolium campestre* Hop Clover

Woody legume seeder



e.g. Cytisus scoparius English Broom

PHOTO COURTESY MICHELE KOHOUT

- Shrubs from Leguminosae (wattles and peas)
- Invade and establish in otherwise undisturbed bushland
- Seed recruitment. at its most abundant post-fire
- Remnant in situ seed bank after fire-cued germination event
- Many of Victoria's most invasive and pervasive environmental woody weeds in this group
- Post-fire response: Usually fire kills the adult plants (little to no resprouting); long lived, persistent soil seed bank, triggered to germinate by fire.

Examples – *Genista monspessulana* Cape Broom, *Psoralea pinnata* Blue Psoralea, *Ulex europaeus* Gorse



Weed group general ecological and post-fire response information

Robust creeper / climber



e.g. Asparagas aparagoides Bridal Creeper

- Creeping, climbing or scrambling habit, such that mature foliage is held well above ground and beyond normal spray techniques
- Vegetative recruitment common and vegetative resprouting common post-fire
- **Post-fire introduction** may occur into new areas via bird dispersed seed in berries; minor **positive germination** response also possible
- Immediate post-fire environment may provide a unique opportunity for control (all foliage accessible)
- Post-fire response: If burnt, may receive a boost post-fire with vigorous resprouting and/or seedling regeneration into fertile, sunny sites. Response strongly dependent on fire severity.

Examples – Anredera cordifolia Anredera, Ipomaea purpurea Common Morning-glory, Passiflora mollissima Banana Passionfruit

Suckering woodys



e.g. Robinia pseudoacacia Black Locust or Mop Top

- Trees and shrubs
- Principal means of propagation is suckering from roots (vegetative)
- Not highly dispersible (cannot 'jump' large distances, except when spread by humans); a few species produce seed that is more dispersible than
- Adventive (i.e. newly established or spreading) near urban and historical areas
- Dense stands not notably flammable, thus often escape being burnt in prescribed fires. High priority if burnt.
- **Post-fire response:** predominantly resprout.

Examples – *Ailanthus altissima* Tree of Heaven, *Populus nigra 'Italica'* Lombardy Poplar, *Salix babylonica* Weeping Willow

Soft-fruit woodys



e.g. *Cotoneaster* sp. Cotoneaster PHOTO COURTESY MICHELE KOHOUT

Weed group general ecological and post-fire response information

- Trees and shrubs
- Produce a berry, or similar succulent fruit, that can be widely dispersed (principally by birds). Likely to be introduced into an area post-fire
- Not commonly with a long-term soil seed store (although a few spp have a long-term soil seed store, e.g. *Chrysanthemoides monilifera* Boneseed)
- Highly dispersible, may occur many kilometres from disturbed situations or the nearest parent
- Seed recruitment common between fires and often rare immediately post-fire
- May take a few years to reproduce after being burnt
- Maybe be evergreen or deciduous
- Post-fire response: Commonly resprout post-fire, but not for all species. Killed by severe fire.

Examples – Fuchsia magellanica Fuchsia, Prunus cerasifera Cherry-plum, Solanum mauritianum Tobacco-bush

Seed hard-fruit woodys



e.g. Hakea sericea Silky Hakea

- Trees and shrubs
- Produce seed in a hard, dry fruit (not fleshy)
- Often limited long-distance dispersal (a few with very fine, wind-dispersed seed or assisted spread by very large birds, such as cockatoos)
- Post-fire response: Generally do not sucker or resprout post-fires, mostly killed by fire and regenerate solely from seed. May prolifically germinate straight after fires (which provide a major regeneration opportunity)
- Susceptible to control using carefully-planned fires in quick succession
- Often long-lived.

Examples – *Acer pseudoplatanus* Sycamore Maple, *Eucalyptus spathulata* Swamp Mallet, *Pinus radiata* Radiata Pine



Weed group general ecological and post-fire response information

Resprout hard-fruit woodys



e.g. *Melaleuca diosmifolia* Green Honey-myrtle (foreground) *Melaleuca armillaris* Giant Honey-myrtle (right rear)

- Trees and shrubs
- Produce seed in a hard, dry fruit (not fleshy)
- Often limited long-distance dispersal (a few with very fine, wind-dispersed seed or assisted spread by very large birds, such as cockatoos)
- Often long-lived
- Post-fire response: Often (but not always)
 limited regeneration from seed post-fire. Sucker or resprout post-fires, sometimes killed by fire (in the most severe fires).

Examples – *Erica lusitanica* Spanish Heath, *Fraxinus angustifolia* Desert Ash, *Quercus robur* English Oak

Thistles



e.g. Cirsium vulgare Spear Thistle

- Herbs usually with spines to discourage browsing (some with stinging hairs – *Urtica*)
- Highly dispersible
- Grow luxuriantly in high nutrient environments and disturbed soil
- Post-fire response Often abundant in first few seasons post-fire. As vegetation matures and, without ongoing disturbance, greatly decrease to sporadic individuals (2 exceptions may dominate in mature vegetation, marked as 'persist')
- Low priority (high dispersibility means seed return is continuous).

Examples – *Carthamus lanatus* Saffron Thistle, *Cirsium vulgare* Spear Thistle, *Urtica dioica* Giant Nettle

Weed group general ecological and post-fire response information

Geophytes



e.g. Allium triquetrum Three-angled Onion

- Often, but not necessarily, irids (includes other monocots and some forbs, such as *Oxalis, Tragopogon*), has an underground storage organ i.e., bulb, corm, rhizome, or aerial cormlets
- Dieback seasonally, usually to a (subterranean) bulb, corm or tuber
- Likely to be unburnt by fire (as bulbs or corms underground in principal wildfire season)
- Likely to be introduced post-fire; garden escapee
- May have prolific vegetative regeneration in unburnt conditions from aerial cormlets
- Can reproduce from seed; fire may stimulate germination in some species
- Difficult to control at any time, and particularly so immediately post-fire
- **Post-fire response:** Usually resprout vigorously post-fire, invades bare ground.

Examples – *Freesia alba* White Freesia, *Oxalis pescaprae* Soursob, *Watsonia meriana* Wild Watsonia

Fleshy lilies



e.g. *Agapanthus pracecox* Agapanthus PHOTO COURTESY MICHELE KOHOUT

- Fleshy, clumping plants , often monocots
- Year-round above-ground foliage
- Vegetative reproduction predominant, although seed reproduction occurs also
- Likely to be introduced post-fire; garden escapee
- Post-fire response: Likely to be unaffected (unburnt) by low to medium intensity fire.

Examples – Acanthus mollis Bear's Breach, Phormium tenax New Zealand Flax, Zantedeschia aethiopica White Arum Lily



Weed group general ecological and post-fire response information

Succulents



- Fleshy dicot (high tissue water) (leaf and/or stem succulence)
- Includes cactus and similar shrubs/herbs
- **Post-fire response**: Likely to be unaffected/ unburnt by low to medium intensity fire
- When burnt, recovery relatively weak or slow
- Frequently with vegetative reproduction
- May reproduce from seed
- Possible to remove small populations <1 ha.

Examples – *Agave americana* Century Plant, *Galenia pubescens* Galenia, *Opuntia robusta* Wheel Cactus

e.g. Opuntia sp. Cactus

Riparian / Paludal



e.g. Carex divisa (foreground) Divided Sedge.

PHOTO COURTESY STEVE SINCLAIR

- Herbs: either sedge-like monocots or creeping forbs
- Restricted to wet environments that have high soil moisture throughout the year and little overhead light competition
- Usually have very effective means of vegetative reproduction
- Post-fire response: Not usually burnt in applied (cool season) fires, but may be burnt in wildfire conditions, if burnt: regenerate rapidly post-fire
- Standard chemical weed control difficult to apply due to proximity to open water or streams
- Low green shoot biomass immediately post-fire offers a unique opportunity for weed control
- High priority for control post-fire, otherwise usually low priority.

Examples – Alternanthera philoxeroides Alligator Weed, Cyperus exaltatus Tall Flat-sedge, Spartina anglica Cord-grass

Weed group general ecological and post-fire response information

Bramble



e.g. Rubus fruticosus spp. agg. Blackberry

• Rosa, Rubus and species

- Widespread in Victoria, except the Mallee
- Scandent, perennial, woody stems ('canes') consumed by fires
- Succulent, widely-(animal) dispersed fruit
- **Post-fire response**: Resprout vigorously from underground buds post-fire
- Rapid growth in the first season post-fire increases susceptibility to chemical control.

Examples – Rosa rubiginosa Sweet Briar, Rubus fruticosus spp. agg. Blackberry, Rubus laciniatus Cut-leaf Blackberry

Mat perennial



e.g. Gazania sp. Gazania

- Dense mats of foliage at, or close to, ground level
- Often stoloniferous or rhizomatous ('layering' or 'suckering')
- Foliage with high moisture levels, and lack of elevated dry fuel, mean that mats are often unburnt in low severity fires
- **Post-fire response**: If rhizomatous, abundant resprouting is likely; if stoloniferous, may be seriously disadvantaged by fire and, in this latter case, the immediate post-fire environment offers a unique opportunity for control
- Typically lacking highly-dispersible propagules (e.g. seed), although stem segments, which are capable of independent establishment, may be readily transported in the open post-fire environment.

Examples – *Convolvulus arvensis* Common Bindweed, *Gazania rigens* Gazania, *Phyla canescens* Fog-fruit



Weed group general ecological and post-fire response information

Aquatic



e.g. Nymphaea alba White Waterlily

• Unlikely to be affected by fire.

Examples – *Elodea canadensis* Canadian Pondweed, *Myriophyllum aquaticum* Parrots Feather, *Salvinia molesta* Salvinia

Notes to the Post-fire Weeds Triage decision key

Target Plant

The importance of determining if the target species is truly a weed is difficult to overstate. A simple definition of weed is 'a plant which is growing where it is not wanted, or at an abundance which is not wanted' (Groves and Hosking 1997; Smith 2000). Where there is doubt over a species classification as a weed it has been noted in Appendix 3 – *Environmental Weeds and Fire*. Not all Victorian weed species are introduced from other parts of Australia, or from outside Australia. There are several examples of Victorian weed species which are indigenous to some areas of the state – but not elsewhere in Victoria. Other species can be weeds within their natural distribution, as they have expanded their ecological range into (formerly unoccupied) nearby communities where they may behave as (undesirable) weeds.

Weed distributions, and the definition of weeds, are considered in column two of Appendix 3 – *Environmental Weeds and Fire*:

- (a) species which are native to Victoria but are also adventive outside their native range (e.g. *Kennedia rubicunda* Dusky Coral-pea),
- (b) species which are native to Victoria and adventive inside their native range, by expanding their ecological range (e.g. *Leptospermum laevigatum* Coast Tea-tree, Figure 1) and
- (c) species which may be native to all or part only of their Victorian range (e.g. *Adiantum capillus-veneris* Venus Hair-fern or Common Maidenhair) (we're not sure of their native range).

Figure 1. Leptospermum laevigatum Coast Tea-tree Wilsons Promontory, entrance road



Land managers have legal obligations, under the *Catchment and Land Protection Act 1994* (CaLP Act), to control noxious weeds. The recent *Noxious Weeds Review* assesses the invasiveness of current and potential future noxious weeds. Further information about the CaLP Act, *Declared Noxious Weeds* and the *Noxious Weeds Review* can be found at www.dpi.vic.gov.au.

New and Emerging

Consistent with the Bio-security Strategy for Victoria (www.land.vic.gov.au), weed species with the highest priority for control (or elimination) are 'new and emerging' weeds. By definition, new and emerging weed species are unfamiliar and their (local) ecology poorly known (Waterhouse 2003). The list of new and emerging weed species (state-level), included in this document, is by no means comprehensive. As soon as it's published, it's out of date. Land managers and planners may be aware of plant species new to their area, and to the state. Species not formerly known to be weedy in Victoria, are (all too) frequently added to the state's flora (e.g. during field visits for the current project, the authors made the first records of an adventive Victorian population of Symphoricarpus albus Snowberry). 'New and emerging' weed species includes more than the DPI/DSE weeds lists and classification (the species on the DPI/DSE list are relatively well known). 'New and emerging' also includes species not yet included on the published lists but which are nevertheless adventive and established in the wild.

Assigning a Weed Group

Information on weed species' responses to fires was collected at regional meetings held throughout the state, except for the north-west. These meetings yielded more than 250 observations of weed species' responses to fire. However, there are more than 1500 weed species recorded for Victoria. Post-fire response data and observations on the majority of these species are lacking. This is especially true for the important group 'new and emerging' weed species. To overcome this knowledge gap, broad species groupings (Table 1) are proposed. A list of Victoria's known weed species, along with their Weed Group, can be found in Appendix 3 – Environmental Weeds and Fire (Victoria) supplied with this document. Groups are based on functional traits, such as life cycle (annual or perennial), reproduction (seed or resprout) and flammability (i.e. succulent vegetation and riparian vegetation are typically less likely to burn than are sclerophyll shrubs and more flammable foothills forests). Not surprisingly, some species do not fit comfortably into any of the 19 proposed groups and fire responses of many species vary according to fire severity. The groups should be considered a guide only; observation and data should always be given precedence.



Tractability

Tractability refers to how much effort is needed for control of the weed. Current methods of weed control are not effective in the large-scale control of certain weed species. However, local eradications of small populations of these species, particularly those introduced and established after fires, may be possible via hand pulling (or other mechanical removal). Other species can be expected to naturally decrease in abundance as the bushland recovers from fire; hence, management action for these may be considered a low priority. Weed species aligned with one or both of these categories are highlighted in the functional groups (1) 'small and control impracticable' (2) 'herbs in cultivated ground', (3) 'herbs in disturbed ground' and (4) 'thistle'. The definitions of these groups are included in Table 1. Species included in these groups can be found in Appendix 3 – Environmental Weeds and Fire.

Population (distribution, abundance)

The scale of field occurrence and management intervention are critical considerations in weed management. Information on the size of the weed population is important in determining the likely outcomes of investing resources in weed management. If the weed is 'new and emerging' in a particular management area or unit (such as a designated reserve) then it may be given priority, even (and especially) if it is widespread in other areas. Furthermore, a small population of a weed (amenable to current methods of control) is more likely to be successfully eradicated, reducing the need for future investment, than is a large, widespread infestation. Consistent with the new biosecurity approach, eradication of a weed population is considered a higher priority than containment of that weed.

Post-fire Risks and Opportunities

This section is fundamental to the post-fire weeds triage process. The immediate (< 1–2 years) post-fire environment includes both opportunities for weed management, and risks from increases in weed abundance. Weed responses to fire are discussed in more detail in Appendix 2, *Weeds, fire and management approaches*.

Off-target impacts

Likely (or even only potential) adverse outcomes of weed management should be considered. These are particularly critical where listed rare or threatened species or vegetation type(s) are in the area affected by weed control works. No management action (or inaction) is without downsides. Management is always a balance between the expected positive outcomes and the expected negative outcomes, considered in association with costs. Rare and threatened species or communities may be adversely affected by weed control works (e.g. removal of protective shrubby weeds, including Gorse *Ulex europaeus*, around Hamilton;

these thorny shrubs providing shelter from predators for a threatened animal, viz. Eastern Barred Bandicoot *Perameles gunnii*, see www.dse.vic.gov.au). Other threats to rare or threatened assets include non-target effects of herbicides on the rare or threatened plants growing near or amongst the target weeds and interference with reproduction in susceptible threatened animals by herbicide breakdown products. These issues are more fully discussed elsewhere, notably in the various Action Statements and Recovery Plans published for listed species and communities (www.dse.vic.gov.au).

Further information on listed threatened species and ecological communities can be found at the *Environment Protection and Biodiversity Conservation Act 1999* and *Flora and Fauna Guarantee Act 1988* websites (www.environment.gov.au/epbc/ and www.dse.vic.gov.au)

The two principal non-target impacts relate to the use of chemical control, and soil (and other) disturbance.

Chemical control – Although there are herbicides that are not broad spectrum and may be somewhat selective, there is no truly species-specific herbicide that is available for standard weed control. Hence all herbicides will have non-target effects. If the herbicides remove substantial amounts of (mature) plant cover, the resultant bare ground will provide a very favourable environment for further weed establishment (McNamara 2003; Crosti, Dixon et al. 2007; McLaren, Ramasamy et al. 2007)

Disturbance – Many weed species respond rapidly and favourably to bare or disturbed ground. All weed control works involve some site disturbance. Occasionally the site disturbance is intrusive enough as to provide very favourable establishment sites for new weed infestations (McIntyre 1990; Gilfedder and Kirkpatrick 1998) or further sites for maintenance and augmentation of existing short life cycle weeds (Anderson 2004).

Additional considerations

Outlined below are some additional questions to refine post-fire weed management actions.

- i. Was the management area disturbed or severely burnt? If so, weeds in the following groups may be expected to grow vigorously for the first few seasons post-fire. They are also expected to decrease in abundance and vigour as the bushland re-establishes and matures further. Given this likelihood, control efforts may be a waste of time and resources that could be better directed towards more persistent and pernicious weed species and stands. Weed groups that are contra-indicated for active weed control post-fire are:
 - Small and Control impracticable
 - Herbs in Cultivated ground
 - Herbs in Disturbed ground
 - Thistle



- ii. Consider how the weed was introduced to the area as a result of the fire and associated activities. Vehicles used in fire suppression and management are common sources of new weed infestations post-fire. Other common weed sources include fodder brought into the district or property after the fires (McKay 2002), or fodder laid out for wildlife after the fires. Many horticultural species do not appear invasive in the absence of fire, but more or less rapidly spread in the benign conditions immediately post-fire. Other species that were not seen before the fire, may result from a long-term soil seed store, perhaps dating back to the next previous fire. This last group may include many native species that appear 'not to belong' due to their unfamiliarity and their luxuriant growth. Consider whether the weed or plant was noticed:
 - Beside a vehicle track?
 - On or beside a fire break or management track?
 - Spread throughout the bushland remote from the track (network)?
 - In a feed lot (formal or informal)?
 - Associated with old fodder (straw or seed)?
 - Associated with ground disturbance, such as caused by heavy-track vehicles (eg, bulldozers)?

Is the species usually dispersed by wind? Are the seeds light weight and with wings or other structures that enable widespread wind dispersal?

Is the species usually dispersed by animals, most commonly birds? Does the species produce a succulent fruit?

Post-fire Weed Management General Information

Weeds, fire and management approaches

1. Weed Introduction and Fire and New and Emerging Weeds - Fire presents several pathways for weed introduction and establishment. As new and emerging weeds have been identified as top priority in the new biosecurity policy approach (www.dse.vic.gov.au), efforts should concentrate on prevention of their entry into the post-fire environment. Arboretums, orchards, cemeteries, cut flower farms and domestic gardens (Allendorf and Lundquist 2003; Reid and Murphy 2008) can all be a source of propagules for species that subsequently become weedy (Groves and Hosking 1997; Groves, Boden et al. 2005), but were not known to be (locally) established in the wild before the fire.

Management activities, including fire operations, that may contribute to weed introduction, establishment and spread include soil disturbance associated with firebreak/ fire containment lines access track construction, and the use of (unsanitised) heavy vehicles, such as bulldozers (Cheal 2002) and management vehicles. In some areas, there are strategies in place to minimise the risk of weed introductions with fire management operations e.g. slashing fire breaks, rather than disturbing soil. These strategies may 'minimise' weed establishment, but they rarely eliminate the risk from (new) weeds. Weed surveillance, for new and emerging weeds, should therefore be a high priority.

The introduction of fodder, for native or domestic animals can provide opportunities for weed seed introduction (DPI 2006, 2009). In addition, new weed infestations may result from the spread of weed seed from nearby areas only burnt at low intensity, or not at

all. Vectors from these areas include:

- animals and birds, especially when the weed produces palatable fruit, and
- water, if these areas are upslope.

Weeds may also be dispersed by animals farther than is usual in unburnt vegetation, as animals may travel farther than usual to find food, including onto open pasture. These more localised effects are not usually interpreted as 'new and emerging' weeds.

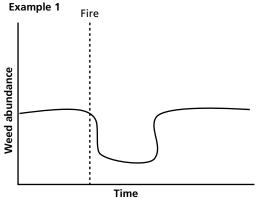
Weed risks and pathways for introduction depend, to some extent, on surrounding land uses (land tenure). This is discussed further in the *Guidelines and Procedures for Managing Environmental Weeds*.

2. Opportunities from Fires – A high priority also applies to established weed species for which fire creates an opportunity for increased management impact. This includes species which are adversely affected by fire (e.g. the mature plants are killed or reduced, Figures 2 and 3) and a rapid management response, before seedling growth to the stage of seed set, is likely to be particularly effective and presents an opportunity for local eradication.

For some weed species, improved access immediately after fires provides opportunities for control that are not usually available (in the absence of recent fire). This may apply in dense riparian vegetation or in the wet forests of the Ranges, wherein the dense vegetation impedes access to established weeds, or wherever the foliage of established weeds is beyond reach of standard foliar chemical methods. Unless burnt, weeds in such situations usually escape control efforts. However, in the first season or two after fires, the vegetation may be substantially more open and the foliage of resprouting taller weed species is now within range of either physical or chemical means of control.

Figure 2. B-type hypothetical weed response to fire. Examples 1 and 2 show species which undergo short-term decrease post-fire. Example 1 shows a species which then recovers to an abundance similar to pre-fire, while example 2 shows a species which continues to increase in abundance post-fire.

(B) Post-fire short-term decrease (control opportunity): weakened in the short-term abundance will remain the same or increase slowly in the longer term



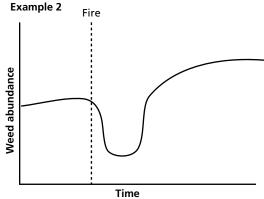




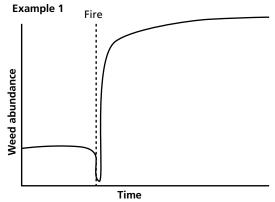
Figure 3. *Ilex aquifolium* English Holly, a species which shows a short term decrease post-fire. Photo courtesy Michele Kohout.



3. Weeds that Respond Positively to Fires – As with many native plant species, there are many weed species that exploit the favourable conditions immediately after fires and germinate prolifically and spread vigorously in the first few seasons (Figure 4). Such weed species may undergo a sustained increase (in both area of occupancy and population density) in the post-fire environment, and may also be a high priority for management. Familiar examples include Genista monspessulana Montpellier Broom and Cytisus scoparius English Broom (Figure 5); (Adams and Simmons 1991, Allan and Sagliocco 2005). These species gradually establish a long-term soil seed bank that is triggered to germination en masse by the fires. In the absence of targeted control efforts in the first few seasons after fires, both these species rapidly spread and reach a new, more intense level of landscape infestation. As a result, timely post-fire management action (usually within 18 months) is necessary for containment.

Figure 4. A-type hypothetical weed response to fire. Examples 1 and 2 illustrate species which increase post-fire. Example 1 illustrates a species which undergoes a very large and sustained increase in abundance post-fire. This occurs most commonly via post-fire seed germination. Example 2 also shows a sustained increase in abundance post-fire, although less dramatic than in Example 1.

(A) Post-fire increase: weakened in the very short-term, but will dramatically increase in abundance within two years



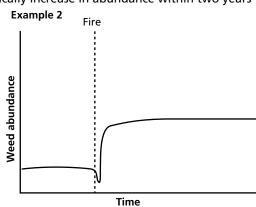




Figure 5. Cytisus scoparius English Broom, a species which increases post-fire.



PHOTO COURTESY MICHELE KOHOUT.

4. Boom and Bust Weeds – The lowest priority for management actions in the first few seasons after fires applies to ephemeral, pioneer, disturbance-specialist species. These species may become locally abundant in the first few seasons after fires, as they vigorously exploit the reduced competition for light and moisture and luxuriate in increased soil nutrients (Hobbs 1991; Hocking 2001). With the recovery of the native vegetation, many will decrease in abundance to virtual local disappearance (yet a soil stored seedbank may persist) (Figures 6 and 7). No special management intervention is required to reduce such 'boom and bust' weed species. They will decrease as the effects of the fire disturbance dissipate. In environments subject to continuing disturbance,

the abundance of 'ephemeral' species is likely to be maintained (Millberg and Lamont 1995, Thomson and Leishman 2005). Summary information for weeds displaying A, B and C-type post-fire responses is included in Table 2.

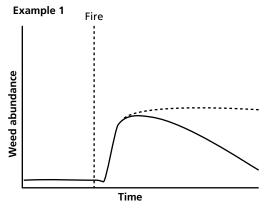
Figure 7. Euphorbia peplus Petty Spurge, a species which undergoes a short-term increase post-fire.



Established Weeds – Species already widespread in the 'landscape management unit', for which there is no reasonable prospect of meaningful containment, are a further low priority group. They may reasonably be considered for control effort in terms of **asset protection**, but otherwise, if there is no reasonable prospect of containment nor eradication, management intervention may be a waste of time and effort.

Figure 6. C-type hypothetical weed response to fire. Examples 1 and 2 show species which undergo short-term increase post-fire. Example 1 illustrates where post-fire abundance of a C-type species may be maintained where there is continuing disturbance (dotted line).

(C) Post-fire ephemeral/adventive: abundance will increase in the short-term, then decrease in the long term – except for in disturbed areas, areas affected by severe fire, and/or where the bush is not recovering



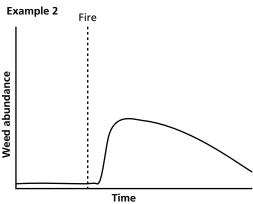


Table 2. Summary information for hypothetical weed responses to fire.

Fire response	Description
A	 Increase post-fire by seed or resprout (including suckers). Competitive/ persistent in recovering native vegetation. Seeding species typically undergo the greatest increase post-fire. Weeds which quickly and vigorously resprout are also in this group. High priority (management action should be promptly taken, e.g. removal of seedlings before they mature / set seed). Weed Groups commonly displaying an A-type fire response include: Woody legume seeders, Herbs in native vegetation, Perennial grasses, Seed hard-fruit woodys and Geophtyes.
В	 Short-term decrease post-fire due to reduction in biomass and/or reduction in densities; mature plants temporarily "weakened". Post-fire response strongly dependent on fire severity (i.e. time to weed recovery). Group includes mainly resprouting and suckering species. High priority (better results and less input if management action is taken promptly to treat fire-weakened weeds). Weed Groups commonly displaying a B-type fire response include: Robust creepers, Suckering woodys, Soft-fruit woodys, Seed hard-fruit woodys, Brambles, and Mat perennials.
С	 Short-term increase post-fire, due to removal of competing vegetation, disturbance and/or stimulation of germination. Abundance and vigour decrease as the native vegetation recovers. Low priority (will naturally decrease with time; high dispersibility means seed return is continuous or long-term seed longevity in the soil means that it will again become visually dominant after the next disturbance event / fire). Weed Groups commonly displaying a C-type fire response include: Herbs in cultivated ground, Herbs in disturbed ground, 'Small and control impracticable' and Thistles.

Biological and Funding Cycles

Higher priority is placed on species for which short-term management (< 3 years) is likely to have a measurable impact. However, this does not discount the fundamental need for follow up in all weed management activities i.e. monitoring, treatment and planting of replacement (native) species. It is acknowledged that long-term sources of funding are difficult to find but thoughtful, effective funding and actions undertaken in the post-fire environment will kick start the weed management process, towards (local) eradication, thus reducing management effort (and expenditure) in the long-term. It is also acknowledged that staff undertaking weed management activities may have competing priorities for their time, in particular fire management in certain seasons. One contributor suggested the use of reputable contractors, so that weed management schedules could be completed. Post-fire weed management should be considered as part of funding for prescribed burning activities.

Caveat: other influences on post-fire weed responses

Caveats on the post-fire weed responses reported in this manual are that, unless explicitly stated otherwise, there is no differentiation between:

- weed responses to high intensity and low intensity fires (e.g. Gleadow and Narayan 2007), and
- responses in different ecosystems e.g. wet gully versus ridge top.

Species with broad niches are likely to be generalists and (similarly) responsive to extra growing space, in whatever situation it occurs. Species more restricted in their habitat preferences (e.g. to moist or dry environments) are largely restricted to these environments, and their fire responses were observed *in situ*.

The rate of recovery of the native vegetation in which weeds are immersed will also influence post-fire weed abundance and persistence (e.g. Ainsworth and Mahr 2003). These in turn are influenced by fire severity and post-fire weather. Above-average rainfall is likely to promote fast growth and shorten timelines for management intervention, while drought post-fire may result in changed competition dynamics, resulting in greater mortality of both exotic



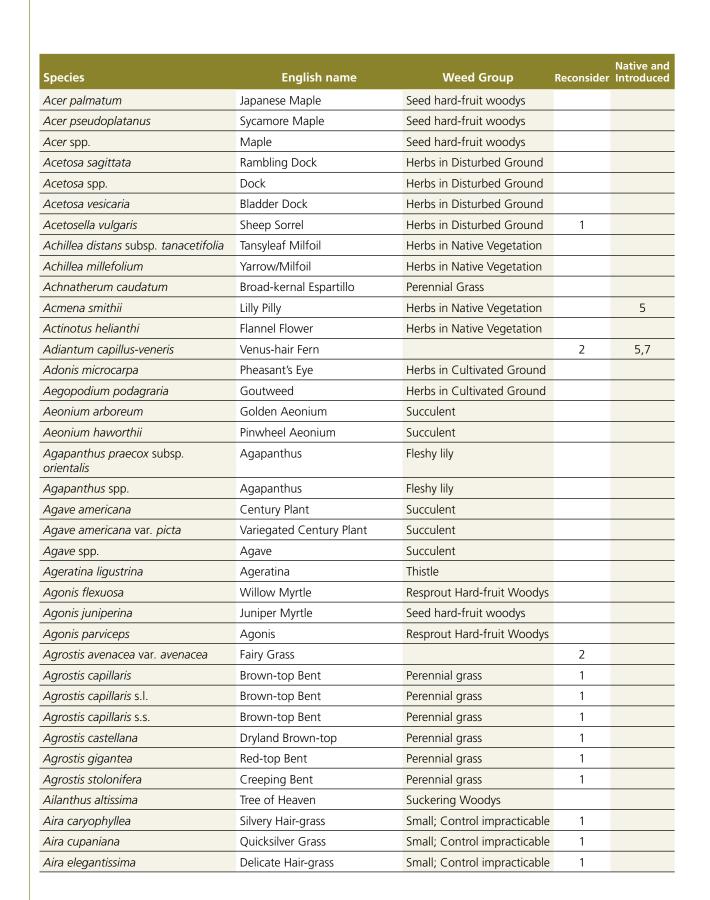
and native species (e.g. McDougall and Morgan 2005), or promoting one functional group over another, such as slow growing hardy species, or plants with root systems established before the fire. Post-fire flooding may also be a pathway for weed spread.

Finally, grazing and browsing pressure can influence postfire weed abundance. For example, if the recruits of native species are palatable relative to weeds, then the recovery from fire is likely to occur more slowly, such that the environment may be classified as 'disturbed'. In terms of vegetation recovery, this could result in the maintenance of post-fire ephemeral weed species (e.g. thistles) providing unfavourable conditions for the re-establishment of native plant species. Grazing pressure can also influence species composition; some species may be unable to recruit successfully without grazing exclusion. Moreover, fire may affect the distribution of herbivores, e.g. horses and deer: other projects are addressing this issue.

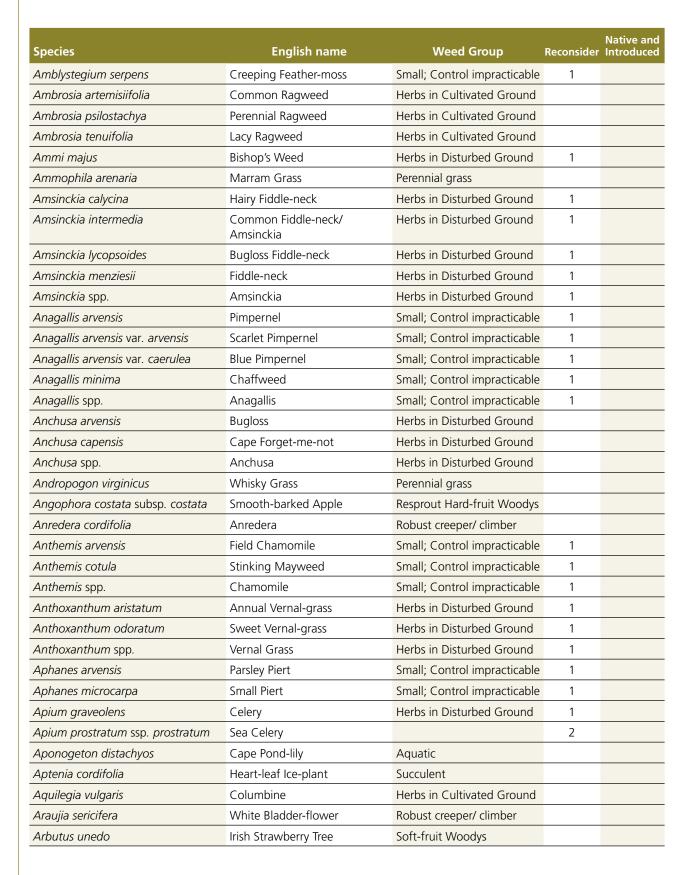
Table of Environmental Weeds and Fire (Victoria)

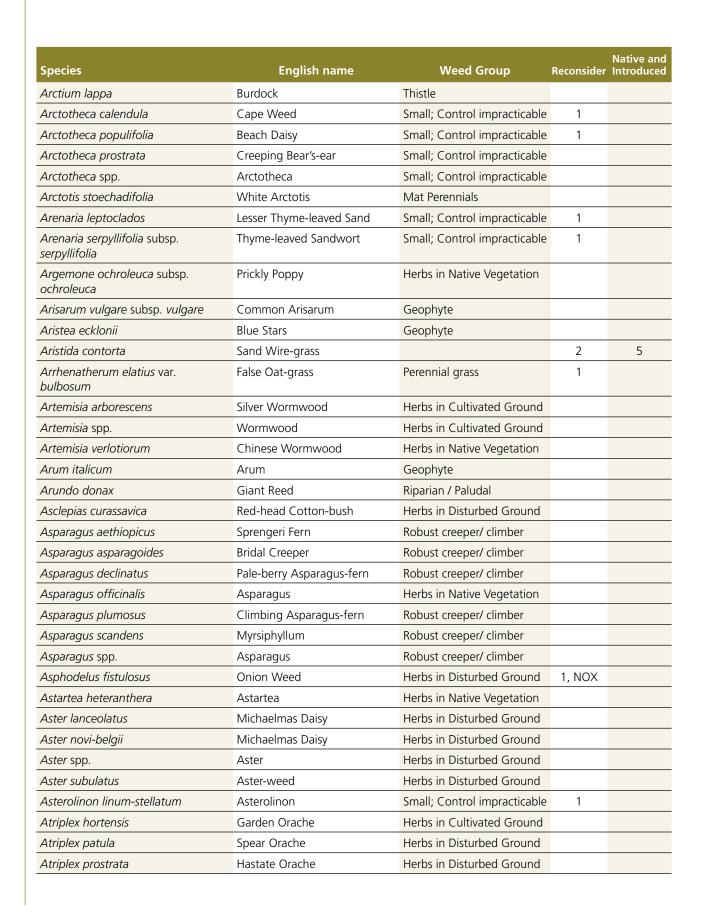
This table, Environmental weeds and fire (Victoria), is intended for use with the Manual. *Classifications*: Reconsider (1) control difficult without hand/mechanical removal, (2) **possibly native** (some authors have considered as indigenous); **Native and Introduced** (5) native to Victoria and adventive outside native range, (6) native to Victoria and adventive inside native range (7) possibly native, possibly not throughout Victorian range. **Weed Groups** are described in Table 1 of the Manual.

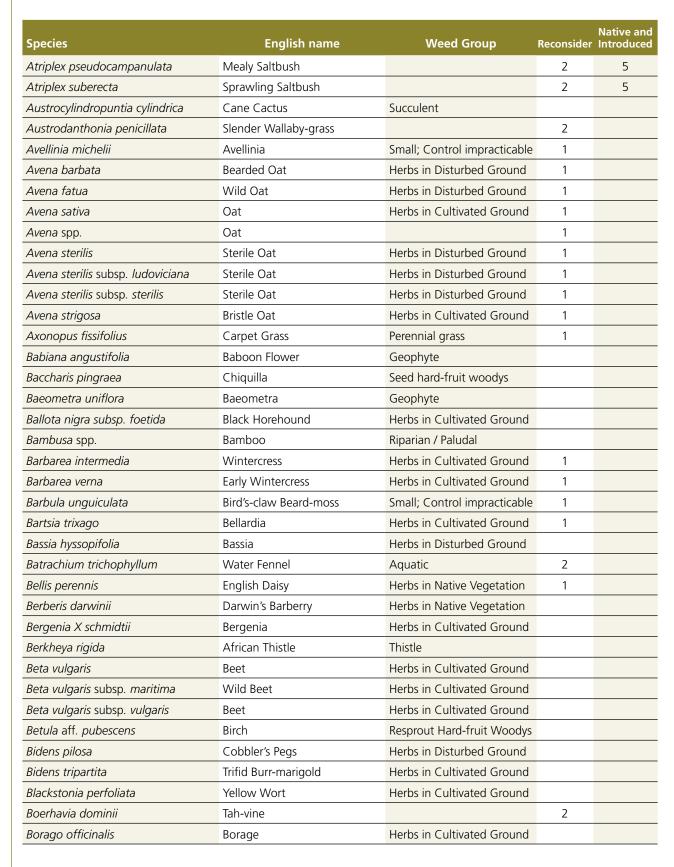
Species	English name	Weed Group	Reconsider	Native and Introduced
Abelia X grandiflora	Glossy Abelia	Resprout hard-fruit woodys		
Abutilon theophrasti	Chingma Lantern	Herbs in disturbed ground		
Acacia baileyana	Cootamundra Wattle	Woody legume seeder		
Acacia cardiophylla	Wyalong Wattle	Woody legume seeder		
Acacia cognata	Narrow-leaf Bower-wattle	Woody legume seeder		5
Acacia cyclops	Western Coastal Wattle	Woody legume seeder		
Acacia decurrens	Early Black Wattle	Woody legume seeder	2	7
Acacia dodonaeifolia	Sticky Hop Wattle	Woody legume seeder	2	7
Acacia elata	Cedar Wattle	Woody legume seeder		
Acacia elongata	Swamp Wattle	Woody legume seeder		
Acacia fimbriata	Fringed Wattle	Woody legume seeder		
Acacia floribunda	White Sallow-wattle	Woody legume seeder		5
Acacia howittii	Sticky Wattle	Woody legume seeder		5
Acacia iteaphylla	Flinders Range Wattle	Woody legume seeder		
Acacia karroo	Karroo Thorn	Woody legume seeder		
Acacia longifolia s.l.	Coast/Sallow Wattle	Woody legume seeder		5,6
Acacia longifolia subsp. longifolia	Sallow Wattle	Woody legume seeder		5,6
Acacia longifolia subsp. Sophorae or Acacia sophorae	Coast Wattle	Woody legume seeder		5,6
Acacia obtusifolia	Blunt-leaf Wattle	Woody legume seeder		5
Acacia paradoxa	Hedge Wattle	Woody legume seeder		5
Acacia pendula	Weeping Myall	Resprout hard-fruit woodys		5
Acacia podalyriifolia	Queensland Silver Wattle	Woody legume seeder		
Acacia pravissima	Ovens Wattle	Woody legume seeder		5
Acacia prominens	Gosford Wattle	Woody legume seeder		
Acacia retinodes	Wirilda	Woody legume seeder		5
Acacia retinodes var. retinodes	Wirilda	Woody legume seeder		5
Acacia rupicola	Rock Wattle	Woody legume seeder		5
Acacia saligna	Golden Wreath Wattle	Woody legume seeder		
Acacia schinoides	Frosty Wattle	Woody legume seeder		
Acacia spp. (naturalised)	Wattle (naturalised)	Woody legume seeder		
Acanthus mollis	Bear's Breach	Fleshy lily		
Acer negundo	Box-elder Maple	Seed hard-fruit woodys		



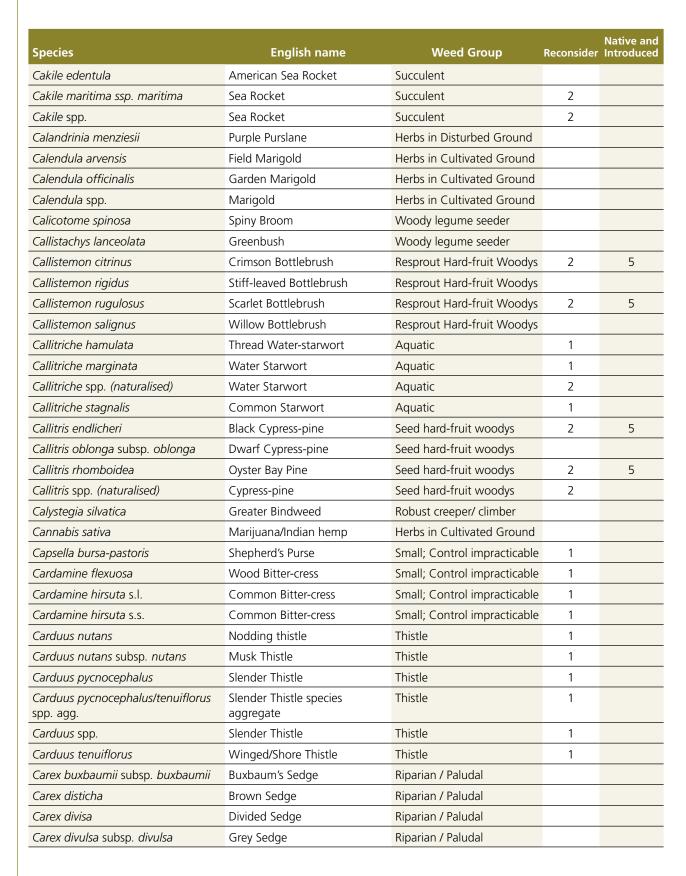


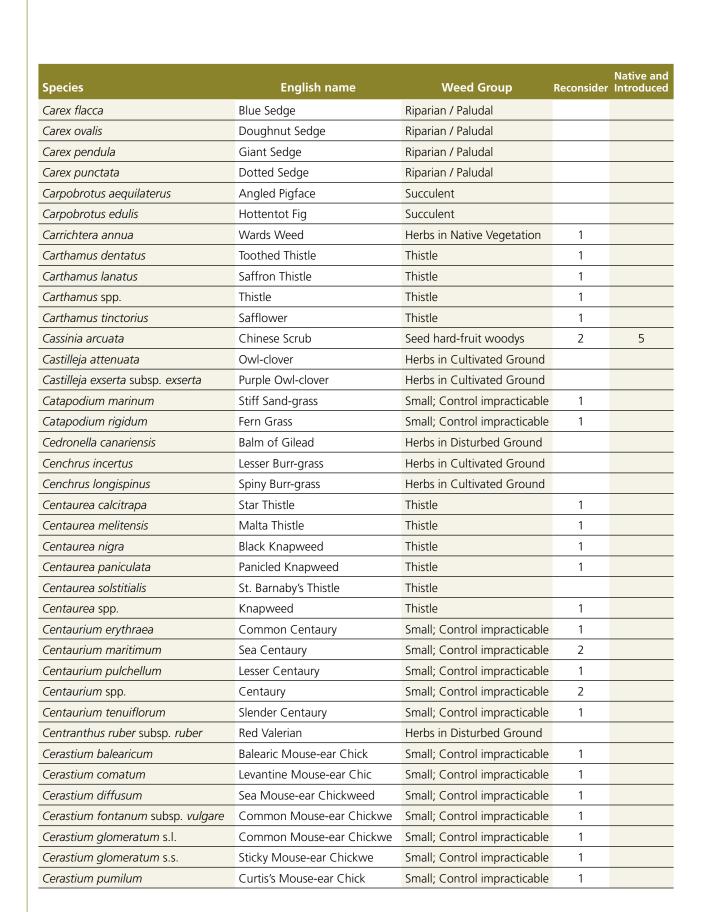


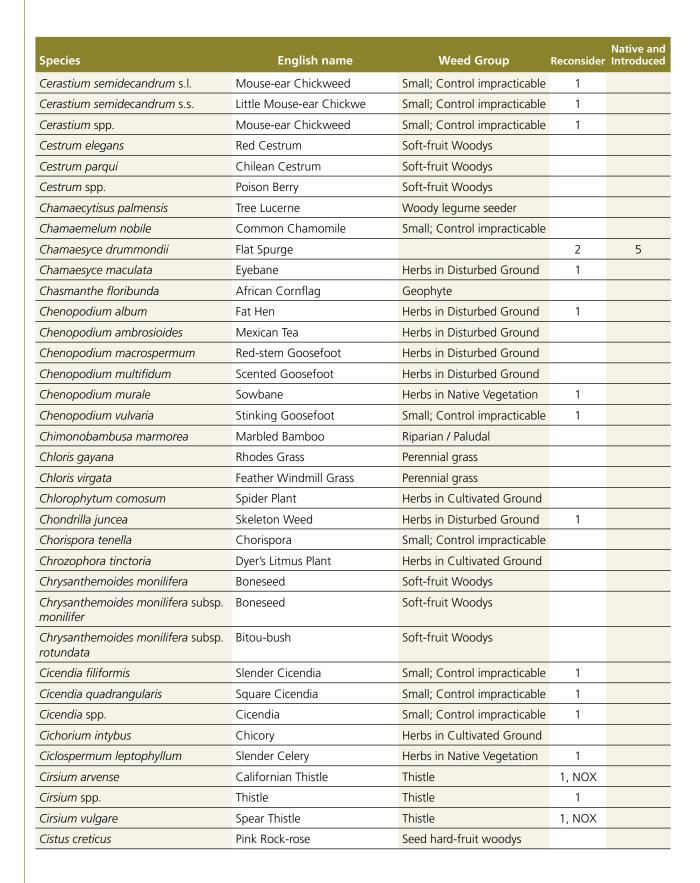




Species	English name	Weed Group	Reconsider	Native and Introduced
Brachychiton populneus subsp. populneus	Kurrajong	Resprout Hard-fruit Woodys		5
Brachypodium distachyon	False Brome	Herbs in Disturbed Ground	1	
Brachypodium sylvaticum subsp. sylvaticum	Forest Brome	Herbs in Disturbed Ground	1	
Brachythecium albicans	Whitish Feather-moss	Small; Control impracticable	1	
Brassica fruticulosa	Twiggy Turnip	Herbs in Disturbed Ground	1	
Brassica nigra	Black Mustard	Herbs in Cultivated Ground	1	
Brassica oleracea	Cabbage	Herbs in Cultivated Ground	1	
Brassica rapa	White Turnip	Herbs in Cultivated Ground	1	
Brassica spp.	Turnip		1	
Brassica tournefortii	Mediterranean Turnip	Herbs in Disturbed Ground	1	
Brassica X juncea	Indian Mustard	Herbs in Disturbed Ground	1	
Brassica X napus	Rape	Herbs in Cultivated Ground	1	
Briza maxima	Large Quaking-grass	Small; Control impracticable	1	
Briza minor	Lesser Quaking-grass	Small; Control impracticable	1	
Briza spp.	Quaking Grass	Small; Control impracticable	1	
Bromus catharticus	Prairie Grass	Herbs in Disturbed Ground	1	
Bromus catharticus var. catharticus	Prairie Grass	Herbs in Disturbed Ground	1	
Bromus catharticus var. rupestris	Prairie Grass	Herbs in Disturbed Ground	1	
Bromus cebadilla	Chilean Brome	Herbs in Disturbed Ground	1	
Bromus diandrus	Great Brome	Herbs in Native Vegetation	1	
Bromus hordeaceus	Soft Brome	Herbs in Native Vegetation	1	
Bromus hordeaceus subsp. hordeaceus	Soft Brome	Herbs in Native Vegetation	1	
Bromus lanceolatus	Mediterranean Brome	Herbs in Disturbed Ground	1	
Bromus lithobius	Chilean Brome	Herbs in Disturbed Ground	1	
Bromus madritensis	Compact Brome	Herbs in Native Vegetation	1	
Bromus racemosus subsp. commutatus	Meadow Brome	Herbs in Disturbed Ground	1	
Bromus rubens	Red Brome	Herbs in Native Vegetation	1	
Bromus sterilis	Sterile Brome	Herbs in Disturbed Ground	1	
Bromus tectorum	Wall Brome	Herbs in Disturbed Ground	1	
Bryophyllum delagoense	Mother of Millions	Succulent		
Buddleja davidii	Butterfly Bush	Seed hard-fruit woodys		
Buddleja dysophylla	African Buddleia	Seed hard-fruit woodys		
Buglossoides arvensis	Corn Gromwell	Small; Control impracticable	1	
Bupleurum semicompositum	Hare's Ear	Small; Control impracticable		
Cabomba caroliniana	Cabomba	Aquatic		

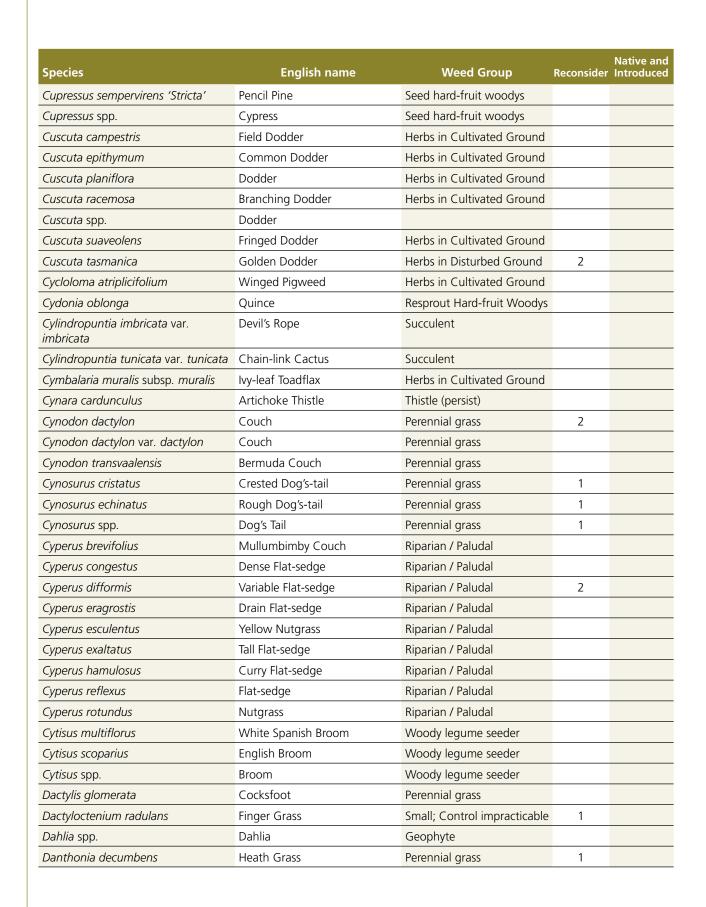


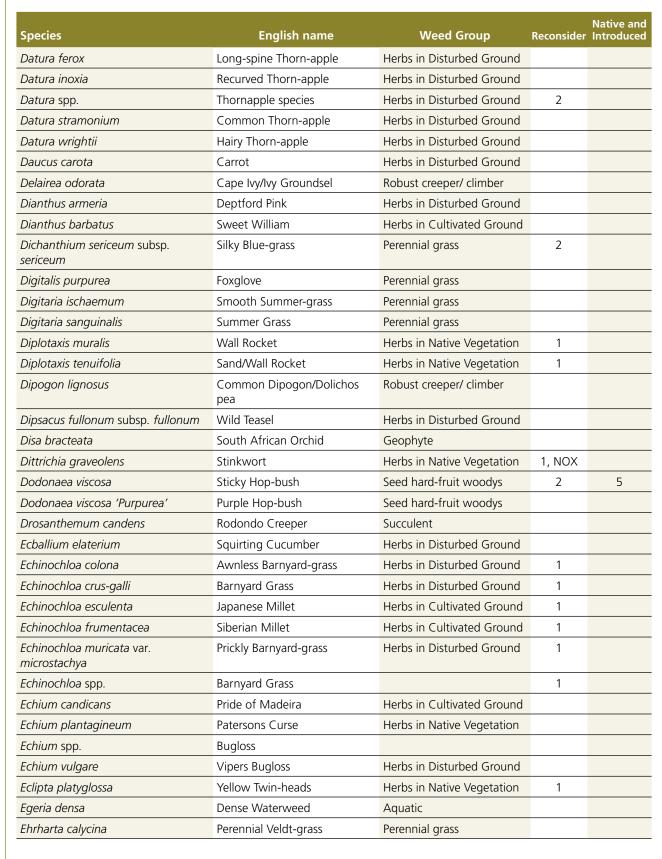




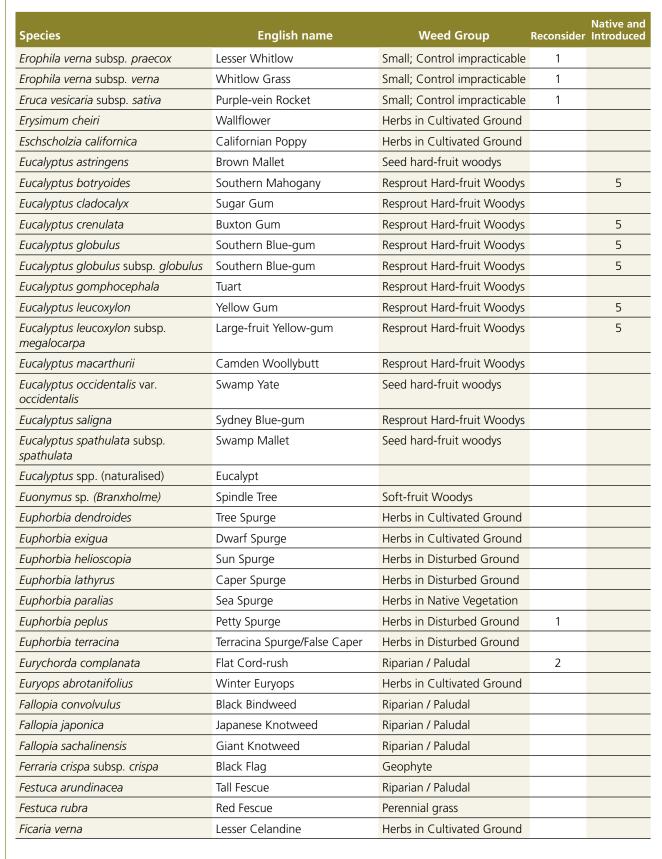


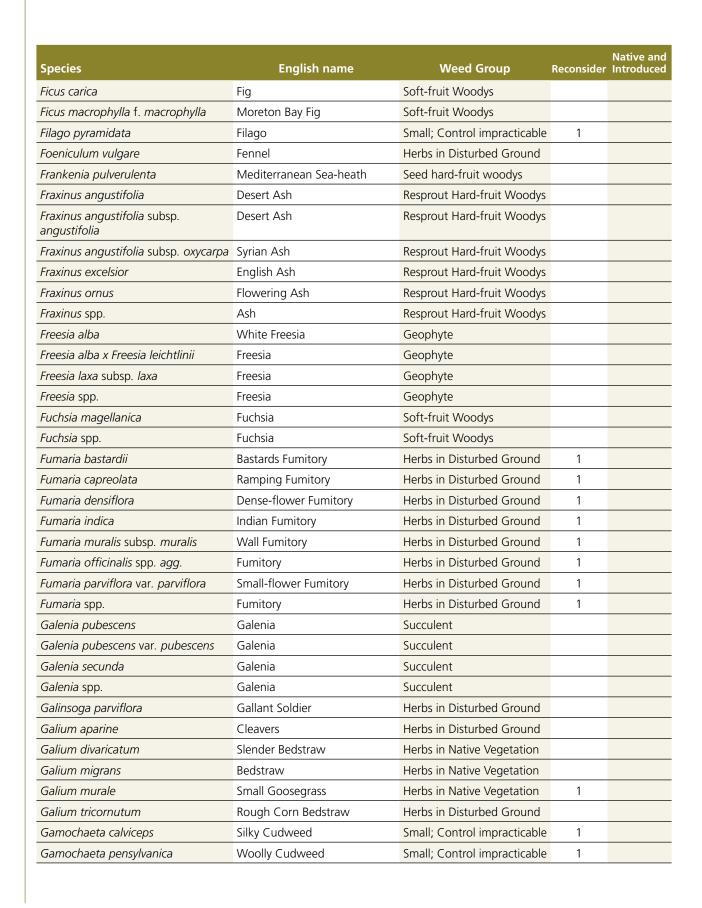


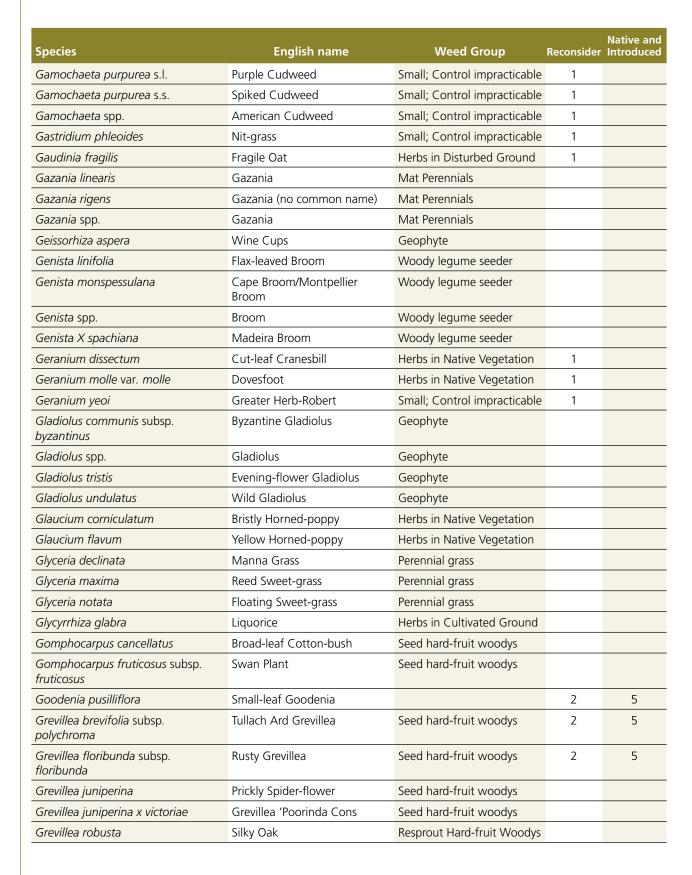




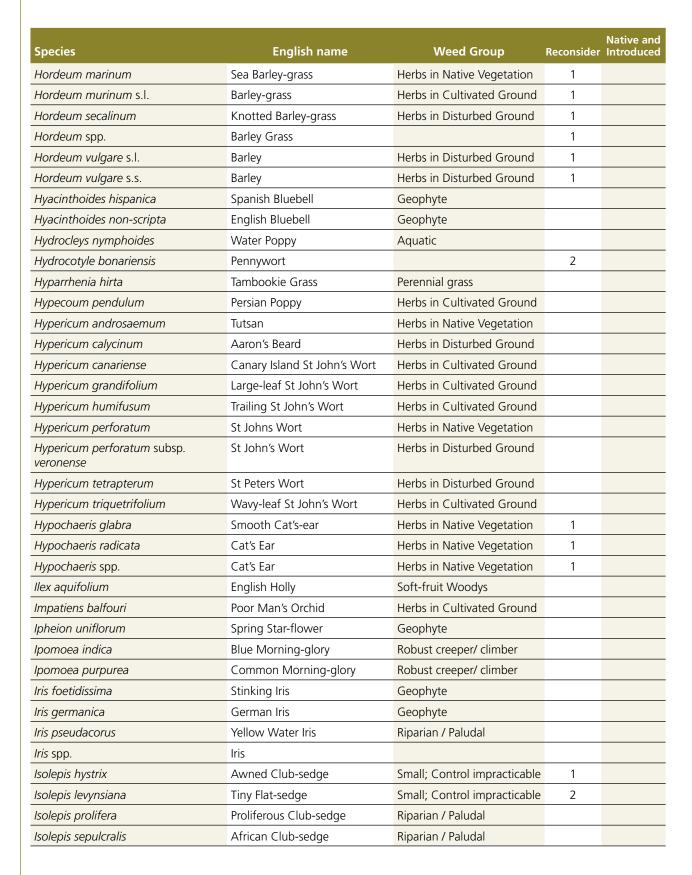


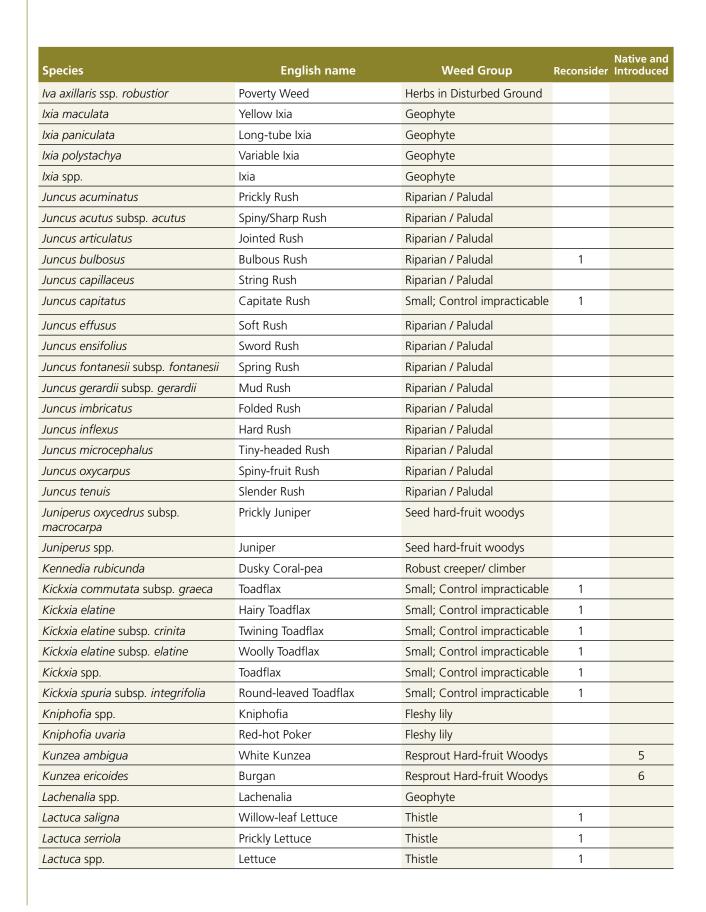






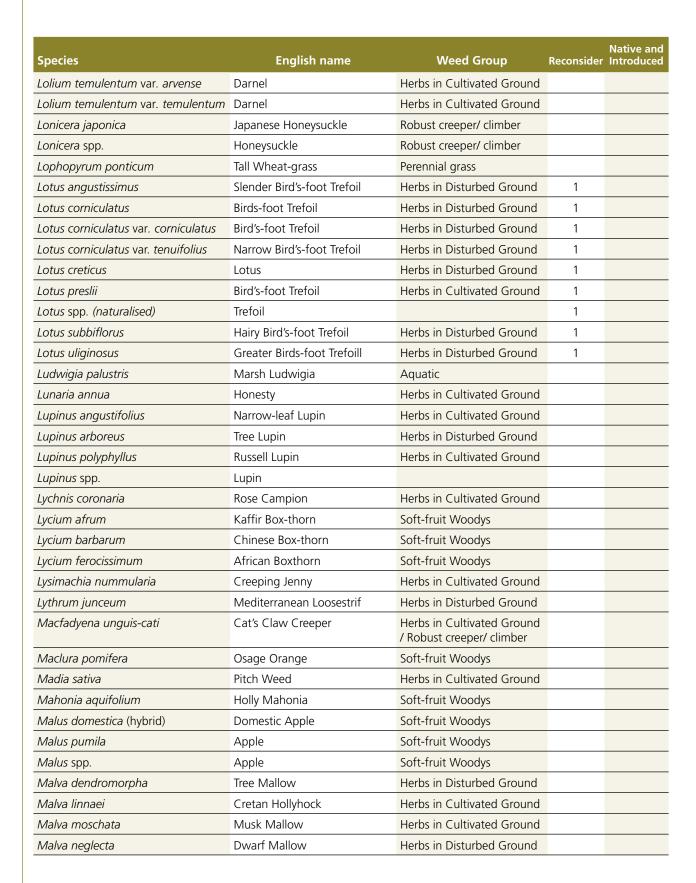
Species	English name	Weed Group	Reconsider	Native and Introduced
Grevillea rosmarinifolia	Rosemary Grevillea	Seed hard-fruit woodys		5
Grevillea rosmarinifolia subsp. rosmarinifolia	Rosemary Grevillea	Seed hard-fruit woodys		5
Gymnocoronis spilanthoides	Senegal Tea	Aquatic		
Gypsophila tubulosa	Chalkwort	Small; Control impracticable	2	
Hainardia cylindrica	Common Barb-grass	Herbs in Native Vegetation	1	
Hakea drupacea	Sweet Hakea	Seed hard-fruit woodys		
Hakea gibbosa	Downy Hakea	Seed hard-fruit woodys		
Hakea laurina	Pincushion Hakea	Seed hard-fruit woodys		
Hakea salicifolia subsp. salicifolia	Willow-leaf Hakea	Seed hard-fruit woodys		
Hakea sericea s.s.	Needle Hakea	Seed hard-fruit woodys		
Hardenbergia violacea	Purple Coral-pea		2	5
Hedera helix	English Ivy	Robust creeper/ climber		
Hedypnois cretica	Cretan Hedypnois Herbs in Native Vegeta			
Helianthus annuus	Common Sunflower	Herbs in Cultivated Ground		
Helianthus tuberosus	Jerusalem Artichoke	Jerusalem Artichoke Herbs in Cultivated Ground		
Heliotropium europaeum	Common Heliotrope		2	
Heliotropium supinum	Creeping Heliotrope	Herbs in Disturbed Ground		
Helminthotheca echioides	Ox-tongue	Herbs in Disturbed Ground	1	
Hemerocallis fulva	Orange Day Lily	Herbs in Disturbed Ground		
Hemerocallis spp.	Day Lily	Herbs in Disturbed Ground		
Herniaria cinerea	Hairy Rupture-wort			
Hibiscus trionum var. trionum	Bladder Ketmia	Herbs in Disturbed Ground		
Hieracium aurantiacum subsp. carpathicola	Orange Hawkweed	Herbs in Native Vegetation		
Hieracium praealtum	King Devil Hawkweed	Herbs in Native Vegetation		
Hieracium spp.	Hawkweed	Herbs in Native Vegetation		
Hirschfeldia incana	Buchan Weed	Herbs in Disturbed Ground		
Holcus annuus	Annual Fog	Herbs in Disturbed Ground	1	
Holcus lanatus	Yorkshire Fog	Perennial grass		
Holcus mollis	Creeping Fog	Perennial grass		
Holcus spp.	Fog Grass			
Homalanthus populifolius	Bleeding Heart	Soft-fruit Woodys		
Homeria ochroleuca	Cape Tulip	Geophyte		
Hordeum distichon	Two-row Barley	Herbs in Disturbed Ground	1	
Hordeum glaucum	Northern Barley-grass	Herbs in Native Vegetation	1	
Hordeum hystrix	Mediterranean Barley-gra	Herbs in Native Vegetation	1	
Hordeum leporinum	Barley-grass	Herbs in Native Vegetation	1	

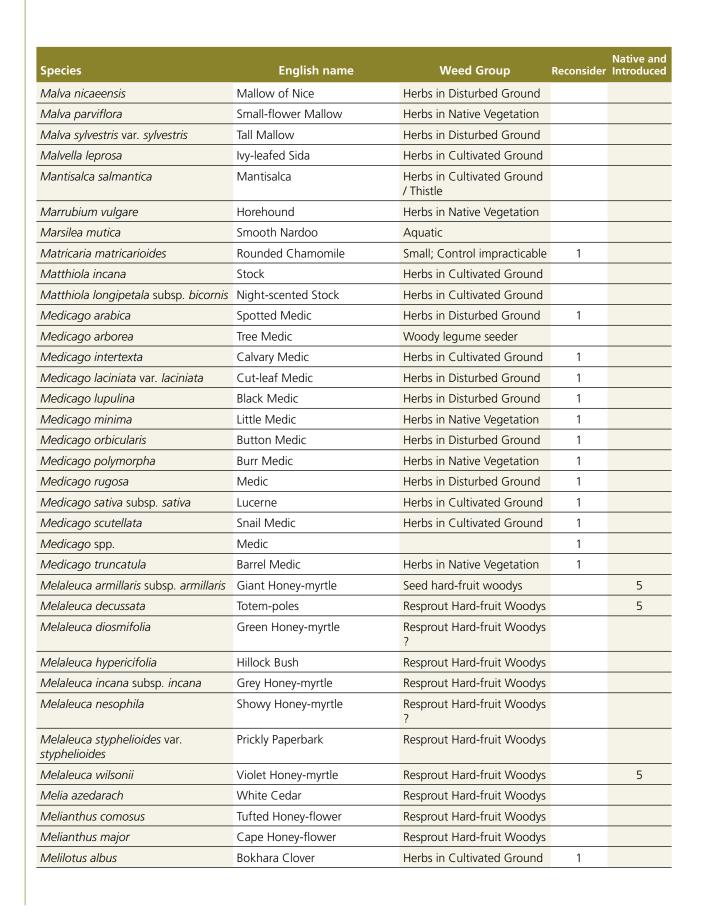




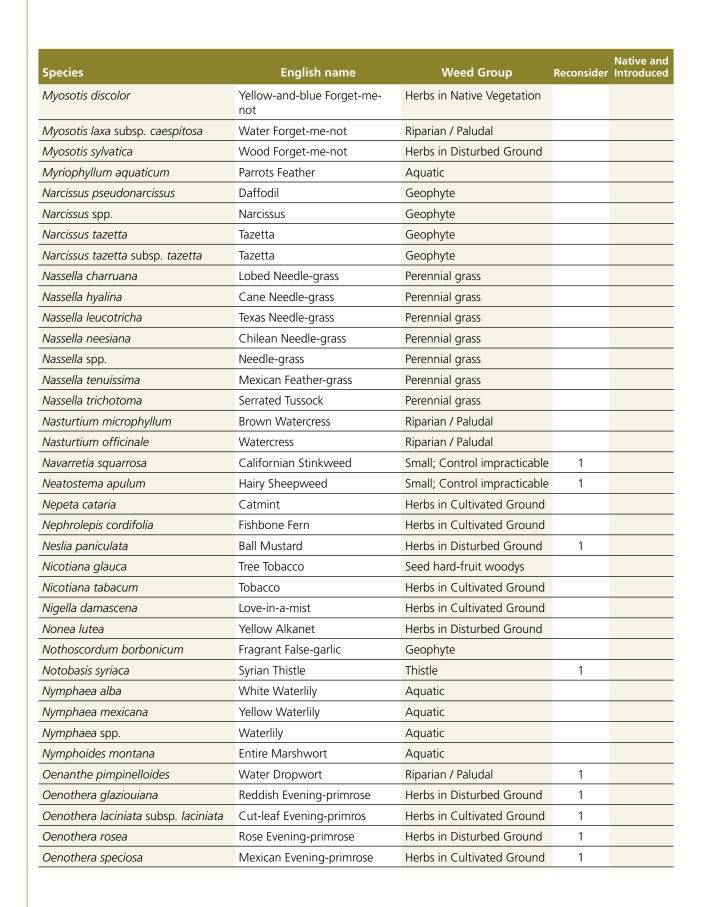




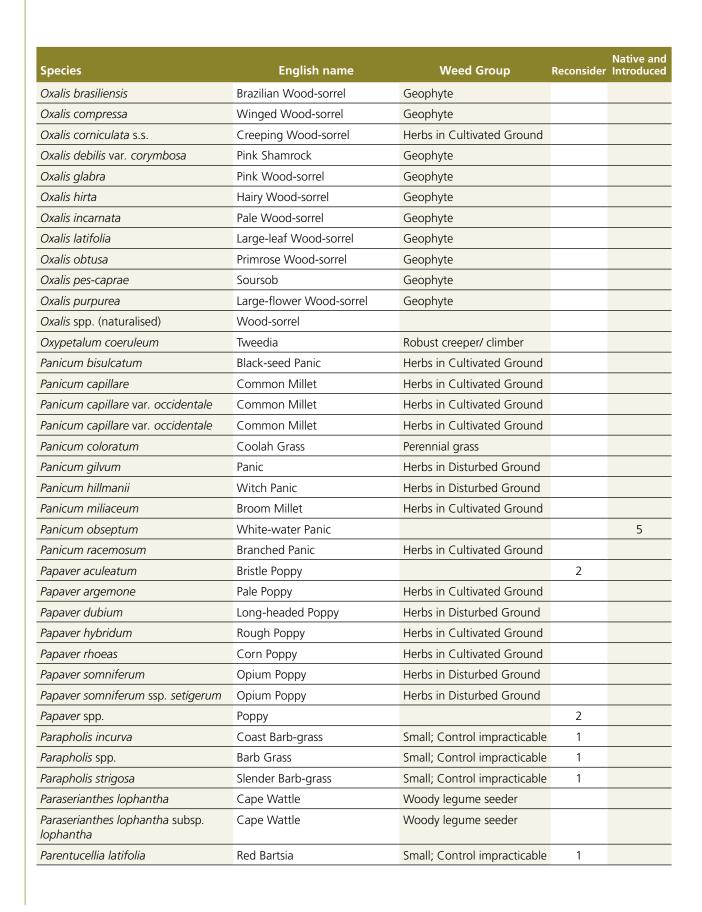


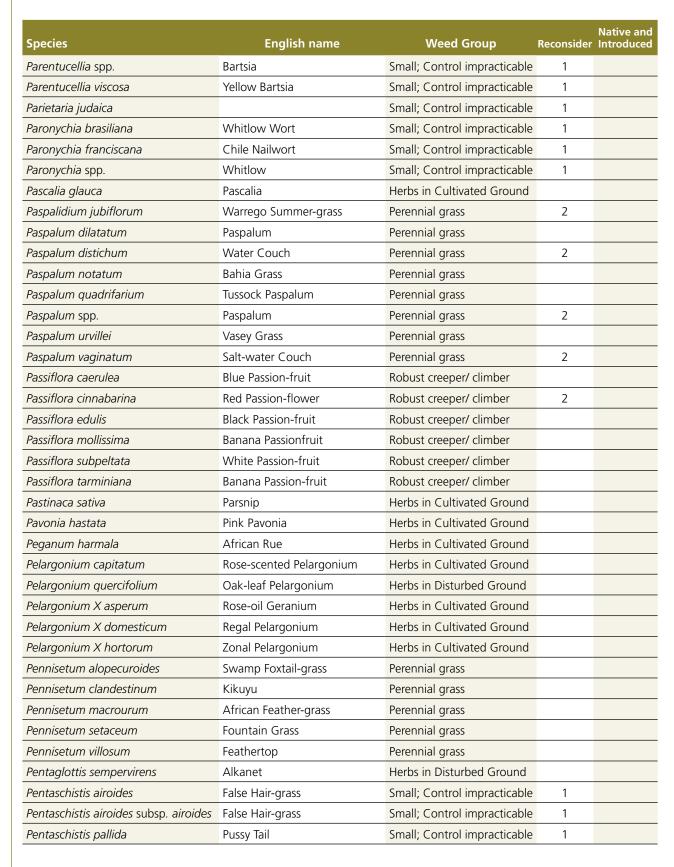
















Species	English name	Weed Group	Reconsider	Native and Introduced
Poa bulbosa	Bulbous Meadow-grass	Perennial grass	1	
Poa bulbosa var. bulbosa	Bulbous Meadow-grass	Perennial grass	1	
Poa bulbosa var. vivipara	Bulbous Meadow-grass	Perennial grass	1	
Poa colensoi	Kiwi Snow-grass	Perennial grass		
Poa infirma	Early Meadow-grass	Small; Control impracticable	1	
Poa pratensis	Kentucky Blue-grass	Perennial grass	1	
Poa trivialis	Rough Meadow-grass	Perennial grass		
Poa trivialis subsp. sylvicola	Rough Meadow-grass	Perennial grass		
Poa trivialis subsp. trivialis	Rough Meadow-grass	Perennial grass		
Poaceae spp. (naturalised)	Grass (naturalised)			
Podalyria sericea	Silky Podalyria	Woody legume seeder		
Polycarpon tetraphyllum	Four-leaved Allseed	Small; Control impracticable	1	
Polygala monspeliaca	Annual Milkwort	Herbs in Disturbed Ground		
Polygala myrtifolia var. myrtifolia	Myrtle-leaf Milkwort	Seed hard-fruit woodys		
Polygala virgata	Polygala	Seed hard-fruit woodys		
Polygala vulgaris	Common Milkwort	Herbs in Disturbed Ground	1	
Polygonum arenastrum	Wireweed	Herbs in Native Vegetation	1	
Polygonum aviculare s.l.	Prostrate Knotweed	Herbs in Native Vegetation	1	
Polygonum aviculare s.s.	Hogweed	Herbs in Native Vegetation	1	
Polygonum bellardii	Tree Hogweed	Herbs in Disturbed Ground		
Polypogon maritimus var. subspathaceus	Coast Beard-grass	Herbs in Native Vegetation		
Polypogon monspeliensis	Annual Beard-grass	Herbs in Native Vegetation	1	
Polypogon spp.	Beard Grass			
Polypogon viridis	Water Bent	Riparian / Paludal		
Pomaderris elliptica var. ellipti	Smooth Pomaderris	Seed hard-fruit woodys	2	5
Pontederia cordata	Pickerel Weed	Aquatic		
Populus alba	White Poplar	Suckering Woodys		
Populus nigra 'Italica'	Lombardy Poplar	Suckering Woodys		
Populus spp.	Poplar	Suckering Woodys		
Populus tremula	Aspen	Suckering Woodys		
Populus X canadensis	Canadian Poplar	Suckering Woodys		
Populus X canescens	Grey Poplar	Suckering Woodys		
Potamogeton acutifolius	Sharp Pondweed	Aquatic		
Potentilla anserina	Silverweed	Herbs in Disturbed Ground		
Potentilla indica	Indian Strawberry	Herbs in Native Vegetation		
Potentilla recta	Sulphur Cinquefoil	Herbs in Disturbed Ground		
Potentilla reptans	Creeping Cinquefoil	Herbs in Disturbed Ground		







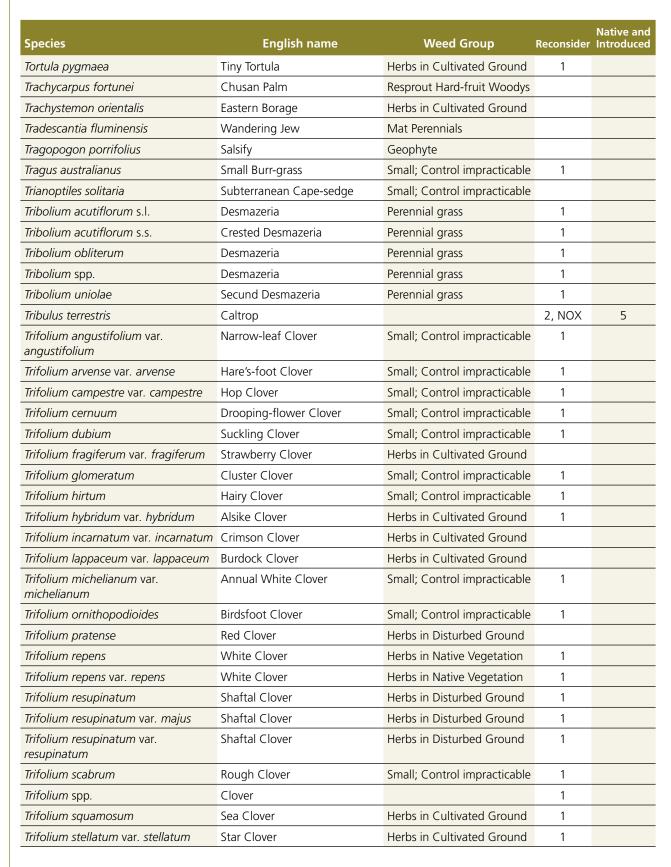




Species	English name	Weed Group	Reconsider	Native and Introduced
Silene dioica	Red Campion	Herbs in Cultivated Ground	1	
Silene gallica	French Catchfly	Herbs in Native Vegetation	1	
Silene gallica var. gallica	French Catchfly	Herbs in Native Vegetation	1	
Silene gallica var. quinquevulnera	Spotted Catchfly	Herbs in Native Vegetation	1	
Silene latifolia	White Campion	Herbs in Disturbed Ground	1	
Silene longicaulis	Portuguese Catchfly Herbs in Native Vegeta		1	
Silene nocturna	Mediterranean Catchfly	Mediterranean Catchfly Herbs in Native Vegetation		
Silene spp.	Catchfly		1	
Silene vulgaris	Bladder Campion	Herbs in Disturbed Ground		
Silene vulgaris subsp. vulgaris	Bladder Campion	Herbs in Disturbed Ground	1	
Silybum marianum	Variegated Thistle	Thistle (persist)		
Sinapis alba var. alba	White Mustard	Herbs in Cultivated Ground	1	
Sinapis arvensis	Charlock	Herbs in Cultivated Ground	1	
Sisymbrium erysimoides	Smooth Mustard	Herbs in Native Vegetation	1	
Sisymbrium irio	London Rocket	Herbs in Native Vegetation	1	
Sisymbrium officinale	Hedge Mustard	Herbs in Native Vegetation	1	
Sisymbrium orientale	Indian Hedge-mustard	Herbs in Native Vegetation	1	
Sisymbrium spp.	Mustard	Herbs in Native Vegetation	1	
Sisyrinchium iridifolium	Blue Pigroot	Geophyte		
Sisyrinchium sp. A	Scour-weed	Geophyte		
Sisyrinchium spp.	Sisyrinchium	Geophyte		
Solanum americanum	Glossy Nightshade	Soft-fruit Woodys	2	
Solanum betaceum	Tamarillo	Soft-fruit Woodys		
Solanum chenopodioides	Whitetip Nightshade	Herbs in Disturbed Ground		
Solanum cinereum	Narrawa Burr Soft-fruit Woodys		2	
Solanum douglasii	Douglas' Nightshade	Herbs in Disturbed Ground		
Solanum elaeagnifolium	Silverleaf Nightshade	Herbs in Disturbed Ground		
Solanum furcatum	Broad Nightshade	Herbs in Disturbed Ground		
Solanum hispidum	Giant Devil's Fig	Herbs in Cultivated Ground		
Solanum laxum	Jasmine Nightshade	Robust creeper/ climber		
Solanum linnaeanum	Apple of Sodom	Herbs in Cultivated Ground		
Solanum lycopersicum	Tomato	Herbs in Cultivated Ground	1	
Solanum marginatum	White-edge Nightshade	Herbs in Cultivated Ground		
Solanum mauritianum	Tobacco-bush	Soft-fruit Woodys		
Solanum nigrum	Black Nightshade	Herbs in Disturbed Ground	1	
Solanum nigrum sensu Willis (1972)	Black Nightshade	Soft-fruit Woodys	2	
Solanum physalifolium var. nitidibaccatum	Cherry Nightshade	Herbs in Disturbed Ground		

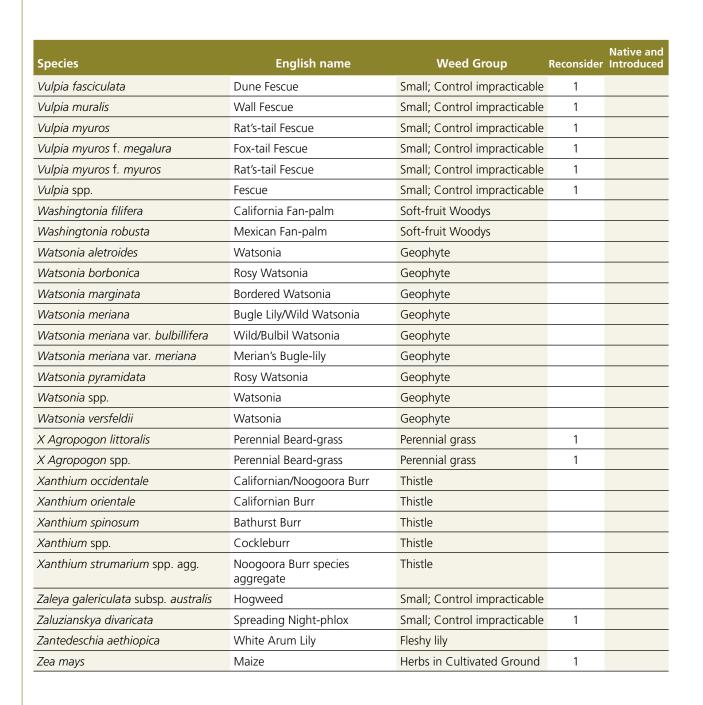












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